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ZONING IN: South Australian Aquaculture Report 2015/16

AUGUST 2017

PREMIUM
FOOD AND WINE FROM OUR
CLEAN
ENVIRONMENT



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Foreword

South Australia's seafood industries are an iconic and important part of our state's regional identity. At the centre of this identity, and the state's success in producing premium seafood, is a strong aquaculture industry. The South Australian aquaculture industry is one of the largest primary production sectors in the state, with production value in 2014/15 amounting to \$228 million - 49% of the state's total value of seafood production and 19% of Australia's aquaculture production value.

Boasting an international reputation for top quality and highly sustainable seafood, the state's aquaculture industry produces some of the most sought-after products in the world, including Southern Bluefin Tuna and Pacific Oysters. South Australia is home to the most diverse range of aquaculture systems in Australia, including subtidal and intertidal mollusc farming, sea-cage farming of finfish and a range of land-based systems. A large proportion of South Australian aquaculture production, particularly Tuna, is exported overseas, primarily to Japan and other Asian countries, and export markets are increasingly seeking seafood produced in our pristine waters.

As the global demand for seafood continues to increase, South Australia's aquaculture industry is well-placed to capitalise on opportunities to meet the demands of local and overseas markets. These opportunities will generate important economic and employment benefit across the state, particularly in regional areas. A diverse, sustainable and high-value aquaculture industry is of benefit to all South Australians. The report entitled '*ZONING IN: South Australian Aquaculture Report 2015/16*' profiles this important industry and details information on current practices, management requirements and environmental monitoring.

A handwritten signature in blue ink that reads "Leon Bignell". The signature is fluid and cursive, with the first name "Leon" and the last name "Bignell" clearly distinguishable.

Leon Bignell MP
Minister for Agriculture, Food and Fisheries

August 23, 2017

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1 Background

1.1 Purpose

This annual report provides a summary of production and management of aquaculture in South Australia. This report broadly covers aquaculture regulation and management, aquatic animal health regulation and management, production trends, environmental monitoring, socio-economic impact, key research activities that underpin management, broad sector trends (including species farmed) and challenges. The report presents information in such a way to address components of the Global Sustainable Seafood Initiative (GSSI) which are grouped into two broad categories: environmental monitoring and aquatic animal health. The information presented in this report is for the general public, key stakeholders of the aquatic environment and the seafood industry.

1.2 General background

Global demand for seafood is increasing, and with wild caught fisheries close to their production limits, aquaculture will play a crucial role in seafood production (FAO, 2015). Worldwide expectations are that by 2022, aquaculture will produce 47% of global seafood production and 53% of global seafood production that is destined for human consumption (FAO, 2015). In Australia, aquaculture has been the fastest growing livestock industry, growing by 9% annually over the 20 years to 2013/14 (ABARES, 2016), although has since plateaued. South Australian aquaculture has a reputation for producing safe, sustainable, high-quality and high-value seafood products within an internationally recognised, and advanced, regulatory framework. Further advantages for aquaculture in South Australia include the availability of relatively inexpensive land, and freedom from many known aquatic diseases that can impact aquaculture. These characteristics create significant opportunities for growth in aquaculture activity in South Australia, including through expanding export markets, growth in trade and attracting investment to the state.

Seafood sustainability standards help to ensure consistency and confidence in the way seafood is produced. There are many environmental and sustainability standards in the seafood industry including those of the Aquaculture Stewardship Council, Friend of the Sea and the Global Aquaculture Alliance to name just a few. In South Australia, some seafood producers, including aquaculture operators, have already applied for and received third party certification in accordance with one or more of these standards. For the seafood industry, the GSSI has recently developed a benchmark for seafood standards so that a seafood supplier can (a) know which standards meet the benchmark and (b) select one that best fits their requirements, therefore avoiding the need for dual or multiple certifications. The GSSI has the backing of the Food and Agriculture Organisation (FAO) and many countries including Australia, through the Fisheries Research and Development Corporation (FRDC). For more information see www.ourgssi.org and www.FRDC.com.au.

PIRSA has supported a number of South Australian seafood businesses to achieve third party seafood certification through the Premium Food and Wine Credentials Grant Program:

www.pir.sa.gov.au/premium_food_and_wine/food_and_wine_credentials_grant_program

This South Australian Aquaculture Report provides a summary of the seafood certification programs achieved by the South Australian aquaculture industry. The report also provides some of the regulatory information that industry and third-party accreditors may require for assessment against the GSSI benchmark.

Separate to third-party certification processes, PIRSA can also provide seafood businesses with a Statement of Recognition. In certain international export markets, including China and Japan, potential customers for agriculture, food and wine products highly regard government recognition of the practices and safety of these products. The Statement of Recognition Program has been designed to provide South Australian Government recognition to approved applicants for key regulatory requirements that apply to South Australian seafood producers and processors to assist with access to identified international markets. Statements can be used by businesses on Government-led outbound and inbound trade missions and also can be used in businesses' own promotional endeavors.

South Australian aquaculture comprises numerous species farmed in both landbased and marine environments. They include Abalone species, Barramundi, Marron, microalgae species, Murray Cod, Mussels, Oyster species, Silver Perch, Southern Bluefin Tuna, Trout, Yabbies and Yellowtail Kingfish.

1.3 Scope

The South Australian Aquaculture Report 2015/16 (the report) covers marine and landbased aquaculture in South Australia up to the financial year 2015/16. Where possible data are the most recently available. The report provides summary information directly related to each aquaculture sector (Tuna, Finfish, Abalone, Mussels, Oysters, Landbased and Tourism).

Data sources used for this report include the following:

- 2014/15 Econsearch production and economic data (EconSearch, 2016)
- 2014/15 Environmental Monitoring Program (EMP) data
- 2014/15 PIRSA management activities, industry trends and external factors
- 2015/16 PIRSA management activities, industry trends and external factors

1.4 Regulatory Framework

1.4.1 General Aquaculture Regulation

South Australia strives to be at the forefront of aquaculture development and planning, and the [Aquaculture Act 2001](#) is currently the only dedicated aquaculture legislation of its kind in Australia.

South Australia has taken a strategic approach to regulation and seeks to proactively plan for the future growth and expansion of the industry. While competition for, and access to, South Australia's natural resources is increasing, the government is supporting the efficient and effective use of these resources through sound policies and planning, and a one-stop-shop approach to aquaculture administration which involves PIRSA coordinating referrals and consultation with other government departments, key stakeholders and the community. The objects of the [Aquaculture Act 2001](#) are:

- to promote ecologically sustainable development of marine and inland aquaculture;
- to maximise the benefits to the community from the state's aquaculture resources; and
- to ensure the efficient and effective regulation of the aquaculture industry.

The [Aquaculture Act 2001](#) establishes the broad framework for the regulation of aquaculture in South Australia by:

- defining aquaculture as the farming of aquatic organisms for the purposes of trade, business or research;
- authorising aquaculture by setting the parameters within which it can occur;
- enshrining the principle of ecologically sustainable development (ESD);
- providing for planning for the future of the aquaculture industry through the development of aquaculture zone policies; and
- maintaining requirements for aquaculture leases and licences.

Pursuant to the [Aquaculture Act 2001](#), no one may conduct aquaculture in South Australia unless authorised to do so by an aquaculture licence.

Two types of aquaculture occur in South Australia:

- marine aquaculture (aquaculture occurring in state waters); and
- landbased aquaculture.

For marine aquaculture, an aquaculture lease is required to provide access to specific areas of state waters and an aquaculture licence authorises the nature of the activity conducted (e.g. species to be farmed, farming method, amount of stock permitted). For landbased aquaculture, only an aquaculture licence is required.

In South Australia, the assessment of individual aquaculture licence applications follows a strict set of guidelines. A semi-quantitative risk based assessment, based on a national best practice Ecological Sustainable Development assessment framework (Fletcher et al 2004) is applied to determine the sustainability and outcome of each individual application. The integrity of the assessment process rests on understanding both the nature of the environment in which the intended aquaculture operation occurs and the manner in which it interacts with or changes the environment that surrounds it.

As part of the assessment process, approximately 40 possible risk events which are viewed to be directly relevant to potential aquaculture influences are considered and applied to both site and regional levels. Risk events are assessed for the construction phase and ongoing activities. Some of the risks that are assessed include impacts to habitats, erosion, sedimentation, access by public, escape, disease management, chemical use, water flow, water quality, nutrient discharge, interaction with migratory species and impacts to sensitive habitats.

PIRSA Fisheries and Aquaculture also applies general guidelines to minimise environmental harm, for example aquaculture activities are not to be placed over sensitive habits (e.g. seagrass or reef) unless the appropriate mitigating strategies are in place to minimise the potential for environmental harm. Aquaculture activity is excluded in buffer zones around areas of conservation and heritage significance such as seal colonies, aquatic reserves, shipwrecks and national parks unless the appropriate approval from relevant authorities is secured.

All applications for aquaculture licences are reviewed for environmental issues and referred to the Environment Protection Authority (EPA) for assessment to ensure the proposal meets the objectives of the *Environment Protection Act 1993* and associated Environment Protection Policies (EPPs). Environmental issues of interest to the EPA include protection of water quality, management of noise and air quality, solid waste management and disposal, storage, use and disposal of hazardous substances and ecological impacts from pollution.

1.4.2 Environmental Regulation

Under the Aquaculture Regulations 2016, all aquaculture licence holders are required to submit an annual Environmental Monitoring Program (EMP) report to PIRSA which provides information on how they have been using the site. This information is vital to the continued sustainable management of the aquaculture industry. Information collected varies for each sector but generally includes:

- Site development and productivity (all sectors);
- Species farmed (all sectors);
- Amount of stock held on site per month (all marine);
- Feed and chemical inputs (all sectors);
- Water usage and discharge (Landbased);
- Interactions with site infrastructure and marine vertebrates (all marine);
- Escape of stock (all sectors);
- Disease incidents (all sectors);
- Debris incidents (all marine);
- Waste and refuse disposal (all sectors); and
- Benthic video assessment (Finfish, Mussel, marine Abalone).

Environmentally responsible infrastructure construction, waste disposal and general storage:

Under regulation 25 of the *Aquaculture Regulations 2016*, aquaculture farming structures and general infrastructure are required to be maintained in such a condition that will prevent pollution, either at the construction or ongoing operations. At the decommissioning of a site, operators of marine leases are required to remove all structures and stock and rehabilitate the site to a condition to the satisfaction of the Minister.

Requirements for waste disposal and appropriate storage of chemicals, feed materials and general farm waste are legislated under the *Environment Protection Act 1993*, and associated EPPs. The EPA has also developed specific codes of practice for the Oyster and Abalone sector that highlight the environmental issues in relation to these industries and provide recommendation to assist farmers to meet their legislative requirements under the *Environment Protection Act 1993*.

Impacts on habitat and biodiversity:

Minimising the impacts to the seafloor from marine aquaculture activities is important for ecological sustainable development. To achieve this, aquaculture activities involving the addition of feed (e.g. Tuna and finfish) are not to be placed over sensitive habitats (e.g. seagrass or reef) unless the appropriate mitigating strategies are in place to minimise and monitor the seafloor over time. In addition, regulation 25 of the *Aquaculture Regulations 2016* requires that floating structures are kept at least 3 metres above the seafloor to prevent scouring or rubbing of the seafloor.

There are a number of areas in South Australia where aquaculture is restricted and require appropriate approvals e.g. around parks declared under the *National Parks and Wildlife Act 1972* and historic shipwrecks declared under the *Historic Shipwrecks Act 1981*, and within some zones of marine parks (*Marine Parks Act 2007*) which further protect sensitive areas. PIRSA also apply an aquaculture exclusion buffer around seal breeding (15 km) and haul-out (5 km) areas.

To ensure that aquaculture activities have minimal impact on Threatened, Endangered and Protected Species (TEPS), PIRSA undertake an ESD Risk Assessment prior to approval of an aquaculture licence that includes an investigation of the impacts to TEPS that may occur in the area. All aquaculture licence holders are also required to submit a strategy to the Minister on how they will minimise the potential for interactions with TEPS (under regulation 18 of the *Aquaculture Regulations 2016*). The strategy must be approved by the Minister and the licence holder is bound by law to comply with the strategy. If an interaction does occur, licence holders are required (under regulation 27 of the *Aquaculture Regulations 2016*) to report the incident as soon as they become aware of the interaction, and work with PIRSA and relevant agencies (e.g. the Department of Environment, Water and Natural Resources - DEWNR) to resolve the incident, and where required, develop a review of mitigation strategies.

Impacts on water resources:

Nutrients released from aquaculture activities can have significant adverse impacts on water quality and benthic environments. To address this, aquaculture zone policies limit the biomass (and by association the amount of feed that is used) that can be farmed in an area. To further understand the impact of aquaculture on water quality, a new regional monitoring program has been recently implemented for Lower Eyre Peninsula (January 2016), in which water quality is a major component (see Tuna and Finfish sections). For Landbased operators, water usage may be legislated by DEWNR.

Requirements for water quality are legislated under the *Environment Protection Act 1993* and the *Environment Protection (Water Quality) Policy 2015* administered by the South Australian EPA. All aquaculture licensees must comply with EPA legislation and not cause environmental harm.

Species selection and escapes:

The escape of aquaculture stock can have serious implications for wild populations. Therefore, it is important to establish and maintain appropriate containment controls for stock to prevent an escape. There are, however, situations beyond the control of a licence holder where an escape can occur. To minimise the impact of the escape, PIRSA have a number of regulatory controls. The genetics of stock are considered and all licence holders must keep a stock register that outlines the movement of stock to and from the aquaculture site (regulation 15 of the *Aquaculture Regulations 2016*). In addition, all aquaculture licence holders are required to submit a strategy to the Minister on how they will minimise the potential for escape of stock, including maintenance of infrastructure and training of staff. The strategy must be approved by the Minister and the licence holder is bound by law to comply with the strategy. If an escape does occur, licence holders are required (under regulation 26 of the *Aquaculture Regulations 2016*) to report the incident within 24 hours.

1.4.3 Compliance

Planning and compliance inspections are central to a well-established and forward-looking industry. To ensure compliance with lease/licence conditions and relevant legislation, PIRSA Fisheries and Aquaculture officers conduct inspections that cover each sector, and issues such as navigation, location of farming structures, species farmed, impacts to benthic habitats and discharge of water are among those investigated. Aquaculture sites may also be conducted as part of the initial assessment of an application, in response to public concern or as part of an audit program.

1.4.4 Aquatic Animal Health Regulation

South Australia's freedom from many significant aquatic diseases provides competitive advantages in seafood production and market access. PIRSA Fisheries and Aquaculture Policy has a dedicated aquatic animal health program which aims to safeguard South Australia's aquaculture, fisheries and natural resources from the impact of aquatic diseases to maintain their clean, green image. Aquatic Animal Health is regulated under the *Aquaculture Act 2001*, the *Aquaculture Regulations 2016*, the *Fisheries Management Act 2007* and the *Livestock Act 1997*, which broadly cover: veterinary medicine use, livestock movements (translocation), record keeping, disease surveillance and disease management, including emergency response.

Veterinary Medicine Use:

Veterinary medicines are important disease management tools. When used correctly, they play a valuable role in ensuring animal welfare and maximising the quality and yield of primary produce. Aquaculture farmers must endeavor to use veterinary medicines that are registered under the *Agricultural and Veterinary Chemicals Code Act 1994* (Agvet Code) through the Australian Pesticides and Veterinary Medicines Authority (APVMA). However, for veterinary medicines that are not permitted or registered with the APVMA, the *South Australian Aquaculture Regulations 2016* (regulation 10) provides a mechanism for off-label use (unregistered with the APVMA) under prescription from a registered veterinarian. Reasons for off-label use include new emergent diseases in aquaculture (a comparably young primary industry), emergency and experimental treatments to facilitate data collection for APVMA applications.

For off-label veterinary medicine use under the *Aquaculture Regulations 2016*, PIRSA requires a veterinary prescription and information on the product, disease diagnosis, species to be treated, efficacy, host safety and environmental risk (including environmental toxicity). Risk assessment, calculation of environmental trigger values and predicted residue calculations are included in the assessment process agreed to by the EPA. The EPA are consulted for applications that include discharge to the environment (e.g. sea-pontoon aquaculture). Requests for use of antibiotics are considered in line with the World Organisation for Animal Health (OIE) Aquatic Animal Health Code and in line with Australia's National Antimicrobial Resistance Strategy (AMR) 2015-2019: that is, treatments for a diagnosed disease are considered (not prophylactic treatment).

For further information, see www.pir.sa.gov.au/aquaculture/aquatic_animal_health/veterinary_medicine_use_in_aquaculture

Livestock Translocations:

Aquatic livestock translocations are regulated under the *Livestock Act 1997* primarily for the purpose of reducing the risk of disease introduction and spread. Legislative restrictions are in place to mitigate high-risk movements of aquaculture livestock, including movements of livestock within South Australia, wild caught stock brought onto a farm, as well as importing stock into South Australia. Two Notices under the *Livestock Act 1997* regulate high risk aquatic livestock movements: (1) the *Livestock (Restrictions on Entry of Aquaculture Stock) Notice 2014*, and (2) *Livestock (Restrictions on Entry of Abalone Livestock for Purposes Other than Aquaculture) Notice 2015*. Wild caught stock for the purpose of aquaculture may require approval under both the *Fisheries Management Act 2007* (i.e. seedstock and broodstock) as well as Notices under the *Livestock Act 1997* (to bring stock onto the farm site). Assessment of livestock translocation requests may include requirements for veterinary stock inspection, batch testing to rule out notifiable and infectious disease, health certification and requirements for hatchery biosecurity.

For further information see: www.pir.sa.gov.au/biosecurity/aquatics/moving_aquatic_animals

Disease Management and Surveillance:

Disease management includes requirements to report disease (including notifiable diseases), report unusually high and unexplained mortality events, and requirements to maintain stock records (i.e. stock movement, mortality rate). These requirements are for aquaculture licence holders as prescribed under the *Aquaculture Regulations 2016*. In addition to batch testing for livestock translocations, these requirements provide for disease surveillance (passive), early detection of disease and they can trigger investigations (e.g. aquaculture mortality or fish kill reports) to rule out disease (to support trade and market access as well as provide for rapid disease response). Emergency disease response protocols are in line with the OIE Aquatic Animal Health Code and Australia's Aquavetplan series of emergency disease response guidelines:

www.agriculture.gov.au/animal/aquatic/aquavetplan

Active surveillance is also undertaken by PIRSA as required to confirm disease status or freedom from disease for the purpose of emergency response, to support policy (e.g. livestock translocation) or to support trade and market access requirements. Previous active surveillance (one-off surveys) in South Australia has occurred for Abalone Viral Ganglioneuritis (AVG) and *Perkinsus* (for Abalone), *Bonamia* (for native Oysters), various notifiable prawn diseases and for Pacific Oyster Mortality Syndrome (POMS).

