



Government of South Australia
Primary Industries and Resources SA

POLICY REPORT

CAPE D'ESTREES AQUACULTURE MANAGEMENT POLICY REPORT

**Supporting the Aquaculture
(Zones - Cape D'Estrees) Policy 2006**

**Cape D'