Disease management in aquaculture can also include farm biosecurity which may be a requirement for state livestock translocation approvals or a requirement of importing jurisdictions / countries. Guidelines for aquaculture farm biosecurity include:

- National farm biosecurity guidelines (www.agriculture.gov.au/fisheries/aquaculture/farm-biosecurity-plan), and
- PIRSA farm biosecurity guidelines, for example (www.pir.sa.gov.au/biosecurity/aquatics/aquatic_diseases/abalone_biosecurity_standards).

PIRSA responds to wild fish kills and suspected disease (includes mollusc, crustacean and finfish) events and reports of suspected disease outbreaks in aquaculture to determine the likely cause (e.g. human health risks, chemical spill, notifiable disease) and possible response and mitigation options. If disease is detected, then mitigation may include control, containment or even eradication measures. If disease is ruled out and a chemical spill, oil spill or pollutant are determined to be a likely cause, then the appropriate government department is notified to investigate (e.g. the EPA).

Fish kills are a global phenomenon and can be attributed to natural oceanographic cycles, disease outbreaks, harmful algal blooms (HABs), coastal pollution and even climate change. In South Australia, many small-scale fish kills investigated have been attributed to shallow, unprotected waters that are greatly influenced by extreme weather conditions including temperature (i.e. peak summer and peak winter), dodge or minimal tides, anoxia (low dissolved oxygen), HABs, 'blackwater' events in freshwater systems (flooding and associated anoxic water from high organic loads) and acid sulphate soil disturbance. Susceptible species are generally those in shallow water environments (including juveniles of economically important species), particularly benthic and intertidal species. Common species associated with natural fish kill events include bony bream, carp, mullet, garfish, crabs and various molluscs (including abalone). Furthermore, causes of individual fish kill events can often remain unknown due mostly to the mortality not being observed and reported until fish wash ashore, which impedes appropriate sample collection and analyses. Investigations sometimes rely on anecdotal evidence and climatic weather observations as the basis for attributing "likely causes", with the situation closely monitored.

1.4.5 South Australian Shellfish Quality Assurance Program

The South Australia Shellfish Quality Assurance Program (SASQAP) is part of PIRSA's Biosecurity SA Division within the Food Safety Program. Biosecurity SA is the principal government agency charged with monitoring and maintaining shellfish food safety in South Australia (www.pir.sa.gov.au/biosecurity/food_safety/shellfish_sasqap).

SASQAP is a regulatory testing body that provides consumer protection and ensures development of domestic and international markets through the monitoring and testing of shellfish and water in shellfish growing areas in South Australia. Bivalve molluscs such as Oysters, Mussels, Cockles and Pipis are filter feeders that have the ability to concentrate bacteria, viruses, toxins and heavy metals.

If adverse conditions are likely to arise in a shellfish harvesting area, for example as a result of heavy rainfall events causing runoff from the land into the marine environment, SASQAP acts to close these areas as a precautionary measure to prevent contamination of the shellfish in the area. This serves to ensure only safe product reaches the market.

There are currently 24 classified shellfish harvesting areas in South Australia, the majority of which are located on the west coast of Eyre Peninsula. There are also some other areas within Spencer Gulf, Yorke Peninsula and Kangaroo Island.

2 Aquaculture activity in South Australia

2.1 Socio-economic data for 2014/15¹

The state's total value of seafood production (landed) in 2014/15 was \$469 million, of which aquaculture contributed 49% (\$228m) with wild catch fisheries contributing the balance (\$241m) (EconSearch, 2016). South Australia produced 19% of Australia's aquaculture production value in 2014/15, the second largest aquaculture producer behind Tasmania.

The aquaculture industry in South Australia has developed significantly since the Oyster sector first began commercial production in the 1980s. South Australia is now home to the most diverse range of aquaculture sectors in Australia. The largest single sector in the state's aquaculture industry is Tuna, which accounted for almost 57% of South Australia's gross value of aquaculture production in 2014/15. Other key sectors include Other² (14%), Oysters (13%), marine Finfish (8%) and Abalone (5%) (EconSearch, 2016). Aquaculture operations undertaking Tourism activities which offer the opportunity to swim with Tuna and interact with other marine organisms, resulted in an estimated 9 732 visitors in 2014/15 (EconSearch, 2016).

Aquaculture production increased steadily from 1997-2009, after which it slowly decreased (Figure 1). The value of aquaculture production tripled from 1997 to 2003, after which it dropped but remained relatively steady (Figure 1). The fluctuating dollar against the Japanese yen which impacted on the price received for Tuna when exported to Japan, the increased Southern Bluefin Tuna quota allocation, innovation and expansion of other aquaculture sectors – such as the fluctuating production of microalgae in recent years – have all been factors that have influenced aquaculture production and value in South Australia.

In 2014/15, South Australia's aquaculture industry created an estimated 817 Full Time Equivalent (FTE) jobs (569 on-farm and 248 in downstream activities) through direct employment and 1 016 flow-on jobs, giving total employment of 1 833 FTE. Approximately 65% of these jobs were generated in regional South Australia (EconSearch, 2016).

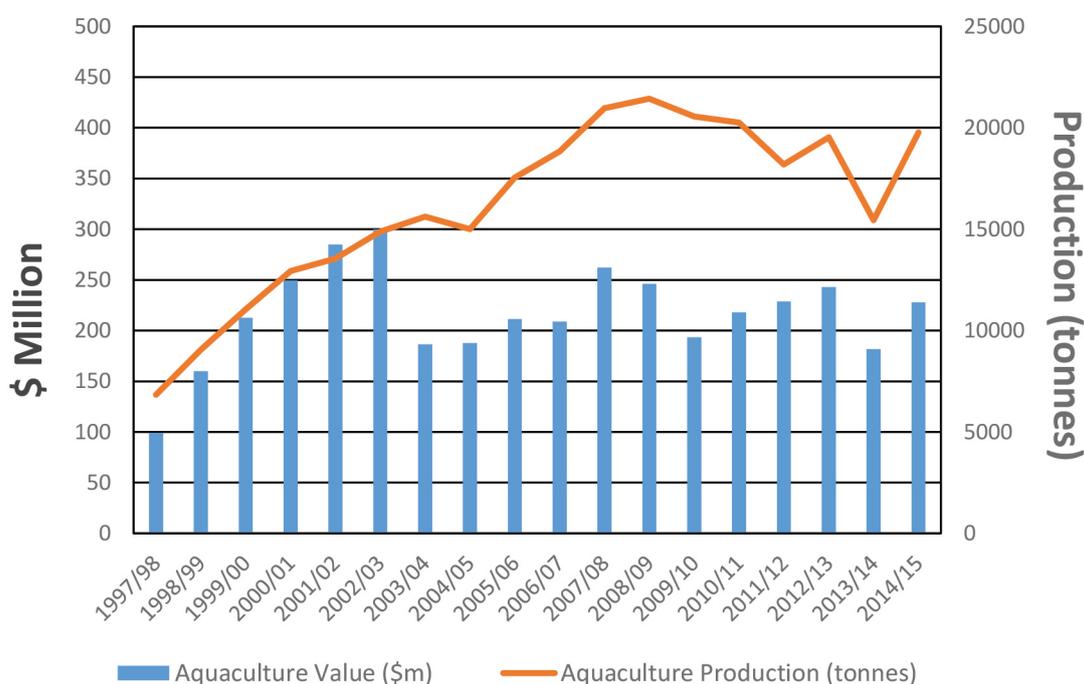


Figure 1. South Australian aquaculture value (\$) and production (tonnes) over time.

¹ Socioeconomic data for 2015/16 was not available at the time of publishing this report.

² Other aquaculture production in 2014/15 was comprised of Algae, Silver Perch, Shortfin Eel and Barcoo Grunter production.

2.2 Industry licence holders

The total number of aquaculture licences operating in South Australia during 2014/15 was 541, comprising 438 marine sites and 103 landbased sites (Figure 2). The number of licences decreased to 536 in 2015/16 through surrender or site amalgamation (435 marine and 101 landbased) (Figure 2). In addition, there were a number of marine miscellaneous holding sites utilised by the Tuna sector to hold and maintain sea-pontoons, but on which stocking is not permitted. A full list of the aquaculture licences for which this report relates is provided in Appendix 1.

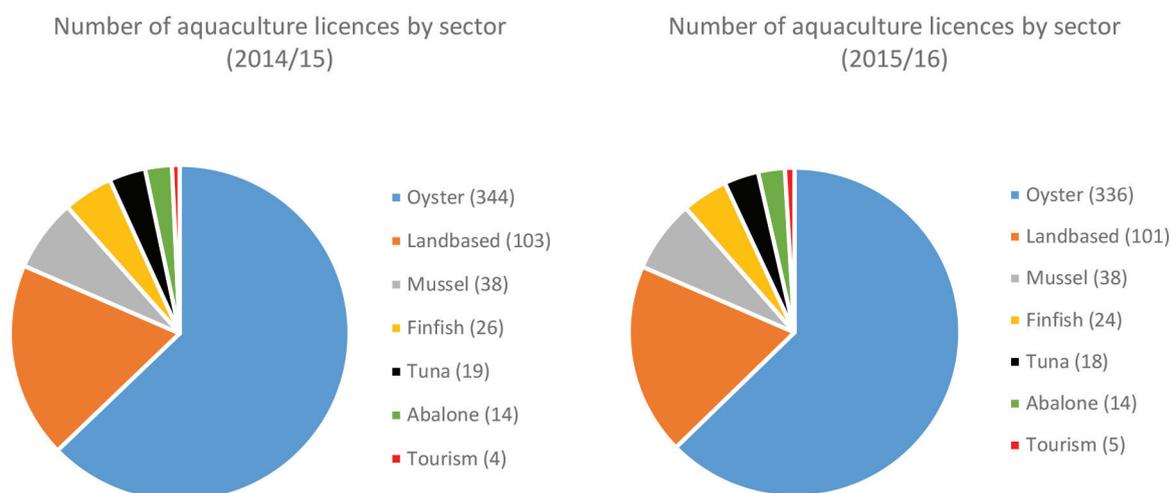


Figure 2. A summary of South Australian aquaculture licences by sector during 2014/15 and 2015/16.

2.3 Aquaculture applications processed by PIRSA

PIRSA Fisheries and Aquaculture process a range of applications each year, which are requested from the aquaculture industry to improve/change the activities of their business. Lease and licence changes managed by PIRSA Fisheries and Aquaculture can include, for example, assessments for new licences, movements of leases/licences, variations of leases/licences (e.g. species additions, divisions and amalgamations, infrastructure changes), transfers, renewals and surrenders. Table 2 represents the number of applications processed by PIRSA in 2014/15 and 2015/16. In addition, a review of all Landbased aquaculture licences was conducted in 2015, resulting in 37 licence category changes and five species amendments.

Table 1. A summary of South Australian aquaculture licences by sector during 2014/15 and 2015/16.

Application type	2014/15	2015/16
Licence/ lease movement	7	5
Lease/ licence transfer	111	43
New licence	2	3
Licence variation	6	7
Lease/ licence surrender	5	5
Renewal of leases	147	123

3 Aquaculture zone policy

3.1 Summary of aquaculture zone policies in South Australia

There are twelve aquaculture zone policies prescribed in South Australia (Figure 3), which represent management areas where aquaculture is excluded or permitted. These zone policies occupy approximately 422 836 hectares or 7% of our state waters (Appendix 2). Ten of the zone policies are located off the coast of the Eyre Peninsula, one off the western side of the Yorke Peninsula and one in the state's south east. More than half (52%) of the area allocated to aquaculture zone policies in South Australia is comprised of aquaculture exclusion zones where no aquaculture activity is permitted. Exclusion zones generally include sensitive habitats or areas that have been identified as important for other users of the marine environment (e.g. commercial and recreational fishers). The remaining 48% is set aside to allow aquaculture production to occur and are known as aquaculture zones. In general, between 5-10% of an aquaculture zone is allocated for aquaculture at any one time. This equates to approximately 0.2% of state waters currently available for aquaculture.

The Eyre Peninsula aquaculture zone is the largest in terms of total area within the state and has the most diverse range of species produced. The most recent zone policy, is located off the coast of Tumby Bay on the Eyre Peninsula. Details on each policy are provided in Appendix 2 or at www.pir.sa.gov.au/aquaculture/policy_and_legislation_for_aquaculture/zone_policies.

Aquaculture zone policies set out considerations for aquaculture that are specific to the environmental, sociological or geographical characteristics of the zone area. Aquaculture zones prescribe the maximum hectares that can be developed and the class of species permitted for the purposes of aquaculture. Dependent on the species considered, a maximum biomass (tonnage) can also be prescribed. The prescribed criteria are determined by the physical and biological characteristics of the zone and the biological requirements and typical farming infrastructure of the species being considered for the zone.

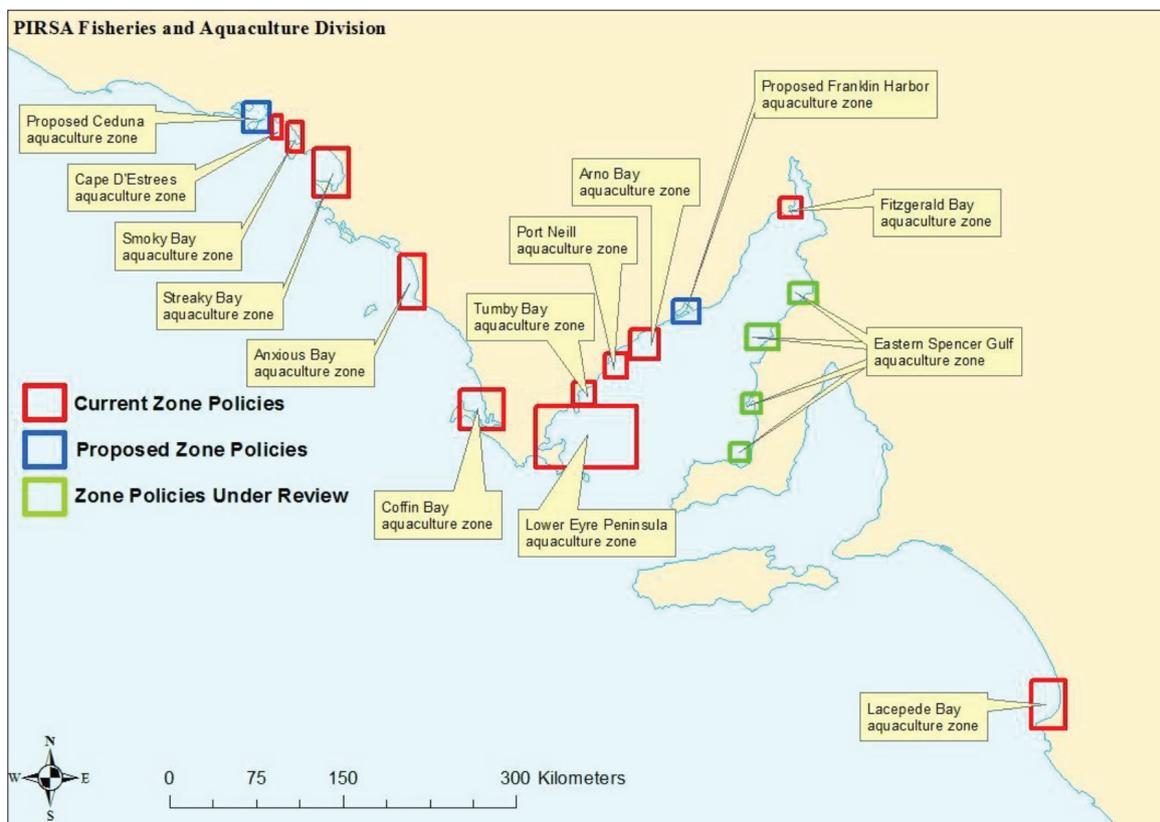


Figure 3. Aquaculture zone policies in South Australia (current, proposed and under review).

The prescribed classes of aquaculture considered for an aquaculture zone can include:

- the farming of aquatic animals (other than specified animals) in a manner that involves regular feeding (i.e. prescribed wild-caught Tuna, Finfish, Abalone or any other species requiring supplementary feed);
- the farming of molluscs (i.e. Abalone and filter feeding organisms such as Oysters, Mussels, Scallops);
- the farming of bivalve/filter feeding molluscs (i.e. filter feeding organisms such as Oysters, Mussels, Scallops); and
- the farming of algae.

Once an aquaculture zone policy has been legislated at the end of the aquaculture zoning process, an aquaculture lease and licence is required in order to undertake farming activities within the zone. It is important to distinguish between aquaculture zoning and individual site allocation and management. Aquaculture zones policies provide a broad overview of the ecological environment and establish areas in which aquaculture is deemed appropriate to occur, while controls relating to the performance of farm operations are applied through marine aquaculture leases, licences and the *Aquaculture Regulations 2016*.

Applications for leases within an aquaculture zone are referred to the Aquaculture Tenure Allocation Board (ATAB). If a zone is prescribed as a public call area within an aquaculture zone policy, a public call is made inviting applicants to submit their proposal on the required application form. These applications are assessed by the ATAB which then makes a recommendation to the Minister for Agriculture, Food and Fisheries on which applications should proceed. The successful applicant will be invited to submit an aquaculture licence application, which will be subject to a comprehensive ESD assessment conducted by PIRSA Fisheries and Aquaculture and provision to mandatory referral agencies for comment. Applications submitted for aquaculture zones which are not prescribed as a public call area are still required to be assessed by the ATAB. Applications for pilot leases outside an aquaculture zone are not subject to a competitive allocation process. The competitive allocation process ensures a fair and efficient means of allocating the state's marine aquaculture resources. The allocation process is used to determine which applicant will use the public resource at an optimum level in terms of the quality and quantity of output relative to the capacity of the environment.

PIRSA monitors the tenure (leasable hectares) and biomass limits prescribed within each zone policy to ensure that tenure allocated is within the defined limits. The following figures (4-12) provide an indication of the tenure that is available within each of the zone policies listed in Appendix 2.

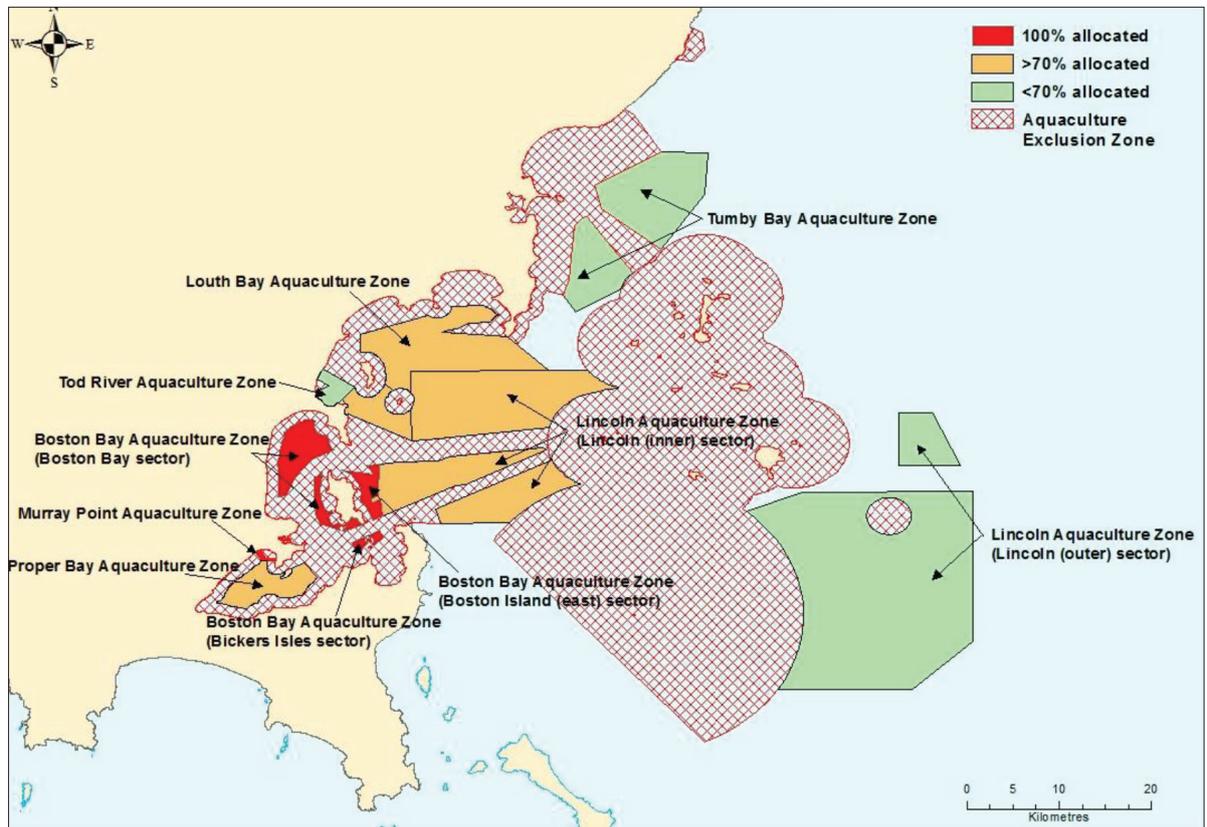


Figure 4. Aquaculture (Zones – Lower Eyre Peninsula) Policy 2013 and Aquaculture (Zones – Tumby Bay) Policy 2015.

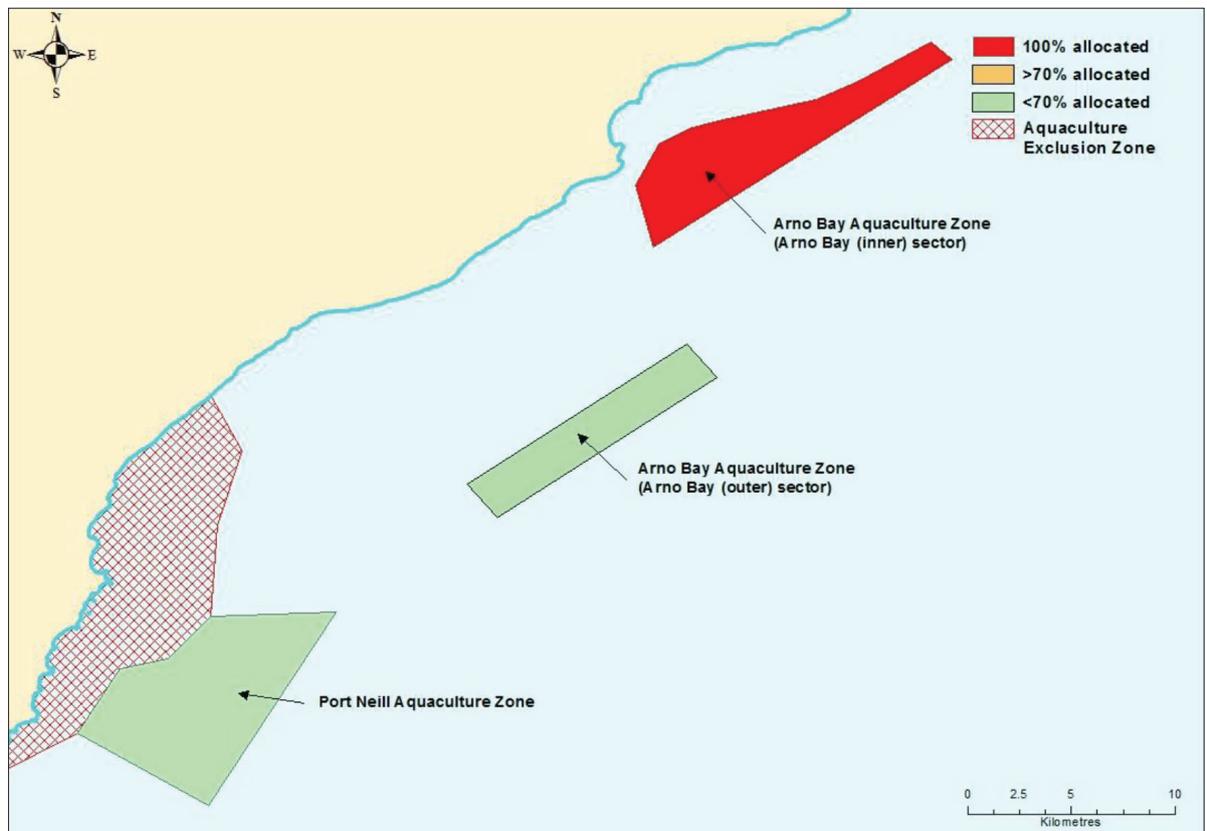


Figure 5. Aquaculture (Zones – Port Neill) Policy 2008 and Aquaculture (Zones – Arno Bay) Policy 2011.

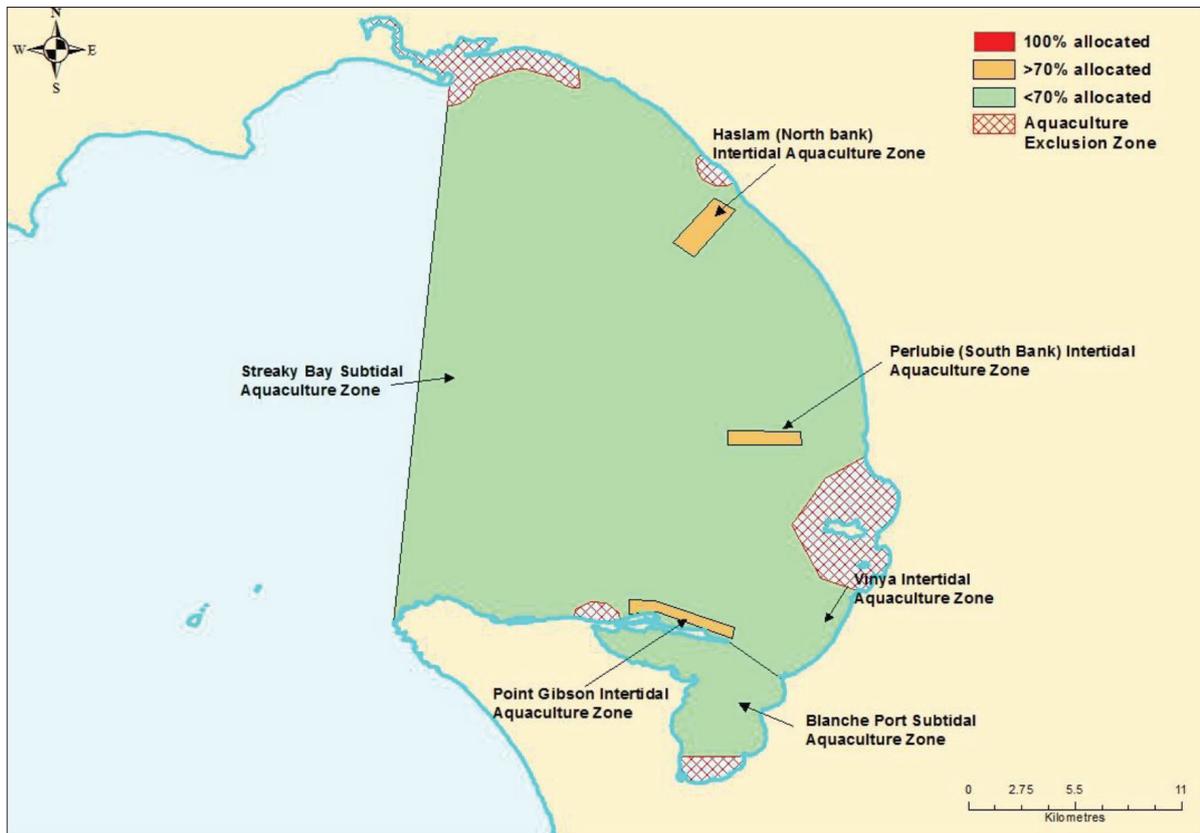


Figure 6. Aquaculture (Zones – Streaky Bay) Policy 2011.

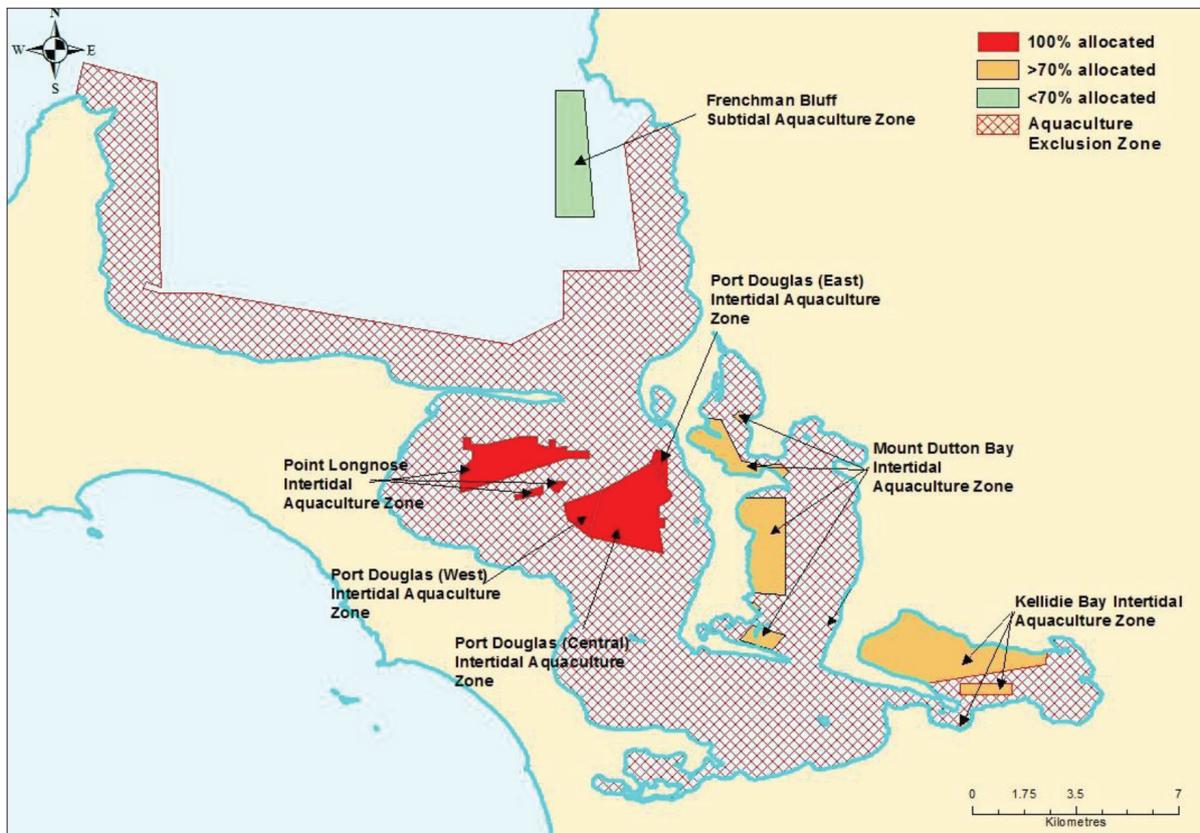


Figure 7. Aquaculture (Zones – Coffin Bay) Policy 2008.

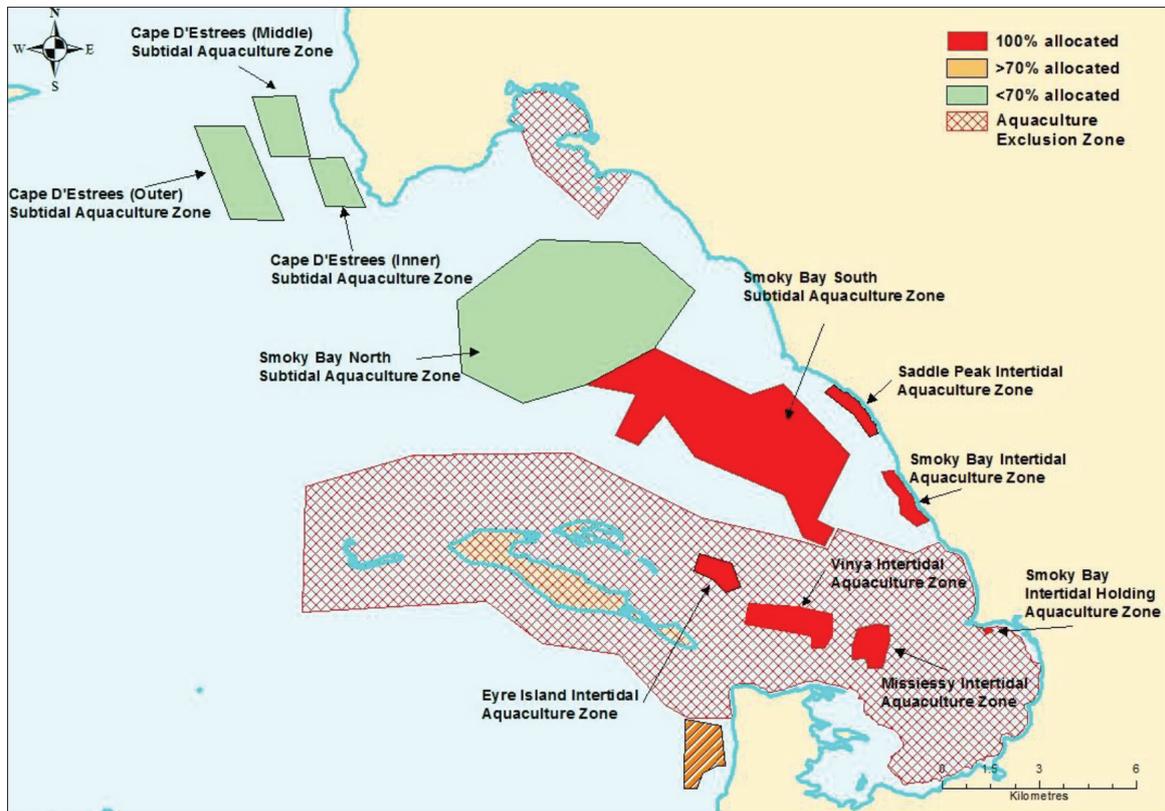


Figure 8. Aquaculture (Zones – Cape D'Estrees) Policy 2006 and Aquaculture (Zones – Smoky Bay) Policy 2007.

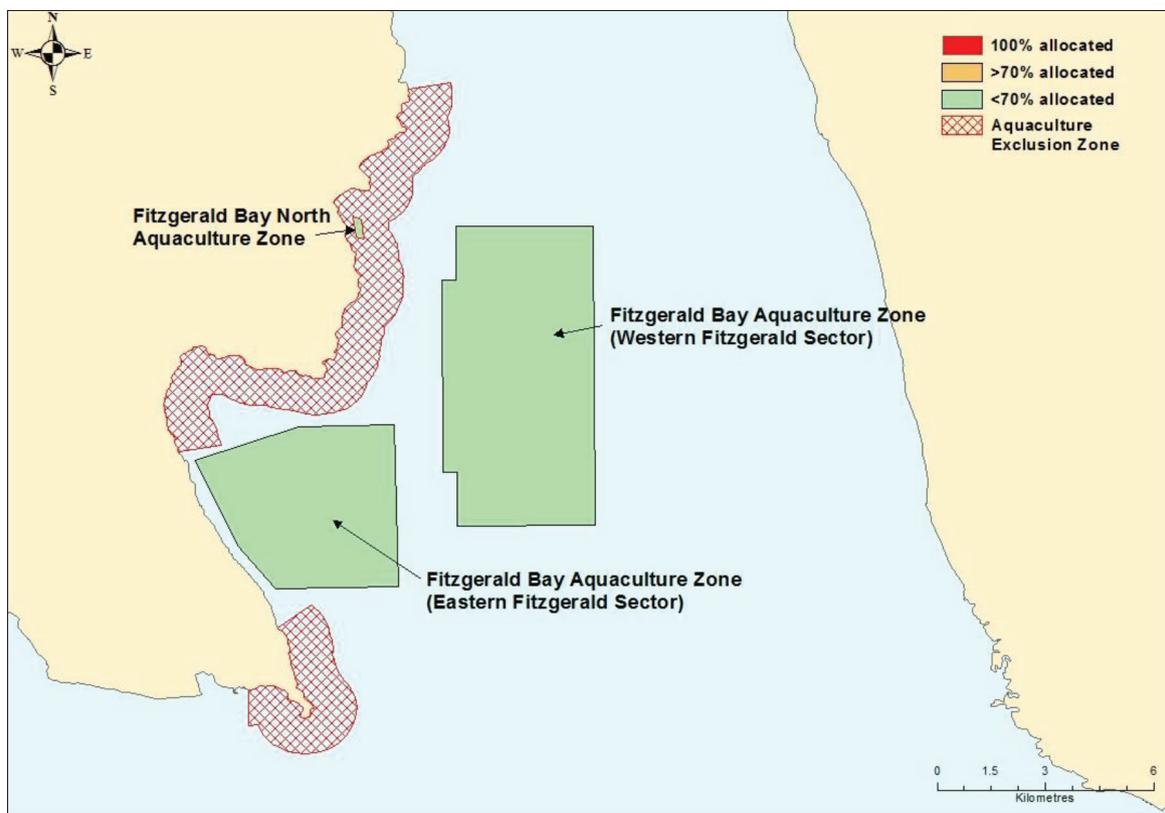


Figure 9. Aquaculture (zones – Fitzgerald Bay) Policy 2008.

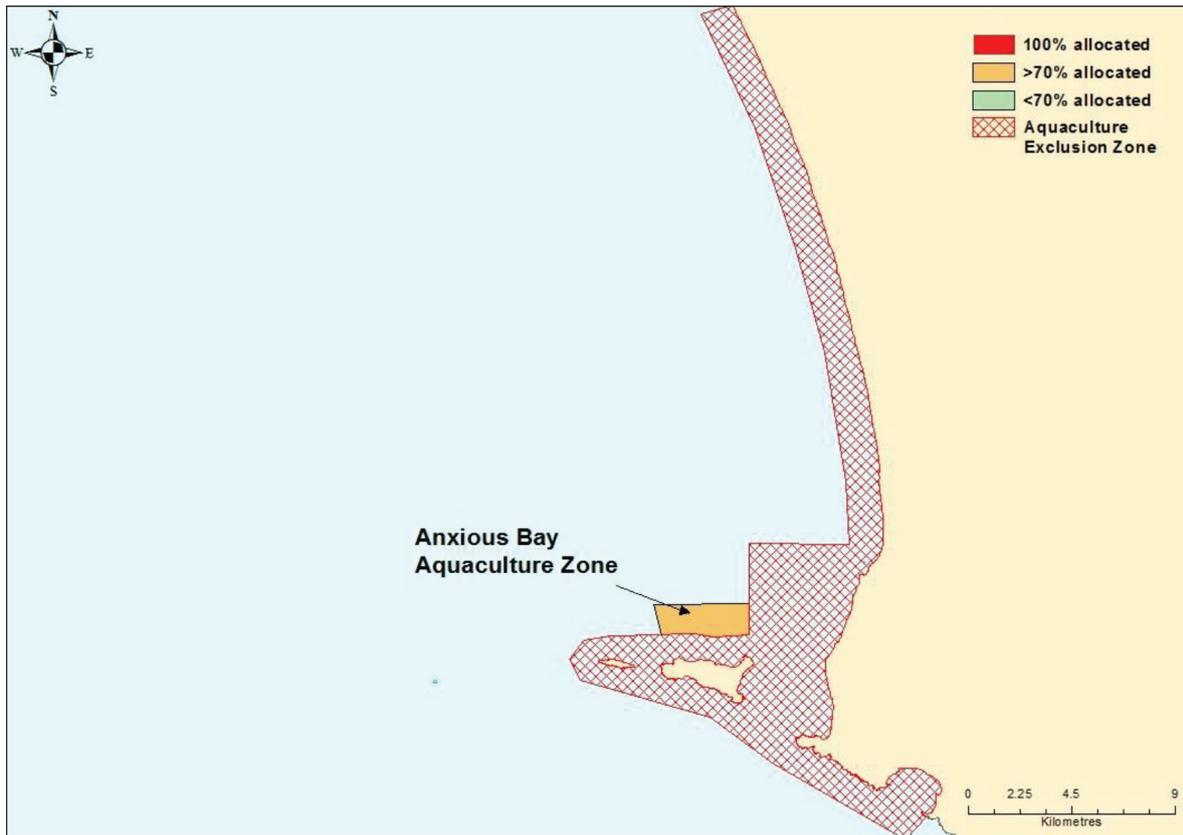


Figure 10. Aquaculture (zones – Anxious Bay) Policy 2007.

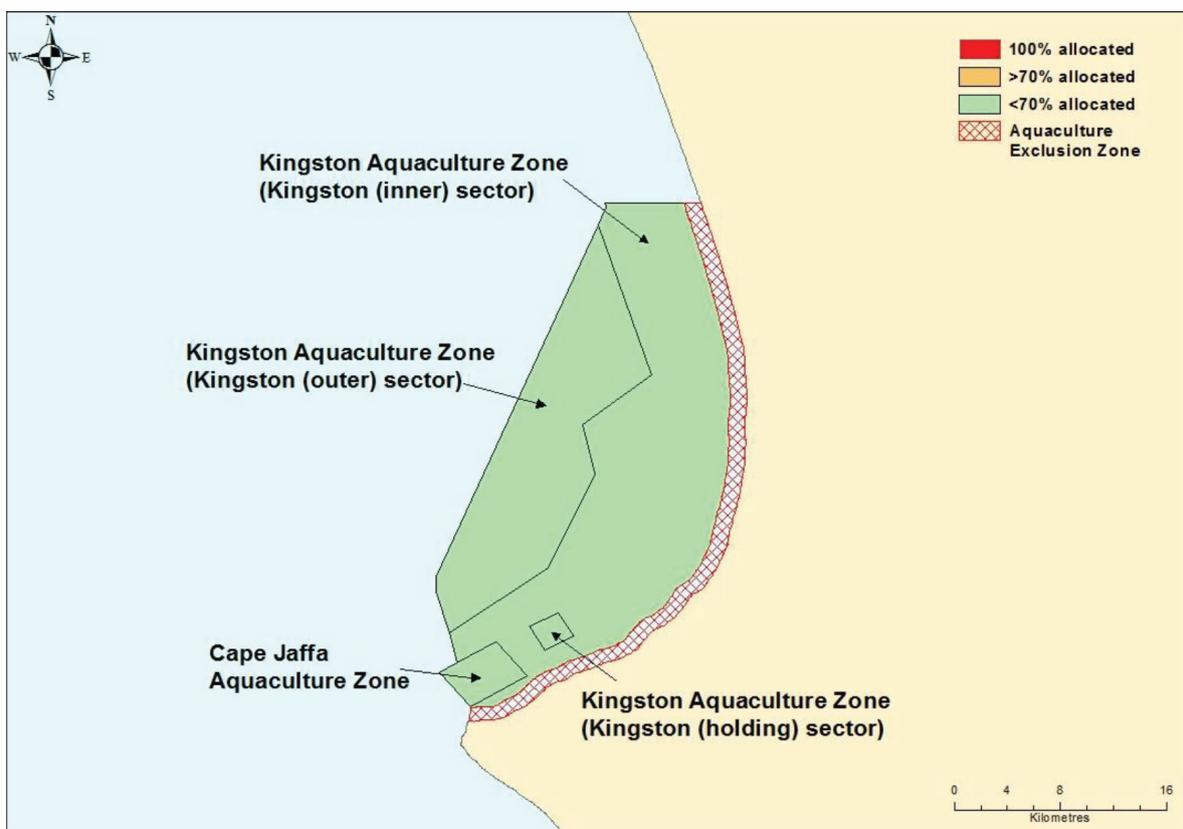


Figure 11. Aquaculture (zones – Lacepede Bay) Policy 2012.

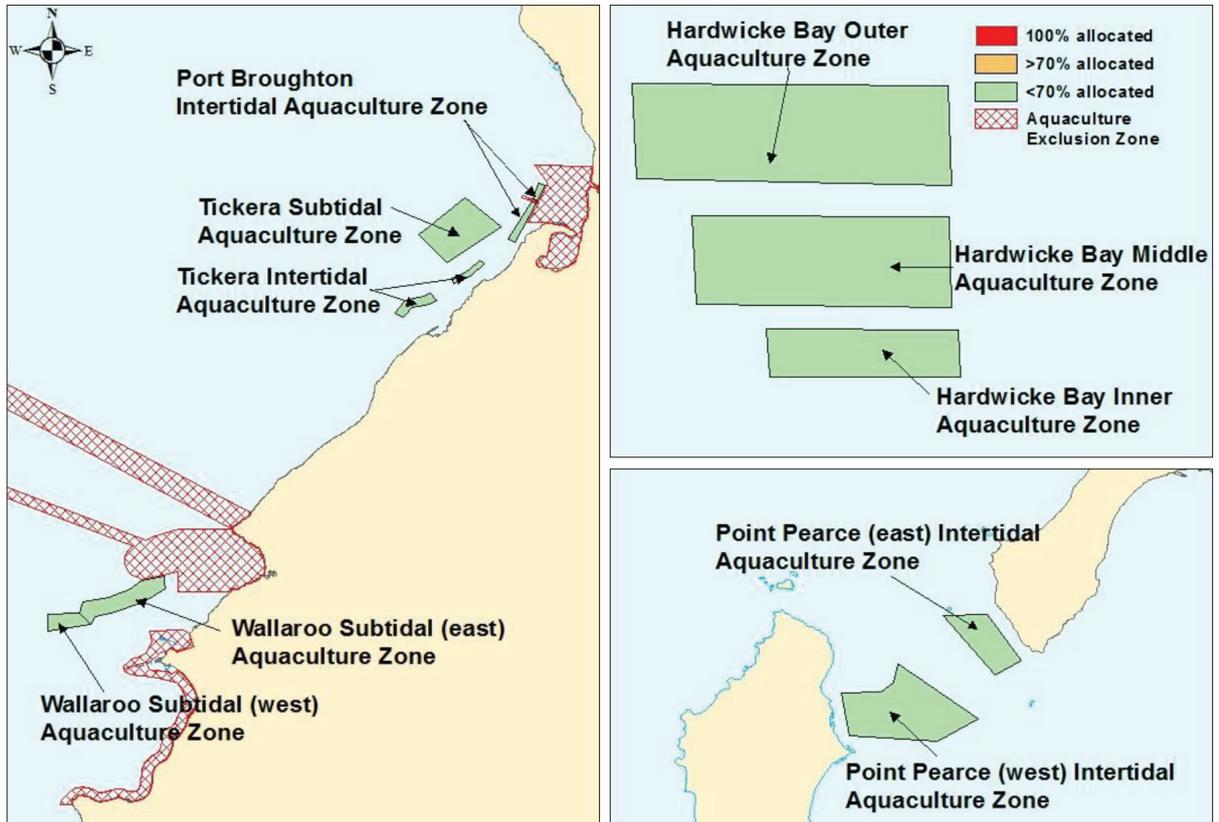
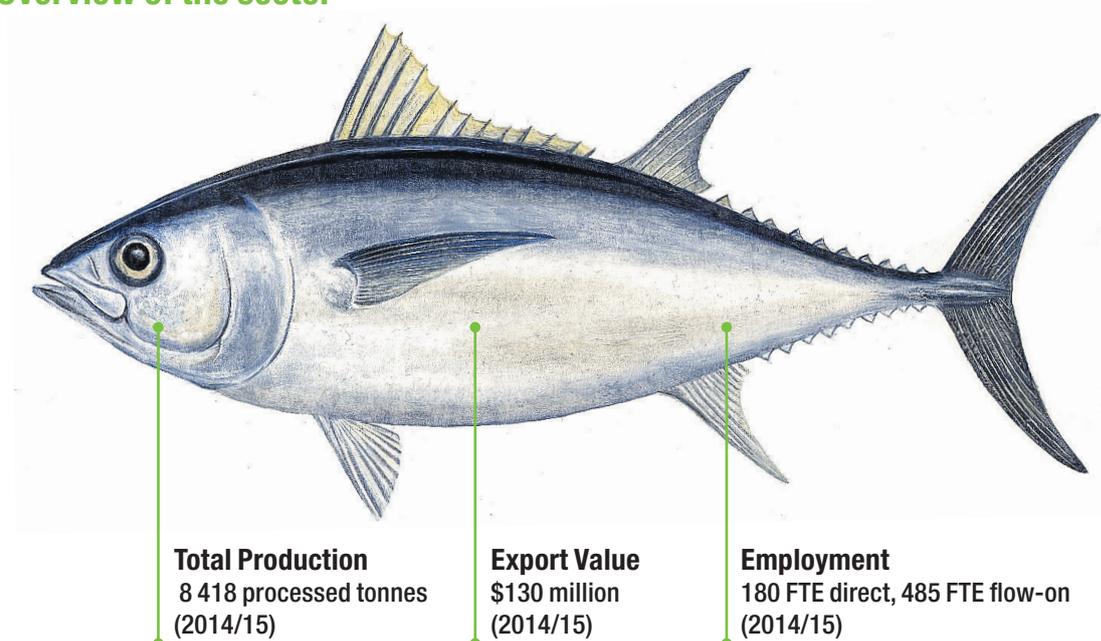


Figure 12. Aquaculture (zones – Eastern Spencer Gulf) Policy 2005.

4 Tuna

4.1 Overview of the sector



The Tuna aquaculture sector is well established, with significant growth in production since its initiation in the 1990's. The species targeted by this sector is the Southern Bluefin Tuna (SBT) (*Thunnus maccoyii*).

SBT farming represents a high-performing sector of the South Australian aquaculture industry. In 2015/16, there were 18 Tuna farms licensed by PIRSA Fisheries and Aquaculture which occupied 2 245 hectares of water. The majority of these (15) were located east of Boston Island, near Port Lincoln. The remaining were located near the Sir Joseph Banks Group of Islands (1) and Arno Bay (2). Arno Bay sites are used to hold broodstock SBT. Individual Tuna aquaculture licences are listed in Appendix 1.

The sector is based on the wild capture of SBT juveniles between December and March each season, the amount of which is restricted by an annual quota determined by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). Over 85% of Australia's SBT quota is used for farming in South Australia. The global and Australian quota has continued to increase from 2012 when the CCSBT adopted a Harvest Strategy which uses a scientific model to determine the sustainable catch and quotas. Since then, Australia's quota has increased gradually from 4 015 tonnes in 2011 to 5 665 tonnes in 2017, and will rise to 6 165 tonnes per annum from 2018 to 2020. The quota for 2021-2023 will be set in October 2019.

Juvenile SBT are moved to off-shore sea-pontoons (40-50 m diameter) where they are grown out to market size. SBT are held in sea-pontoons for a grow-out period of approximately 3-7 months, during which time they more than double their whole weight on average. During grow-out, SBT are typically fed wild-caught fresh Sardines caught under the South Australian Sardine catch quotas.

The environmental impact of off-shore sea-pontoon SBT farming have been well described and include impacts associated with dissolved nutrients and chemicals from fish metabolism, and solid waste from faeces and any excess feed, which are predominantly dispersed in the water column (~85%), with the remainder deposited on the underlying seafloor (Fernandes *et al.* 2007a and 2007b, Tanner and Volkman 2009).

To ensure the impacts are managed, precautionary biomass limits for both individual sites and zone policies are developed to protect the environment from significant ecological impacts that the Tuna sector may have within their relative growing regions, and to ensure husbandry standards. The EMP process provides ongoing environmental monitoring information required to identify and control the occurrence of any impacts the Tuna sector may present on both an individual site level and a whole of sector level. In addition, it is a legislative requirement for licence holders to fallow or move sea-pontoons each year to provide the seafloor time to recover.

The wider ecological benefit of Tuna farming is that in the wild the SBT age-groups captured for farming have a high annual natural mortality of 20-30% from predators and periods of starvation. They are also believed to have a relatively poor feed conversion ratio (FCR) because of the high energy used in escaping predators and in mass migrations. In contrast, in farms the natural mortality is around 1% in the grow-out period and much more of the energy from feed goes into growth rather than escaping predators and migration. In addition, Tuna farming maximises the seasonal grow-out (summer) and the quality (fat) content in autumn/winter before harvest.

4.2 Environment

4.2.1 Regional environmental monitoring program

In 2015, a new regional environmental monitoring program was developed for the Finfish and Tuna aquaculture sectors in lower Eyre Peninsula. The program is designed to describe the overall health of the region with respect to aquaculture impacts rather than monitoring at the site or lease scale, in response to recognition that the majority of waste from Finfish and Tuna licensed sites is dissolved in the water column and is carried offsite. The monitoring program was developed in consultation with the Tuna and Finfish aquaculture industries, PIRSA, the EPA and the South Australian Research and Development Institute Aquatic Sciences (SARDI). Information collected and analysed for the regional program includes water quality, sediment biochemistry and benthic infauna, all of which contributes to an existing hydrodynamic and biogeochemical model. The first sampling for the new program was undertaken in January 2016 and data is being collected over a four-year period. As such information relating to this program will not form part of this report, but will be available in the next report.

4.2.2 Annual environmental monitoring reports

Submission rates for EMPs for the Tuna sector were 90% in 2014/15. EMP's were not submitted for two sites (one site was surrendered and the other was operated as a maintenance site during this financial year).

Development

Of the 17 reports submitted for the 2014/15 EMP reporting period, all of the licences were reported to have farming structures developed on the site and 15 reported stock on site. The remaining two sites were used as maintenance sites and held no stock.

Biomass

A maximum of approximately 7 331 tonnes of SBT were farmed by the Tuna sector in any one month during the 2014/15 reporting period.

At the site level, individual licence conditions state that the maximum biomass of SBT held on an aquaculture site at any one time cannot exceed 6 tonnes of stock per hectare. In 2014/15, two sites reported to exceed this stocking rate. PIRSA investigated each breach in biomass and was satisfied that follow up actions by the licence holders were sufficient to ensure that future biomass held on the sites were kept within the limits of 6 tonnes per hectare.

Feed Inputs

Farmed SBT are fed baitfish (largely locally-sourced Sardines from the commercial Sardine fishery which is sustainably managed under the South Australian Sardine Fishery Management Plan). Approximately 50 581 tonnes of baitfish were used by the sector in 2014/15, of which around 10 000 or 20% were imported.

Reported Interactions and escapes

As a part of marine licence EMP reporting requirements, licence holders are required to submit information regarding any interactions with seabirds and large marine vertebrates that occurred on their licensed site during each reporting year. There were two reported interactions with seals on licensed aquaculture sites during 2014/15 and 2015/16. In both instances, the seals released themselves or were released alive.

Licence holders are also required to submit information regarding any stock escape events that occurred on their licensed sites. No escape events were reported by the Tuna sector in 2014/15 or 2015/16. There is some poaching reported by the sector, and this reflected in annual audits of numbers of SBT in and out of the farms by the Australian Fisheries Management Authority.

4.3 Aquatic Animal Health Management

4.3.1 Veterinary medicine use

Off-label approvals under Aquaculture Regulations 2016:

A total of 25 (in 2014/15) and 33 (in 2015/16) requests (veterinary prescriptions) for the use of praziquantel from the Tuna sector were assessed and approved. Praziquantel is used by the sector, under veterinarian supervision, to successfully reduce parasitic blood fluke (*Cardicola forsteri*) infestations in SBT and maintain fish health. Praziquantel (used in medicines for humans and other livestock industries) has reduced SBT mortalities from approximately 14% per year to less than 1% per year in 2016. Off-label use assists industry with data collection for the purpose of progressing an application to the APVMA for ongoing use. A final application is expected to be submitted in 2017 to the APVMA for national registration of Praziquantel.

A total of one (in 2014/15) and three (2015/16) requests (veterinary prescriptions) for the use of Emamectin Benzoate from the Tuna sector were assessed and approved. Emamectin Benzoate is used by the sector, under veterinary supervision, to treat isopod sea lice (*Caligus* sp.) infections in SBT stock and reduce stock loss due to mortalities. Emamectin Benzoate treatments were prescribed for broodstock SBT that were not intended for human consumption.

Reported APVMA registered and permitted veterinary medicines

None were reported to be used during the 2014/15 EMP reporting period.

4.3.2 Livestock translocations

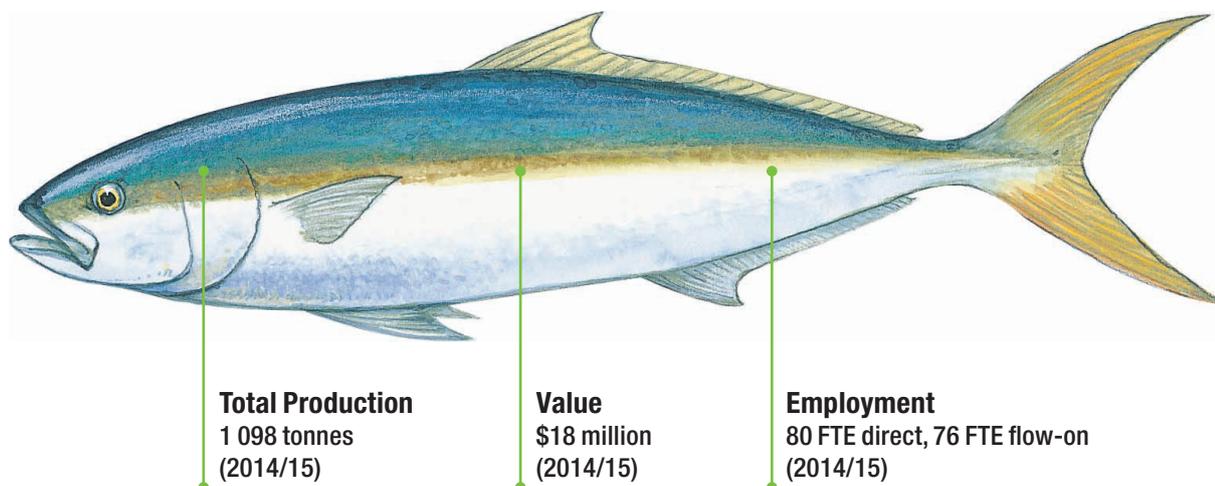
No livestock translocations were requested during 2014/15 and 2015/16 for the SBT sector.

4.3.3 Disease Management and surveillance

No unusually high and unexplained mortalities, nor suspected or confirmed notifiable disease were reported to PIRSA during the 2014/15 and 2015/16 period for the Tuna sector. Consequently, no disease investigations or emergency disease responses were required for the Tuna sector during those periods.

5 Finfish

5.1 Overview of the sector



The marine Finfish aquaculture sector as a whole is well established, with significant growth in production over the years. The species farmed by this sector is the Yellowtail Kingfish (YTK) (*Seriola lalandi*).

Marine Finfish farming represents a high performing sector of the South Australian aquaculture industry. In 2015/16, there were 24 finfish farms licensed by PIRSA Fisheries and Aquaculture, operated by two companies and which occupied 485 hectares of water. Finfish licences were located in waters along the west coast of Spencer Gulf at Fitzgerald Bay, Arno Bay, Louth Bay and Boston Bay, near Port Lincoln. The majority of farming occurred in Boston Bay. Individual Finfish aquaculture licences are listed in Appendix 1.

The sector is based on the on-growing of hatchery-reared YTK fingerlings from selectively bred broodstock fish originally caught in South Australian waters. Juveniles are moved to sea-cages (40-44 m diameter) where they are grown out to market size. Fingerlings are transferred to marine sea-cages at ~15-30 g, fed on specially formulated manufactured diets, and grown out at sea for ~12–32 months until they are harvested at either 1-1.5kg or 4.5 kg.

The environmental impacts of sea-cage Finfish farming have been well described and include impacts on biogeochemical processes, seagrasses and benthic communities (Tanner and Bryars 2007, Tanner *et al.* 2007). These impacts are primarily associated with dissolved nutrients and chemicals from fish metabolism and solid waste from faeces and excess feed which are predominantly dispersed in the water column (~85%), with the remainder deposited on the underlying seafloor.

Biomass limits for both individual sites and zone policies are developed to protect the environment from any ecological impacts that the finfish sector may have within their relative growing regions. The EMP process provides ongoing environmental monitoring information required to identify and control the occurrence of any impacts the Finfish sector may present on both an individual site level and a whole of sector level. In addition, it is a legislative requirement for licence holders to fallow or move sea-pontoons each year to provide the seafloor time to recover.

5.2 Environment

5.2.1 Regional environmental monitoring program

In 2015, a new regional environmental monitoring program was developed for the Finfish and Tuna aquaculture sectors in lower Eyre Peninsula. The program is designed to describe the overall health of the region with respect to aquaculture impacts rather than monitoring at the site or lease scale, in response to recognition that the majority of waste from Finfish and Tuna licensed sites is

dissolved in the water column and is carried offsite. The monitoring program was developed in consultation with the Tuna and Finfish aquaculture industries, PIRSA, the EPA and SARDI. Information collected and analysed for the regional program includes water quality, sediment biochemistry and benthic infauna, all of which contributes to an existing hydrodynamic and biogeochemical model. The first sampling for the new program was undertaken in January 2016 and data is being collected over a four-year period. As such information relating to this program will not form part of this report, but will be available in the next report.

5.2.2 Annual environmental monitoring reports

Submission rates for EMPs for the finfish sector were 100% in 2014/15.

Development

Of the 26 reports submitted for the 2014/15 EMP reporting period, eight licences were reported to have farming structures (sea-cages) and stock (Yellowtail Kingfish) on the site.

Biomass

A maximum of approximately 2 466 tonnes of YTK were farmed by the marine Finfish sector in any one month during 2014/15. The marine production cycle for YTK can take up to 32 months, therefore the stock on site at any one time does not necessarily reflect the annual production sold (1 098 tonnes in 2014/15). At the site level, individual licence conditions state that the maximum biomass of Finfish held on an aquaculture site at any one time cannot exceed 15 tonnes of stock per hectare (unless otherwise approved by the Minister). In 2014/15, three sites reported to exceed their licensed biomass. PIRSA worked with the sector and the EPA to adaptively manage the biomass held on these sites through variations to licensed biomass and site specific monitoring programs, including a research project, to monitor potential impacts to the seafloor.

Feed Inputs

Farmed YTK are fed commercially produced manufactured pellets. A total of approximately 5 563 tonnes of pellets were used by the sector in 2014/15.

Reported Interactions and escapes

As a part of marine licence EMP reporting requirements, licence holders are required to submit information regarding any interactions with seabirds and large marine vertebrates that occurred on their licensed site during each reporting year. A total of ten interactions with seals and sea lions were reported on licensed finfish aquaculture sites during 2014/15. A total of eleven interactions were reported in 2015/16, including seals, sea lions and bronze whaler sharks. All reported interactions with seals and sea lions resulted in the animals releasing themselves or being released alive. The bronze whaler sharks (not a protected species) were euthanised as attempts to release them were unsuccessful and had safety implications for staff.

Licence holders are also required to submit information regarding any stock escape events that occurred on their licensed sites. In 2014/15, two YTK escape events were reported, resulting in approximately 23 fish escaping. In 2015/16, three escape events were reported, resulting in just under 5 000 fish escaping. Where possible, escaped fish were recaptured. A summary of the escape events can be found at [www://pir.sa.gov.au/aquaculture/monitoring_and_assessment/register - finfish escape](http://www://pir.sa.gov.au/aquaculture/monitoring_and_assessment/register_-_finfish_escape)

5.3 Aquatic Animal Health Management

5.3.1 Veterinary medicine use

Off-label approvals under Aquaculture Regulations 2016:

A total of 27 (in 2014/15) and 26 (in 2015/16) requests (veterinary prescriptions) for the use of veterinary medicines from the Finfish sector were assessed and approved. Praziquantel has been used by the sector, under veterinarian supervision, to successfully reduce parasitic blood (*Paradeontacylix* spp.), skin (*Benedenia seriolae*) and gill fluke (*Zeuxapta seriolae*) infestations. In addition, approvals were provided for the use of hydrogen peroxide to control flukes and oxytetracycline as a treatment to control systemic bacterial infection.

Reported APVMA registered and permitted veterinary medicines

A total of eight Finfish sites reported the use of a permitted veterinary medicine (Hydrogen Peroxide – APVMA Permit PER83276) to control fluke infestations in stock during the 2014/15 EMP reporting period.

5.3.2 Livestock translocations

No livestock translocation requests were requested during the 2014/15 and 2015/16 period for the marine Finfish sector.

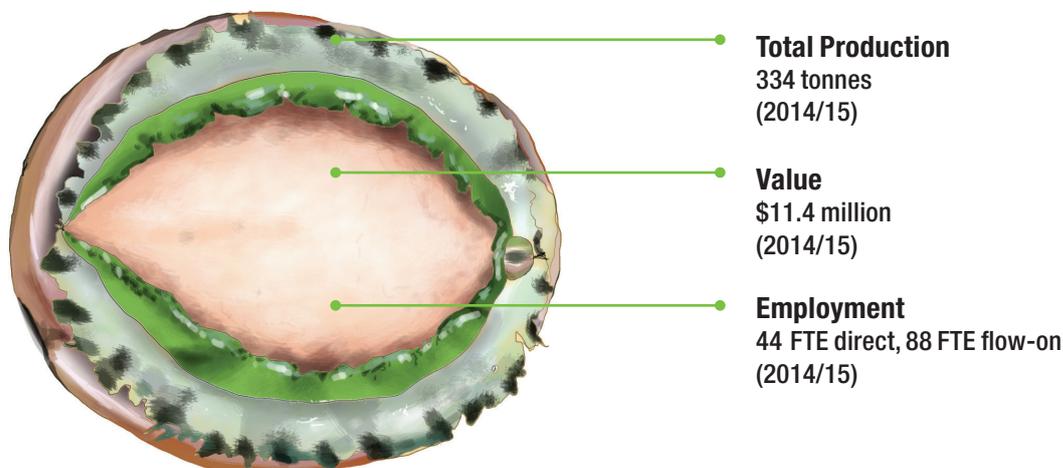
5.3.3 Disease Management and surveillance

No unusually high and unexplained mortalities, nor suspected or confirmed notifiable disease were reported to PIRSA during the 2014/15 and 2015/16 period for the Finfish sector. Consequently, no disease investigations or emergency disease responses were required for the sector during this period.

Results of two fish health investigations, conducted by private veterinarians, formed part of the passive surveillance data collected for the sector.

6 Marine Abalone

6.1 Overview of the sector



The sector is based on the grow-out of hatchery reared Greenlip Abalone (*Haliotis laevis*) spat, which are moved to subtidal structures (e.g. sea-cages) where they are grown out to market size. Other subtidal structures for the farming of Abalone stock are currently being trialed and include uncontained benthic structures made from concrete. Abalone are held for a grow-out period of approximately three years and are typically fed both naturally occurring marine algae and manufactured pelleted supplements. Economic data in 2014/15 is combined for marine and landbased sectors farming Greenlip Abalone, although the majority of activity occurs on land.

In 2015/16, there were 14 Abalone sites licensed by PIRSA Fisheries and Aquaculture which occupied 222 hectares of water. Individual marine Abalone aquaculture licences are listed in Appendix 1.

Biomass limits for both individual sites and zone policies are developed to protect the environment from any ecological impacts that the Abalone aquaculture may have. The site-specific monitoring programs provide ongoing environmental monitoring information required to adaptively identify and manage any impacts Abalone aquaculture may have. Specifically, monitoring is designed to assess any impacts to nearby seagrass from feed inputs.

6.2 Environment

6.2.1 Annual environmental monitoring reports

Submission rates for EMPs for the marine Abalone sector was 100% in 2014/15.

Development

Four of the 14 marine Abalone licences reported having farming structures on site during the 2014/15 reporting period.

Biomass

During the 2014/15 reporting period, two licences reported to have stock on site with a maximum of approximately 3.4 tonnes of Abalone farmed in any one month across both sites.

At the site level, individual Abalone licence conditions vary in relation to the maximum biomass of Abalone allowed on site, however they are all limited to a biomass equal to or below 8 tonnes per hectare. The biomass held on marine-based Abalone sites was kept within the limits of the specific biomass licence condition during the 2014/15 reporting period.

Feed inputs

Farmed Abalone are fed commercially produced manufactured pellets, or naturally occurring drift algae. A total of approximately 1.04 tonnes of pellets was used by the sector in 2014/15.

Reported Interactions and escapes

No interaction or escape events were reported by the marine Abalone sector during 2014/15 and 2015/16.

6.3 Aquatic Animal Health Management

6.3.1 Veterinary medicine use

Off-label approvals under Aquaculture Regulations 2016:

No chemical use approvals were requested by the marine Abalone sector in 2014/15 and 2015/16.

Reported APVMA registered and permitted veterinary medicines:

No chemical use was reported by the marine Abalone sector in 2014/15.

6.3.2 Livestock translocations

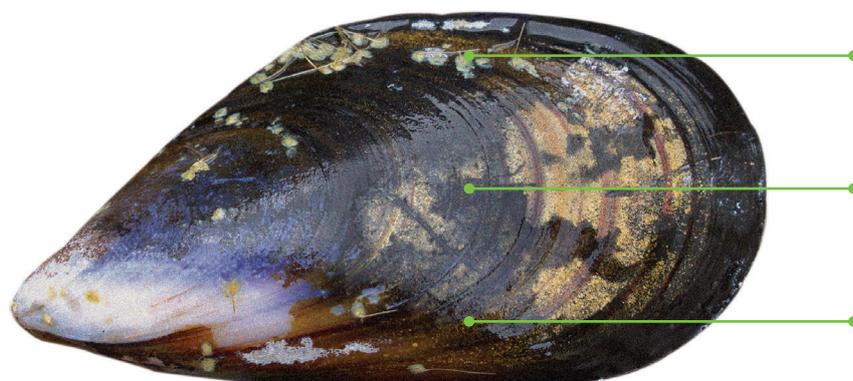
A total of eight and six livestock translocation approvals were requested by the marine Abalone sector for 2014/15 and 2015/16 respectively.

6.3.3 Disease Management and surveillance

No unusually high and unexplained mortalities, nor suspected or confirmed notifiable disease were reported to PIRSA during the 2014/15 and 2015/16 period for the marine Abalone sector. Consequently, no disease investigations or emergency disease responses were required for the sector during this period.

7 Mussel

7.1 Overview of the sector



Total Production
1 057 tonnes
(2014/15)

Value
\$3 million
(2014/15)

Employment
61 FTE direct, 39 FTE flow-on
(2014/15)

The Mussel sector is well established in the waters of Boston Bay, near Port Lincoln, with 38 farms covering 573 hectares in 2015/16. Individual Mussel aquaculture licences are listed in Appendix 1. The species farmed by this sector is the Blue Mussel (*Mytilus galloprovincialis*).

Blue Mussels are grown using long-line culture. Long-lining involves a system of horizontal ropes with buoys to provide flotation, to which vertical droppers are attached every 1–4 m, depending on site conditions. Long-lines are used for spat collection as well as for on-growing juvenile Mussels to market size.

Currently, Blue Mussel spat are collected from the wild on spat collectors, which are fibrous, ‘hairy’ looking ropes hung from long-lines during the peak spawning season (June to September) in areas known to have good mussel ‘spatfall’. After ~6 months, juveniles (12 mm long) are transferred from the spat collectors to grow-out long-lines. The juvenile Mussels are separated from each other by passing through a mussel de-clumping machine and then feeding them through a funnel onto a grow-out rope. A cotton stocking, known as a ‘mussock’, is placed around the grow-out rope to hold the juvenile Mussels against the rope. As the Mussels grow they re-attach themselves to the ropes. In time, the mussock disintegrates leaving the Mussels to grow for a further 8–12 months. Mussels are generally harvested after a period of 18 months at ~10–11 cm length.

Blue Mussel spat collection from the wild can be unreliable and inconsistent, and in poor collection seasons can impact the sector significantly. Many factors influence the number of spat collected, including: water currents, climatic variations or bio-fouling on the ropes, which can all prevent spat from settling.

7.2 Environment

7.2.1 Annual environmental monitoring reports

Submission rates for EMPs for the marine Abalone sector was 100% in 2014/15.

Development

Of the 38 reports received for the 2014/15 EMP reporting period, 25 of the Mussel licences reported having farming structures and stock on the site.

Biomass

Licence conditions limiting the amount of Mussels farmed on a site relate to infrastructure not biomass, and state that the total length of backbone (the supporting structure on the surface for all underwater lines on which the Mussels are attached) held on site does not exceed 560 metres per hectare, with no more than 15 metres of submerged line per meter of backbone (unless otherwise approved by the Minister).

During the 2014/15 EMP reporting period, all licences reported being within the total allowable length of backbone and submerged line on the site. On average, the length of backbone infrastructure across all farmed sites within the region during the 2014/15 reporting period was approximately 312 metres of backbone per hectare.

Feed Inputs

Mussels are filter feeders and do not require supplementary feed.

Reported Interactions and escapes

No interaction or escape events were reported during 2014/15 and 2015/16.

7.3 Aquatic Animal Health Management

7.3.1 Veterinary medicine use

Off-label approvals under Aquaculture Regulations 2016:

No chemical use approvals were requested by the Mussel sector in 2014/15 and 2015/16.

Reported APVMA registered and permitted veterinary medicines

No chemical use was reported by the Mussel sector in 2014/15.

7.3.2 Livestock translocations

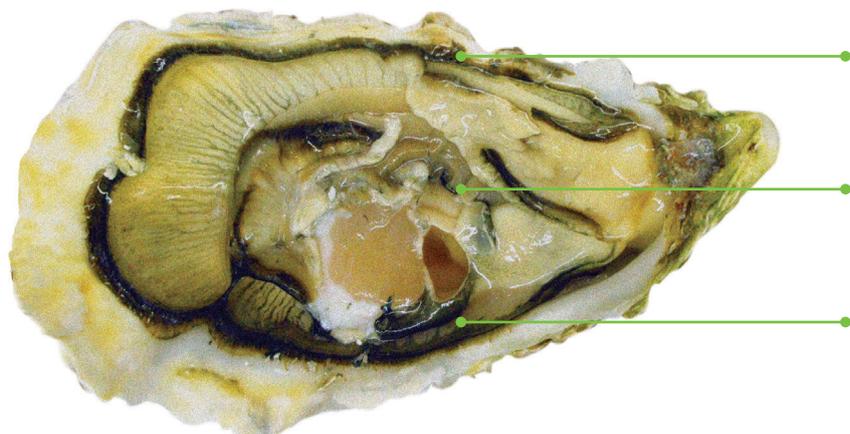
One livestock translocation approval was requested during 2014/15 and two in 2015/16 for the Mussel sector.

7.3.3 Disease Management and surveillance

No unusually high and unexplained mortalities, nor suspected or confirmed notifiable disease were reported to PIRSA during the 2014/15 and 2015/16 period for the Mussel sector. Consequently, no disease investigations or emergency disease responses were required for the sector during this period.

8 Oysters

8.1 Overview of the sector



Total Production
3.9 million dozen
(2014/15)

Value
\$28.4 million
(2014/15)

Employment
402 FTE direct, 218 FTE flow-on
(2014/15)

The Oyster sector is well established in South Australia. The majority of farmed Oysters are Pacific Oysters (*Crassostrea gigas*), with some farmers trialing Native Oysters (*Ostrea angasi*). Oysters are farmed in South Australia in seven main growing regions (Coffin Bay, Streaky Bay, Smoky Bay, Cowell, Denial Bay/Ceduna, Kangaroo Island, Yorke Peninsula) with 336 licensed sites covering approximately 959 hectares in 2015/16. Individual Oyster aquaculture licences are listed in Appendix 1.

Until recently, the majority (80%) of Pacific Oyster spat was sourced from Tasmania. However, an outbreak of Pacific Oyster Mortality Syndrome in Tasmania in January 2016 has resulted in South Australia implementing a ban of Oyster imports from Tasmania (see Section 16 for more detail). Since then, the South Australian Government and South Australian Oyster farmers have worked towards developing their own hatcheries in order to be able to provide their stock. To facilitate this, the South Australian Government has provided grants to two local South Australian Oyster hatcheries, increased capacity at SARDI, and fast-tracked two new Oyster hatchery developments.

South Australian Oysters are predominately grown intertidally using a rack and rail system, a long-line system or a combination of both. Fixed 'rack and rail' culture systems have been shown to cause localised impacts to some seagrass species, as the racks and baskets are stationary and can shade the seagrass beneath. Now Oyster farmers mainly use the Baker-Schultz-Turner (BST) long-line system developed by the Turner family of Cowell, to allow oyster growers to alter the height of the free-swinging oyster baskets in the water column to reduce exposure to storm events, high air temperatures and mudworm. This system also has minimal shading effect on seagrass. The BST system is now used by farmers in New South Wales (for Sydney Rock Oyster and Pacific Oyster) and overseas.

Oyster spat are placed into baskets at ~5–15 mm shell length and on-grown for ~12-18 months. During this time, Oysters are removed from the baskets and graded several times before they are sold. Grading the Oysters minimises shell fouling, maximises growth opportunities, and helps the development of optimal shell quality for marketing.

8.2 Environment

8.2.1 Annual environmental monitoring reports

Submission rates for EMPs for the Oyster sector were 94% in 2014/15. The remaining 6% did not submit an EMP report for 2014/15 because there was no development on site or had transferred the licence to another party and was therefore no longer responsible for the licence.

Development

Of the reports received for the 2014/15 EMP reporting period, 94% reported having farming structures and 86% reported having stock (Pacific Oyster) on the site.

Biomass

Licence conditions limiting the amount of Oysters farmed on a site relate to infrastructure not biomass, and state that the licence holder must ensure that the structures used to farm Oysters on site does not exceed a specified amount per hectare (e.g. does not exceed 3 km of longline per hectare, 1 km of baskets on racking per hectare, and/or must not exceed a specified amount of baskets on longline per hectare).

Of the reports received for the 2014/15 EMP reporting period, 24% reported as having exceeded the total allowable length of line on the site and 1% reported as having exceeded the total number of baskets allowed on the site. While this does not necessarily translate to an environmental impact, PIRSA has been working with the South Australian Oyster Growers Association (SAOGA) to address the issue including improved biomass indicators as well as research being undertaken by SARDI to determine carrying capacity (biomass) in Oyster growing regions.

Feed Inputs

Oysters are filter feeders and do not require supplementary feed.

Reported Interactions and escapes

No interaction or escape events were reported by the Oyster sector during 2014/15 or 2015/16.

8.3 Aquatic Animal Health Management

8.3.1 Veterinary medicine use

Off-label approvals under Aquaculture Regulations 2016:

No chemical use approvals were requested by the Oyster sector in 2014/15 and 2015/16.

Reported APVMA registered and permitted veterinary medicines

No chemical use was reported for the Oyster sector in 2014/15.

8.3.2 Livestock translocations

One livestock translocation approval was requested during 2014/15 and five in 2015/16 by the Oyster sector.

8.3.3 Disease Management and surveillance

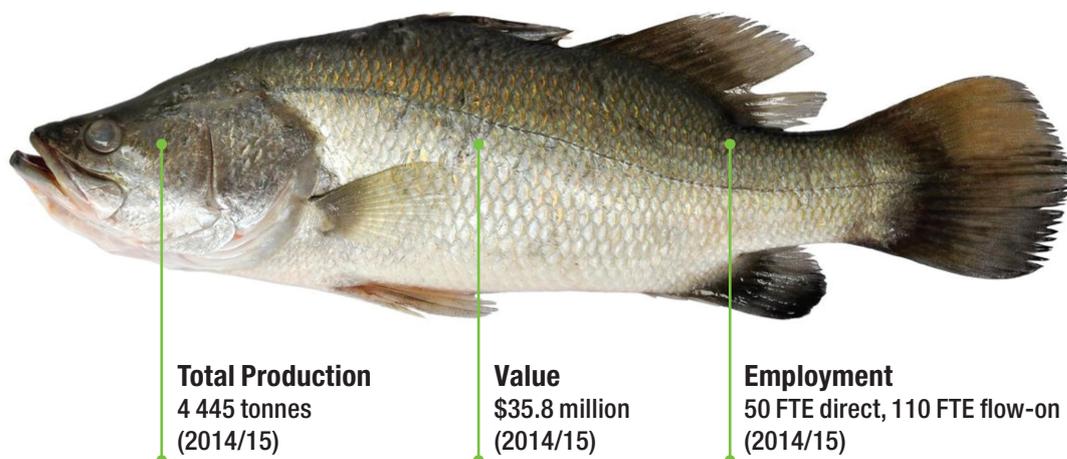
One mortality event was reported to PIRSA, and subsequently investigated, during the 2014/15 and 2015/16 period for the sector. No notifiable diseases were detected hence no emergency disease responses were required during this time.

During 2015/16, 24 Oyster samples were submitted to the state veterinary laboratory as part of tracing activities associated with the Tasmanian outbreak of Pacific Oyster Mortality Syndrome (POMS) in early 2016. A total of 689 Oysters from across South Australia tested negative for OsHV-1 microvariant, which is the virus that causes POMS, as part of this tracing. Furthermore, as part of the above-mentioned mortality event, investigated in April 2016, a further 31 Oysters tested negative for OsHV-1 microvariant.

PIRSA are developing a surveillance strategy for POMS to enhance early detection and rapid response to the disease. The surveillance strategy is anticipated to be implemented in 2016/17. For further information on the Tasmanian outbreak of POMS and the indirect effect on South Australia's Oyster sector, see Section 15 below.

9 Landbased

9.1 Overview of the sector



The Landbased sector is the most diverse of the South Australian aquaculture industry in terms of farming systems and culture species (see 9.2.1 for species farmed). In 2015/16, there were 101 Landbased aquaculture licences in South Australia, comprising private businesses, hatcheries (Abalone, Oysters and Finfish), educational and research facilities as well as Tourism and hobby farm businesses. Individual Landbased aquaculture licences are listed in Appendix 1.

Landbased aquaculture licences are located all over South Australia, including the Eyre Peninsula, Yorke Peninsula, Kangaroo Island, Adelaide Hills, Murraylands and South East. A number of production systems are utilised by the Landbased aquaculture sector. The most popular systems are pond culture, recirculating aquaculture systems and flow-through systems.

PIRSA regulate the Landbased sector by categorising each licence based on the level of work required by PIRSA to manage the risks associated with the activity. Prior to 2014/15, Landbased aquaculture licences were categorised as “A”, “B” or “C”. In 2014/15, a Landbased Category Review was conducted by an external consultant and PIRSA made amendments to the category criteria based on the review and consultation with the Landbased sector. As a result, a Category D licence was created which covers the risks associated with Landbased sites that discharge wastewater into the marine environment. The criteria are listed below:

Category A: Small scale operators, which do not discharge wastewater off-site, and require minimal aquatic animal health legislation requirements and environmental monitoring.

Category B: Small scale operators, which may potentially discharge some waste water off-site, or farm a species with applicable aquatic animal health legislation.

Category C: Intensive and/or large-scale operators with waste water discharge off-site and/or farm a species with applicable aquatic animal health legislation.

Category D: Intensive and/or large-scale operators with waste water discharge off-site into the marine environment and/or farm a species with applicable aquatic animal health legislation.

9.2 Environment

9.2.1 Annual environmental monitoring reports

Submission rates for EMPs for the Landbased sector was 80% in 2014/15. The remaining 20% did not submit an EMP report for 2014/15 because there was no development on site during the year or had ceased to operate.

Species farmed

In 2014/15, the landbased species farmed included Marron (*Cherax tenuimanus*), Yabbies (*Cherax destructor*), Greenlip Abalone (*Haliotis laevis*), Blacklip Abalone (*Haliotis rubra*), Mud cockle (*Katylsia* spp.), Pacific Oyster (*Crassostrea gigas*), Native Oyster (*Ostrea angasi*), Yellowtail Kingfish (*Seriola lalandi*), Murray Cod (*Maccullochella peelii peelii*), Snapper (*Pagrus auratus*), Mulloway (*Argyrosomus japonicus*), Barramundi (*Lates calcarifer*), Rainbow Trout (*Oncorhynchus mykiss*), Brown Trout (*Salmo trutta*), Silver Perch (*Bidyanus bidyanus*), Golden Perch (*Macquaria ambigua*), Southern Bluefin Tuna (*Thunnus maccoyii*), Barcoo Grunter (*Scortum barcoo*), Eels (*Anguilla* spp.), as well as a variety of ornamental aquarium species and microalgae species.

Wastewater disposal and water quality analysis

PIRSA does not restrict the number of fish held on a Landbased site however all aquaculture licence holders need to comply with the *Environment Protection (Water Quality) Policy 2015* with respect to management of water on site and not cause environmental harm. The quality of discharge water which may be impacted by excess feed, animal waste and chemical use, can be significantly improved through the implementation of waste water treatment prior to discharge.

During 2014/15, 16 EMPs for Landbased licences reported discharge of waste water from the licensed site. Of those, ten reported water being treated prior to discharge, while one discharged into local drainpipe systems and five discharged directly into state waters. Wastewater treatment processes included reducing suspended sediment loads using settlement ponds, sand filters, evaporation pans, denitrification by aquatic plants (e.g. 'sea lettuce' or *Ulva* sp.) in biological filters to reduce ammonia, and ultra-violet (UV) light and chlorine treatments to substantially decrease bacteria and viruses.

During the 2014/15 reporting period it was a requirement (regulation 27 of the previous *Aquaculture Regulations 2005*) that all licences that were classified as a medium risk (category B) or high risk (category C) were required to undertake water testing in relation to discharged waste water. Parameters tested were oxidised nitrogen, ammonia, soluble phosphorus and total suspended solids. PIRSA used this information to determine if the water being discharged met the requirements of the EPA's *Environment Protection (Water Quality) Policy 2015*.

The majority of water quality results submitted by Landbased licence holders met the requirements of the *Environment Protection (Water Quality) Policy 2015*. However, on a few occasions, ammonia levels were reported to exceed the *Environment Protection (Water Quality) Policy 2015*. For these occasions, PIRSA liaised with the EPA.

Reported Interactions and escapes

No interaction or escape events were reported during 2014/15 and 2015/16.

9.3 Aquatic Animal Health Management

9.3.1 Veterinary medicine use

Off-label approvals under Aquaculture Regulations 2016:

A total of two (in 2014/15) and 14 (in 2015/16) requests (veterinary prescriptions) for the use of veterinary medicines from the Landbased sector were assessed and approved. These were: Praziquantel, Magnesium Chloride, Salinomycin, Gonadotropin Releasing Hormone, Detomidine, Sulprim and Oxytetracycline. These chemicals were used primarily for the treatment of infections and to address husbandry issues in hatcheries.

Reported APVMA registered and permitted veterinary medicines

The use of APVMA veterinary medicine products by the Landbased sector were reported in annual EMPs for five sites in 2014/15.

These included the APVMA registered chemical product AQUI-S Aquatic Anaesthetic (APVMA Product 48157), as well as permitted veterinary chemical products for anaesthetics (Benzocaine – APVMA Permit PER14638), managing fluke infestations and fish health (Hydrogen Peroxide – APVMA Permits PER12169 and PER83276, Formalin – APVMA Permit PER83525) as well as chemicals for settling bivalve molluscs (Epinephrine – APVMA Permit PER80085).

9.3.2 Livestock translocations

Ten livestock translocation approvals were requested during 2014/15 and five in 2015/16 for the Landbased sector. Species included Abalone, Pacific Oysters, Brown and Rainbow Trout, Silver Perch and Short-fin Eels.

Three farm biosecurity audits were undertaken for the purposes of livestock trade or translocation requirements, including two Abalone farms and one Finfish hatchery, during this period.

9.3.3 Disease Management and surveillance

Two mortality events (Landbased Finfish) were reported to PIRSA, and subsequently investigated, during the 2014/15 (1 event) and 2015/16 (1 event) period for the sector. No notifiable diseases were detected, hence no emergency disease responses were required during this time.

A total of 27 samples were submitted to the state veterinary laboratory for the purpose of health certification (e.g. export requirements for livestock), including two for the Landbased Oyster sector, eight for the Landbased Abalone sector and 17 for the Landbased Finfish sector. In all cases, no notifiable disease was detected.

Results of one Abalone health investigation formed part of the passive surveillance data collected for the sector. A total of 659 individual Abalone were tested for Abalone Viral Ganglioneuritis (AVG) via histopathological examination. No notifiable diseases were detected.

10 Tourism and Education

In addition to the commercial production of seafood, aquaculture has an important role in Tourism and education. Aquaculture facilities provide opportunity for students and the public alike to learn directly about marine and freshwater aquatic environments through a hands-on approach. The Cowell Area School has a current aquaculture program comprising an operating Oyster farm and associated Landbased facilities. There are also a number of other schools that include aquaculture in their curriculum.

There are also four licensed aquaculture Tourism sites located in Boston Bay near Port Lincoln and one in Encounter Bay near Victor Harbor. Currently, only one is operating (in Boston Bay), which provides the opportunity for the general public to view, swim with, and learn about various marine species found locally in South Australian waters such as SBT, Abalone, Snapper, Rock Lobster and YTK within the safe confines of a sea-cage and floating pontoon equipped with touch tanks.

11 Compliance outcomes

Inspections of a number aquaculture sites were undertaken by the PIRSA Fisheries Compliance Unit during 2014/15 and 2015/16. The purpose of these inspections is to ensure that licence holders are complying with lease and licence conditions, to work with licence holders to achieve compliance, and to enhance relationships between industry and PIRSA.

During 2014/15 and 2015/16, Finfish, Oysters, Mussel, Abalone, Tuna, Tourism and Landbased aquaculture sites were visited, with a particular focus on compliance to navigation requirements (marine), infrastructure located outside sites (marine), investigation of reports in regard to marine debris (marine), rehabilitation of unused sites (marine sites) and species farmed (Tourism and Landbased).

The results from these visits showed that all Mussel sites demonstrated good compliance in relation to navigational requirements, and all Landbased sites were compliant with their licence conditions. In general, Finfish, Tuna, Abalone and Tourism sites demonstrated compliance to navigational requirements (e.g. location and marking of navigational structures, and aquaculture farming structures within the boundaries of the site). Where there was evidence of non-compliance, lease and licence holders were contacted, and areas regarding attention (e.g. correct marking of navigation structures, and structures outside the licensed area) were raised. Follow up inspections of non-compliant sites were undertaken to ensure action had been taken to address the issue.

12 Aquatic Animal Health and Biosecurity

12.1 Fish kill and fish health investigations

This section provides a comparison between aquaculture mortality or disease investigations (reported above) and wild fish kill or wild fish health investigations conducted by PIRSA.

For 2014/15 and 2015/16, there were three aquaculture related mortality events investigated compared to 19 wild fish kill (or fish health) events reported and investigated (Figure 13). The aquaculture related mortality events were not disease related, but caused by environmental conditions or husbandry practices. South Australia has a list of 58 notifiable diseases pursuant to the *Livestock Act 1997* which require reporting if suspected or detected. During both years, no notifiable diseases were detected as a result of fish kill (or fish health) investigations. One naturally occurring disease (not notifiable) was detected in wild caught Blue Swimmer Crabs, which was Bitter Crab Disease caused by the dinoflagellate *Hematodinium spp.* (protozoan dinoflagellate) in March 2015. Bitter Crab Disease is not a human health issue, and it did not cause a mortality event but was noted by fishers, albeit at low levels. During both years, the majority of fish kills were caused by environmental conditions (e.g. water quality issues, weather events, unusually high or low water temperatures, moult event etc.). Environmental conditions also commonly play a contributing role in disease outbreaks triggered by stress. This was true for Bitter Crab Disease, which was linked to warmer waters as observed at the time of detection.

South Australian Fish Kill and Fish Health Investigations during 2014/15 and 2015/16 for Aquaculture and Wild Fish

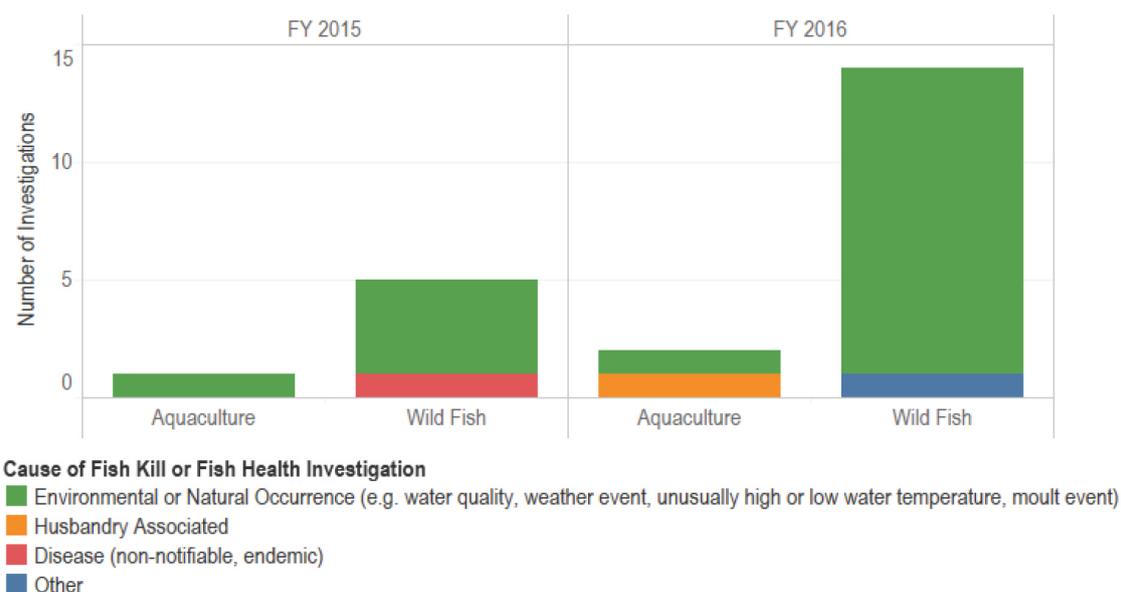


Figure 13. A summary of South Australian fish kill (mortality) and fish health (disease) investigations in wild fish and aquaculture sectors during 2014/15 (FY 2015) and 2015/16 (FY 2016) financial years.

Figure 13. A summary of South Australian fish kill (mortality) and fish health (disease) investigations in wild fish and aquaculture sectors during 2014/15 (FY 2015) and 2015/16 (FY 2016) financial years.

13 Industry initiatives

13.1 Marine debris

A need for a collaborative approach to the regular collection of debris from local beaches on the Eyre Peninsula was identified in 2011 where the aquaculture industry agreed to undertake marine debris beach clean-ups.

Led by the Australian Southern Bluefin Tuna Industry Association (ASBTIA) and supported by the Finfish and Mussel sectors, the Adopt-a-Beach Program is a debris clean-up program that covers a coastal area of approximately 155 km located in the Lower Spencer Gulf region, from Maclaren Point to Point Bolingbroke. It includes a number of islands within the Boston Bay area and Spilsby Island (Sir Joseph Banks Group), with the area divided into 13 individual zones which are assigned to/adopted by individual Tuna, Finfish and Mussel companies. Adopted areas range from 6 to 19 km:

(see [www://pir.sa.gov.au/aquaculture/monitoring_and_assessment/adopt_a_beach_program](http://www.pir.sa.gov.au/aquaculture/monitoring_and_assessment/adopt_a_beach_program)).

Beach clean ups are undertaken a minimum of four times a year, with clean-up data collected and submitted to the ASBTIA for collation and reporting to PIRSA. Information collected for each “beach” includes the five most common types of items, unusual items and total weight. Table 3 provides an overview of materials collected during the 2013/14 and 2014/15 clean ups.

Table 2: Most common material types and total weight of the marine debris collected in Lower Eyre Peninsula during the Adopt a Beach Program in 2013/14 and 2014/15.

Year	Most common items	Total weight (kg)
2013/14	Short ropes, plastic, wood, aquaculture waste, bottles	2 894
2014/15	Rope, plastic bags, milk crates, oyster racks	1 427

The program also encompasses the collection of non-aquaculture related debris and its disposal in a responsible manner. While some debris, such as ropes and some plastics may be attributed to aquaculture, it is clear that debris originated from a range of sources including commercial and recreational fishing, landbased operations, commercial shipping and the general public.

In 2015, the Oyster sector has recently implemented a similar beach clean-up program for the Oyster growing areas around the state. Debris collected to date includes: oyster baskets, timber, buoys, ropes, fishing gear, tyres and general rubbish (e.g. plastic bottles).

13.2 Oyster Basket Recycling

In 2013, the EPA, working collaboratively with the South Australian Oyster Sector, Regional Development Australia Whyalla and Eyre Peninsula, and the Department for Manufacturing, Innovation, Trade, Resources and Energy, undertook a feasibility study into the recycling of plastic oyster baskets (see http://www.epa.sa.gov.au/files/477882_oyster_basket_study.pdf).

The aim of the South Australian Oyster Basket Recycling Feasibility Study was to 'identify cost-effective Oyster basket recycling options that will value add to the efficient operation of the industry as a whole'. The Oyster sector uses 2.5 million baskets annually. Each year about 5–10%, or 150–200 tonnes, of these plastic baskets reach their end of life and must be disposed. Instead of sending the baskets to landfill, many Oyster growers have been stockpiling them on their properties until more environmentally sustainable disposal by recycling option becomes available.

13.3 Seafood Certification

Finfish farming in South Australia is currently conducted by one company which achieved the internationally recognised "Friend of the Sea" certification for its production of Hiramasa Yellowtail Kingfish in 2014 (see www.friendofthesea.org/ for information about this certification). It was the first aquaculture company in the Southern Hemisphere to earn the internationally-recognised sustainability certification.

In December 2015, the Australian Southern Bluefin Tuna fishery and farms achieved "Friend of the Sea" certification. Operating in marine waters off the coast of Port Lincoln, the certification provides independent assurance to markets that the product has been produced in a healthy, safe and sustainable environment. It involves a rigorous environmental sustainability performance assessment that assesses the whole Tuna supply chain from the catch in the wild, through the value adding aquaculture process to final harvesting.

One South Australian Oyster company holds the eco-label NASAA (National Association for Sustainable Agriculture, Australia) Certified Organic (see www.nasaa.com.au/ for information on NASAA certification programs) which provides assurance that the product is free from being genetically modified or biologically enhanced in any way. The same company has also been approved as "Friend of the Sea" certified for Pacific Oysters.

The principal company farming mussels in South Australia has also achieved "Friend of the Sea" certification and holds the NASAA Certified Organic eco-label for Blue Mussels.

Separate to third party seafood certification, PIRSA issued Statement of Recognition certificates to 6 seafood business in 2015/16 (Tuna and Oyster sectors) and to two seafood businesses in 2016/17 (Oyster sector).

14 Research

As part of its commitment to supporting industry growth and developing an adaptive resource management framework, PIRSA Fisheries and Aquaculture plays a key role in supporting a number of strategic research initiatives.

Many of these projects are led and conducted by the South Australian Research and Development Institute (SARDI), the research division of PIRSA which offers an integrated research and development (R&D) capability to sustainably create, nurture and grow aquaculture industries.

SARDI and PIRSA Fisheries and Aquaculture work closely with the aquaculture sector to produce applied research outcomes and timely delivery. SARDI's aquaculture research program is uniquely set up to provide support across the whole spectrum of industry research needs, including:

- Developing novel technologies, species and sites;
- Environmental assessment, monitoring and carrying capacity modelling;
- Improving spawning, and larval and juvenile rearing of stock;
- Developing improved and more cost-effective sustainable feeds;
- Providing advice and support on selective breeding programs and aligned molecular technologies;
- Enhancing algal production and systems to produce biomass for a diverse range of products;
- Addressing disease and pest issues, through support with chemical registration, monitoring and surveillance, evaluation of therapeutics and development of improved husbandry practices;
- Pre and post-harvest product safety and quality, including developing novel products and packaging; and
- Trade and market access.

The outcomes of such initiatives are integrated into decision-making processes such as those associated with aquaculture zoning, disease control, managing interactions with protected wildlife species and environmental management.

A strategic research initiative is the Innovative Solutions for Aquaculture Planning and Management suite of projects (IS). Commenced in 2004, this program is a joint initiative between PIRSA Fisheries and Aquaculture and the Fisheries Research and Development Corporation (FRDC) to fund research to foster the continued sustainable development of the South Australian aquaculture industry.

Stage 1 of IS involved a site or species focus. Projects included an environmental audit of marine aquaculture, spatial impacts and carrying capacity for finfish aquaculture, finfish parasites, seal interactions and the development of rapid environmental assessment and monitoring techniques. In addition, a communication and extension strategy was developed to disseminate project outcomes to industry.

The particular focus of the current and second stage of the IS program is to facilitate further economic growth of the aquaculture industry and to provide information to improve the management of aquaculture resources. Projects completed under Stage 2 include oceanic and biological modelling of Spencer Gulf, biosecurity, new technologies and new species and improving programs for environmental monitoring. Two projects are currently underway; one investigating interactions of sharks with marine activities (e.g. aquaculture and fisheries) in Southern Spencer Gulf, the other identifying the feeding requirements of Pacific Oysters, Mud-cockles and Mussels.

15 External factors or events affecting the aquaculture industry in South Australia

Oysters

Pacific Oyster Mortality Syndrome (POMS) is a disease which affects Pacific Oysters (*Crassostrea gigas*) and has not been detected in South Australia to date. POMS causes rapid and high mortalities in farmed Oysters (up to 100% within days of being detected) and can spread quickly if introduced. There are no human health implications associated with POMS. South Australia produces some of the finest Pacific Oysters on the market and table Oysters purchased from retailers, restaurants and fish processors are safe to eat.

In February 2016, POMS was detected in Tasmania causing a significant economic impact to that state and South Australia. Previously, South Australia received 80% of spat (juvenile Oysters) from health certified hatcheries in Tasmania, however a South Australian ban now exists for live Oysters, including spat, from Tasmania to prevent the risk of POMS entering South Australia. Since February 2016, a significant spat supply issue for South Australian Oyster growers has occurred, with a forecasted low supply of saleable size Oysters predicted in the short-term future.

PIRSA's response to the detection of POMS in Tasmania included substantial funding being provided from the South Australian Government to two local South Australian hatcheries, EP Shellfish and Sustainable Aquatic Industries, both on the Eyre Peninsula and to SARDI Aquatic Sciences to increase the production of spat for South Australia and address the significant shortfall.

Further, in September 2016 two Oyster hatcheries were endorsed in South Australia, including Eyre Shellfish Pty Ltd (Franklin Harbor) and Cameron of Tasmania Pty Ltd (Port Lincoln). Construction has commenced for Eyre Shellfish Pty Ltd, and Cameron of Tasmania Pty Ltd has produced batches of spat which have been made available to growers. South Australia is now in a unique position as a POMS-free jurisdiction, which will facilitate market access and trade, particularly for hatcheries producing POMS-free spat.

For more information see: www://pir.sa.gov.au/aquaculture/aquatic_animal_health/pacific_oyster_mortality_syndrome.

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17 Glossary

AMR	Antimicrobial Resistance Strategy
APVMA	Australian Pesticides and Veterinary Medicines Authority
ASBTIA	Australian Southern Bluefin Tuna Industry Association
ATAB	Aquaculture Tenure Allocation Board
AVG	Abalone Viral Ganglioneuritis
BST	Baker-Schultz-Turner
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
DEWNR	Department of Environment, Water and Natural Resources
EMP	Environmental Monitoring Program
EPA	Environment Protection Authority
EPPs	Environment Protection Policies
ESD	Ecologically Sustainable Development
FAO	Food and Agriculture Organisation
FCR	Food Conversion Ratio
FRDC	Fisheries Research and Development Corporation
FTE	Full Time Equivalent
GSSI	Global Sustainable Seafood Initiative
HABs	Harmful Algal Blooms
NASAA	National Association for Sustainable Agriculture, Australia
OsHV-1	Oyster Herpesvirus-1 microvariant
OIE	World Organisation for Animal Health
PIRSA	Primary Industries and Regions South Australia
POMS	Pacific Oyster Mortality Syndrome
SA	South Australia
SAOGA	South Australian Oyster Growers Association
SARDI	South Australian Research and Development Institute Aquatic Sciences
SASQAP	South Australia Shellfish Quality Assurance Program
SBT	Southern Bluefin Tuna
TEPS	Threatened, Endangered and Protected Species
UV	Ultra-violet
YTK	Yellowtail Kingfish

18 Appendix 1

Aquaculture licences held in South Australia in 2014/15 and 2015/16 by sector

Tuna sector

Reporting period	Number of licences	Aquaculture licence numbers						
2014/15	19	AQ00025	AQ00053	AQ00059	AQ00112	AQ00202	FB00011	FB00079
		AQ00030	AQ00057	AQ00060	AQ00169	AQ00255	FB00051	
		AQ00047	AQ00058	AQ00097	AQ00170	AQ00325	FB00078	
2015/16	18	AQ00025	AQ00053	AQ00060	AQ00169	AQ00255	FB00051	
		AQ00030	AQ00057	AQ00097	AQ00170	AQ00325	FB00078	
		AQ00047	AQ00058	AQ00112	AQ00202	FB00011	FB00079	

Finfish sector

Reporting period	Number of licences	Aquaculture licence numbers						
2014/15	26	AQ00015	AQ00032	AQ00214	AQ00302	FF00029	FF00085	FF00095
		AQ00016	AQ00072	AQ00234	FF00026	FF00030	FF00090	FF00096
		AQ00017	AQ00139	AQ00235	FF00027	FF00037	FF00092	
		AQ00018	AQ00140	AQ00292	FF00028	FF00060	FF00093	
2015/16	24	AQ00015	AQ00032	AQ00214	AQ00302	FF00029	FF00085	
		AQ00016	AQ00072	AQ00234	FF00026	FF00030	FF00090	
		AQ00017	AQ00139	AQ00235	FF00027	FF00037	FF00095	
		AQ00018	AQ00140	AQ00292	FF00028	FF00060	FF00096	

Marine Abalone sector

Reporting period	Number of licences	Aquaculture licence numbers						
2014/15 & 2015/16	14	AQ00021	AQ00029	AQ00070	FA00015	FA00017	FA00026	FA00029
		AQ00022	AQ00069	FA00008	FA00016	FA00023	FA00027	FA00030

Mussel sector

Reporting period	Number of licences	Aquaculture licence numbers						
2014/15 and 2015/16	38	AQ00031	AQ00141	AQ00209	FS00014	FS00022	FS00071	FS00097
		AQ00063	AQ00189	AQ00210	FS00015	FS00023	FS00072	FS00102
		AQ00067	AQ00190	AQ00215	FS00016	FS00029	FS00073	
		AQ00101	AQ00192	FS00011	FS00019	FS00038	FS00082	
		AQ00108	AQ00193	FS00012	FS00020	FS00041	FS00084	
		AQ00109	AQ00208	FS00013	FS00021	FS00042	FS00095	

Oyster sector

Reporting period	Number of licences	Aquaculture licence numbers						
2014/15	344	AQ00001	FM00023	FM00438	FM00204	AQ00186	FM00117	FM00422
		AQ00002	FM00024	FM00443	FM00313	AQ00188	FM00137	FM00423
		AQ00004	FM00035	FM00445	FM00339	AQ00198	FM00139	FM00424
		AQ00005	FM00045	FM00446	FM00406	AQ00199	FM00140	FM00425
		AQ00006	FM00046	FM00447	FM00416	AQ00222	FM00144	FM00426
		AQ00012	FM00048	FM00450	FM00417	AQ00227	FM00151	FM00427
		AQ00039	FM00060	FM00454	FM00437	AQ00231	FM00153	FM00428
		AQ00042	FM00061	FM00456	FM00444	AQ00243	FM00154	FM00439
		AQ00043	FM00062	FM00457	FM00469	AQ00244	FM00155	FM00440
		AQ00071	FM00064	FM00461	FM00470	AQ00256	FM00159	FM00441
		AQ00090	FM00082	FM00462	FM00520	AQ00278	FM00162	FM00449
		AQ00094	FM00084	FM00463	AQ00003	AQ00295	FM00177	FM00451
		AQ00095	FM00090	FM00466	AQ00009	AQ00297	FM00181	FM00452
		AQ00103	FM00134	FM00468	AQ00011	AQ00299	FM00212	FM00453
		AQ00104	FM00146	FM00478	AQ00013	AQ00300	FM00221	FM00455
		AQ00105	FM00149	FM00479	AQ00014	AQ00317	FM00307	FM00458
		AQ00110	FM00156	FM00480	AQ00034	FM00015	FM00316	FM00459
		AQ00137	FM00161	FM00482	AQ00035	FM00017	FM00324	FM00460
		AQ00138	FM00163	FM00484	AQ00036	FM00018	FM00326	FM00464
		AQ00145	FM00165	FM00485	AQ00091	FM00019	FM00330	FM00465
		AQ00146	FM00166	FM00495	AQ00099	FM00020	FM00332	FM00467
		AQ00148	FM00170	FM00496	AQ00100	FM00025	FM00335	FM00471
		AQ00157	FM00171	FM00497	AQ00102	FM00027	FM00336	FM00474
		AQ00158	FM00173	FM00500	AQ00106	FM00028	FM00346	FM00476
		AQ00162	FM00175	FM00502	AQ00107	FM00031	FM00349	FM00477
		AQ00164	FM00178	FM00505	AQ00126	FM00032	FM00351	FM00498
		AQ00165	FM00217	FM00506	AQ00127	FM00033	FM00352	FM00501
		AQ00166	FM00309	FM00514	AQ00133	FM00034	FM00353	FM00504
		AQ00172	FM00315	FM00517	AQ00134	FM00036	FM00354	FM00507
		AQ00173	FM00321	FM00518	AQ00135	FM00038	FM00355	FM00508
		AQ00179	FM00325	FM00519	AQ00147	FM00039	FM00373	FM00509
		AQ00180	FM00328	FM00521	AQ00149	FM00040	FM00374	FM00510
		AQ00181	FM00329	FM00524	AQ00150	FM00044	FM00375	FM00515
		AQ00197	FM00331	FM00531	AQ00151	FM00047	FM00376	FM00525
		AQ00220	FM00347	FM00532	AQ00152	FM00053	FM00377	FM00530
		AQ00221	FM00348	FM00538	AQ00153	FM00059	FM00380	FM00542
		AQ00223	FM00358	FM00539	AQ00154	FM00065	FM00382	FM00546
		AQ00228	FM00359	FM00543	AQ00155	FM00066	FM00385	FM00547
		AQ00232	FM00366	FM00544	AQ00156	FM00068	FM00387	FM00550
		AQ00233	FM00379	AQ00167	AQ00159	FM00069	FM00389	FM00552
		AQ00257	FM00384	AQ00168	AQ00160	FM00072	FM00391	FM00553
		AQ00261	FM00392	AQ00171	AQ00161	FM00075	FM00393	FM00554
		AQ00262	FM00401	AQ00178	AQ00163	FM00076	FM00395	FM00555
		AQ00263	FM00402	AQ00196	AQ00174	FM00081	FM00400	FM00556
		AQ00277	FM00404	FM00037	AQ00175	FM00088	FM00403	FM00448
		AQ00282	FM00405	FM00055	AQ00176	FM00094	FM00407	AQ00041
		AQ00284	FM00432	FM00067	AQ00177	FM00095	FM00408	FS00085
		AQ00312	FM00434	FM00145	AQ00182	FM00099	FM00410	FS00079
		AQ00313	FM00436	FM00167	AQ00183	FM00101	FM00420	FS00080
		AQ00068						

2015/16	336	AQ00001	AQ00156	AQ00284	FM00069	FM00315	FM00410	FM00479
		AQ00002	AQ00157	AQ00295	FM00072	FM00316	FM00416	FM00480
		AQ00003	AQ00158	AQ00297	FM00075	FM00324	FM00417	FM00482
		AQ00004	AQ00159	AQ00299	FM00076	FM00325	FM00420	FM00484
		AQ00005	AQ00160	AQ00300	FM00081	FM00326	FM00422	FM00485
		AQ00006	AQ00161	AQ00312	FM00082	FM00328	FM00423	FM00495
		AQ00009	AQ00162	AQ00313	FM00084	FM00329	FM00424	FM00496
		AQ00011	AQ00163	AQ00317	FM00088	FM00330	FM00425	FM00497
		AQ00012	AQ00164	AQ00322	FM00090	FM00331	FM00426	FM00498
		AQ00013	AQ00165	AQ00323	FM00094	FM00332	FM00427	FM00500
		AQ00014	AQ00167	AQ00324	FM00095	FM00335	FM00428	FM00502
		AQ00034	AQ00168	AQ00328	FM00099	FM00336	FM00432	FM00504
		AQ00035	AQ00172	AQ00329	FM00101	FM00347	FM00434	FM00505
		AQ00036	AQ00173	AQ00334	FM00117	FM00348	FM00436	FM00506
		AQ00039	AQ00174	AQ00335	FM00134	FM00349	FM00437	FM00507
		AQ00042	AQ00175	FM00015	FM00137	FM00351	FM00439	FM00508
		AQ00043	AQ00176	FM00017	FM00139	FM00352	FM00440	FM00509
		AQ00071	AQ00177	FM00018	FM00140	FM00353	FM00441	FM00510
		AQ00090	AQ00178	FM00019	FM00144	FM00354	FM00443	FM00514
		AQ00091	AQ00179	FM00023	FM00145	FM00355	FM00445	FM00515
		AQ00094	AQ00180	FM00024	FM00146	FM00358	FM00446	FM00517
		AQ00095	AQ00181	FM00025	FM00149	FM00359	FM00447	FM00518
		AQ00099	AQ00182	FM00027	FM00151	FM00366	FM00448	FM00519
		AQ00100	AQ00183	FM00028	FM00153	FM00373	FM00449	FM00520
		AQ00102	AQ00186	FM00031	FM00154	FM00374	FM00450	FM00521
		AQ00103	AQ00188	FM00032	FM00155	FM00375	FM00451	FM00524
		AQ00104	AQ00197	FM00033	FM00156	FM00376	FM00452	FM00525
		AQ00105	AQ00198	FM00034	FM00159	FM00377	FM00453	FM00530
		AQ00106	AQ00199	FM00035	FM00160	FM00379	FM00454	FM00531
		AQ00107	AQ00220	FM00036	FM00161	FM00380	FM00455	FM00532
		AQ00110	AQ00221	FM00037	FM00162	FM00382	FM00456	FM00538
		AQ00127	AQ00222	FM00038	FM00163	FM00384	FM00457	FM00539
		AQ00133	AQ00223	FM00039	FM00165	FM00385	FM00458	FM00542
		AQ00134	AQ00227	FM00040	FM00166	FM00387	FM00459	FM00543
		AQ00135	AQ00228	FM00044	FM00167	FM00389	FM00460	FM00544
		AQ00137	AQ00231	FM00045	FM00170	FM00391	FM00461	FM00546
		AQ00138	AQ00232	FM00046	FM00171	FM00392	FM00462	FM00547
		AQ00145	AQ00233	FM00047	FM00173	FM00393	FM00463	FM00550
		AQ00146	AQ00243	FM00048	FM00175	FM00395	FM00464	FM00552
		AQ00147	AQ00244	FM00053	FM00177	FM00400	FM00465	FM00553
		AQ00148	AQ00256	FM00059	FM00178	FM00401	FM00466	FM00554
		AQ00149	AQ00257	FM00060	FM00181	FM00402	FM00467	FM00555
		AQ00150	AQ00261	FM00061	FM00212	FM00403	FM00468	FM00556
		AQ00151	AQ00262	FM00062	FM00217	FM00404	FM00471	AQ00041
		AQ00152	AQ00263	FM00064	FM00221	FM00405	FM00474	AQ00068
		AQ00153	AQ00277	FM00065	FM00307	FM00406	FM00476	FS00079
		AQ00154	AQ00278	FM00066	FM00309	FM00407	FM00477	FS00080
		AQ00155	AQ00282	FM00068	FM00313	FM00408	FM00478	FS00085

Landbased sector (includes Landbased Abalone, Finfish and Oyster hatcheries)

Reporting period	Category	Number of licences	Aquaculture licence numbers					
2014/15	Category A	52	AQ00132 AQ00211 AQ00270 AQ00294 FT00133 FT00157 FT00166 FT00310 FT00365	FT00485 FT00478 FT00372 FT00323 FT00459 FT00655 FT00545 FT00549 FT00601	FT00530 FT00660 FT00407 FT00685 FT00314 FT00611 FT00633 FT00025 FT00738	FT00402 FT00505 FT00184 FT00239 FT00523 FT00734 FT00007 FT00740 FT00510	FT00044 FT00544 FT00253 FT00464 FT00432 FT00487 FT00539 FT00498	FT00493 FT00068 FT00543 FT00730 FT00701 FT00383 FT00234 FT00502
2014/15	Category B	37	FT00728 FT00158 AQ00260 FT00739 FT00185 FT00123 FT00506	AQ00281 FT00745 AQ00245 AQ00136 FT00736 AQ00248 FT00721	FT00034 FT00032 AQ00246 FT00043 FT00036 FT00373 FT00524	FT00440 FT00013 FT00035 FT00687 FT00385 FT00604 FT00607	FT00735 FT00154 AQ00040 FT00597 FT00676 FT00014 FT00618	FT00069 AQ00280
2014/15	Category C	14	FT00287 FT00560 FT00558	FT00619 FT00652 FT00634	FT00089 FT00620	AQ00131 FT00737	FT00040 FT00423	FT00702 FT00135
2015/16	Category A	37	AQ00132 AQ00211 AQ00248 AQ00260 AQ00294 AQ00305 FT00014	FT00044 FT00133 FT00157 FT00166 FT00184 FT00234 FT00239	FT00253 FT00310 FT00314 FT00323 FT00372 FT00383 FT00432	FT00485 FT00487 FT00493 FT00498 FT00502 FT00505 FT00523	FT00543 FT00545 FT00601 FT00655 FT00660 FT00685 FT00701	FT00734 FT00738
2015/16	Category B	42	AQ00040 AQ00136 AQ00246 AQ00270 AQ00280 AQ00281 FT00007 FT00013	FT00025 FT00068 FT00069 FT00123 FT00154 FT00185 FT00365 FT00373	FT00402 FT00407 FT00440 FT00459 FT00464 FT00478 FT00506 FT00510	FT00524 FT00530 FT00539 FT00544 FT00549 FT00597 FT00604 FT00607	FT00611 FT00618 FT00633 FT00687 FT00721 FT00728 FT00730 FT00735	FT00740 FT00745
2015/16	Category C	13	AQ00131 AQ00326 FT00036	FT00040 FT00043 FT00089	FT00135 FT00158 FT00287	FT00385 FT00676 FT00736	FT00739	
2015/16	Category D	9	FT00423 FT00558	FT00560 FT00619	FT00620 FT00634	FT00652 FT00702	FT00737	

Tourism sector

Reporting period	Number of licences	Aquaculture licence numbers				
2014/15	4	AQ00184	AQ00185	AQ00195	AQ00206	
2015/16	5	AQ00184	AQ00185	AQ00195	AQ00206	AQ00315

19 Appendix 2

Aquaculture zone policies in South Australia

POLICY	ZONE	Sector	Total area (ha)	Leasable area (ha)	Species
<i>Aquaculture (Zones – Eastern Spencer Gulf) Policy 2005</i>	Hardwicke Bay (inner) subtidal aquaculture zone	NA	420	60	Molluscs
	Hardwicke Bay (middle) subtidal aquaculture zone	NA	1053	60	Molluscs
	Hardwicke Bay (outer) subtidal aquaculture zone	NA	1402	60	Molluscs
	Port Broughton intertidal aquaculture zone	NA	356	65	Filter feeding molluscs
	Tickera intertidal aquaculture zone	NA	512	45	Filter feeding molluscs
	Tickera subtidal aquaculture zone	NA	2398	60	Filter feeding molluscs
	Wallaroo subtidal aquaculture zone	NA	1903	300	Molluscs
	Point Riley aquaculture exclusion zone	NA	9639	Nil	NA
	Port Broughton aquaculture exclusion zone	NA	4384	Nil	NA
	Port Hughes aquaculture exclusion zone	NA	3407	Nil	NA
	Wallaroo aquaculture exclusion zone	NA	10889	Nil	NA
<i>Aquaculture (Zones – Cape D'Estrees) Policy 2006</i>	Cape D'Estrees (inner) subtidal aquaculture zone	NA	145	60	Molluscs (other than filter feeding molluscs) & algae
	Cape D'Estrees (middle) subtidal aquaculture zone	NA	198	60	Molluscs (other than filter feeding molluscs) & algae
	Cape D'Estrees (outer) subtidal aquaculture zone	NA	392	60	Molluscs (other than filter feeding molluscs) & algae
	Laura Bay aquaculture exclusion zone	NA	534	Nil	NA
<i>Aquaculture (Zones – Anxious Bay) Policy 2007</i>	Anxious Bay aquaculture zone	NA	452	120	Molluscs (other than mussels or oysters) & algae
	Anxious Bay aquaculture exclusion zone	NA	8634	Nil	NA
<i>Aquaculture (Zones – Smoky Bay) Policy 2007</i>	Eyre Island intertidal aquaculture zone	NA	81	21	Bivalve Molluscs (other than mussels) & research
	Missiesey intertidal aquaculture zone	NA	108	24	Bivalve Molluscs (other than mussels) & research
	Saddle Peak intertidal aquaculture zone	NA	62	21	Bivalve Molluscs (other than mussels) & research
	Smoky Bay aquaculture emergency zone	NA	171	Not defined	Bivalve Molluscs (other than mussels)
	Smoky Bay (holding) intertidal aquaculture zone	NA	4	0.35	Holding Bivalve Molluscs (other than mussels)
	Smoky Bay intertidal	NA	73	20.9	Bivalve Molluscs (other than mussels) & research
	Smoky Bay north subtidal aquaculture zone	NA	2166	40	Bivalve Molluscs (other than mussels)
	Smoky Bay south subtidal aquaculture zone	NA	1621	40	Bivalve Molluscs (other than mussels)
	Vinya intertidal aquaculture zone	NA	180	61	Bivalve Molluscs (other than mussels) & research
	Eyre Island aquaculture exclusion zone	NA	9784	Nil	NA

POLICY	ZONE	Sector	Total area (ha)	Leasable area (ha)	Species
<i>Aquaculture (Zones – Coffin Bay) Policy 2008</i>	Frenchman Bluff aquaculture zone	NA	388	90	Supplementary fed organisms (other than finfish) that involves regular feeding, algae & research
	Kellidie Bay aquaculture zone	NA	732	23	Bivalve molluscs (other than mussels), storage & research
	Mount Dutton Bay aquaculture zone	NA	601	32	Bivalve molluscs (other than mussels) & research
	Point Longnose aquaculture zone	NA	379	63	Bivalve molluscs (other than mussels), algae & research
	Port Douglas (central) aquaculture zone	NA	446	50	Bivalve molluscs (other than mussels) & research
	Port Douglas (east) aquaculture zone	NA	34	4	Bivalve molluscs (other than mussels) & research
	Port Douglas (west) aquaculture zone	NA	90	10	Bivalve molluscs (other than mussels) & research
	Coffin Bay aquaculture exclusion zone	NA	15686	Nil	NA
<i>Aquaculture (Zones – Fitzgerald Bay) Policy 2008</i>	Fitzgerald Bay aquaculture zone	Eastern Fitzgerald sector	2849	550	Supplementary fed organisms (other than wild-caught tuna), bivalve molluscs & algae
		Western Fitzgerald sector	1705		
	Fitzgerald Bay (north) aquaculture zone	NA	10	10	Bivalve molluscs & algae
	Fitzgerald Bay aquaculture exclusion zone	NA	2148	Nil	NA
<i>Aquaculture (Zones - Port Neill) Policy 2008</i>	Port Neill aquaculture zone	NA	4913	565	Prescribed wild-caught tuna broodstock, supplementary fed organisms (other than wild-caught tuna), bivalve molluscs & algae
	Port Neill aquaculture exclusion zone	NA	7227	Nil	NA
<i>Aquaculture (Zones - Arno Bay) Policy 2011</i>	Arno Bay aquaculture zone	Arno Bay (outer) sector	2209	200	Prescribed wild-caught tuna broodstock & supplementary fed organisms (other than wild-caught tuna)
		Arno Bay (inner) sector	3494	80	
<i>Aquaculture (Zones – Streaky Bay) Policy 2011</i>	Blanche Port aquaculture zone	NA	2799	77.5	Bivalve molluscs (other than mussels)
	Haslam (north bank) aquaculture zone	NA	342	50	Bivalve molluscs (other than mussels)
	Perlubie (south bank) aquaculture zone	NA	224	40	Bivalve molluscs (other than mussels)
	Point Gibson aquaculture zone	NA	265	70	Bivalve molluscs (other than mussels)
	Streaky Bay aquaculture zone	NA	45334	40	Molluscs (other than mussels)
	Streaky Bay aquaculture exclusion zone	NA	3748	Nil	NA

POLICY	ZONE	Sector	Total area (ha)	Leasable area (ha)	Species
<i>Aquaculture (Zones – Lacepede Bay) Policy 2012</i>	Cape Jaffa aquaculture zone	NA	1316	40	Supplementary fed organisms (other than wild-caught tuna & abalone)
	Kingston aquaculture zone	Kingston (holding) sector	416	5	Supplementary fed organisms (other than wild-caught tuna & abalone)
		Kingston (inner) sector	25560	80	Supplementary fed organisms (other than wild-caught tuna & abalone)
		Kingston (outer) sector	14899	200	Supplementary fed organisms (other than wild-caught tuna & abalone)
	<i>Kingston aquaculture exclusion zone</i>	NA	4712	Nil	NA
<i>Aquaculture (Zones - Lower Eyre Peninsula) Policy 2013</i>	Boston Bay aquaculture zone	Bicker Isles sector	243	368	Supplementary fed species (i.e. wild-caught tuna, finfish, abalone etc.), bivalve molluscs & algae
		Boston Island (east) sector	855		
		Boston Bay sector	2702		
	Lincoln aquaculture zone	Lincoln (inner) sector	18447	1825	Prescribed wild-caught tuna & algae
		Lincoln (outer) sector	35024	5000	
	Louth Bay aquaculture zone	NA	9443	270	Supplementary fed organisms (other than wild-caught tuna), bivalve molluscs & algae
	Murray Point aquaculture zone	NA	72	2	Bivalve molluscs (other than mussels)
	Proper Bay aquaculture zone	NA	2356	60	Bivalve molluscs & algae
	Tod River aquaculture zone	NA	747	38	Bivalve molluscs (other than mussels)
	<i>Lincoln aquaculture exclusion zone</i>	NA	27383	Nil	NA
	<i>Sir Joseph Banks aquaculture exclusion zone</i>	NA	96723	Nil	NA
	<i>Buffalo Reef aquaculture exclusion zone</i>	NA	1255	Nil	NA
	<i>Aquaculture (Zones - Tumby Bay) Policy 2015</i>	Tumby Bay aquaculture zone	NA	10324	1300
<i>Tumby Bay aquaculture exclusion zone</i>		NA	13765	Nil	NA

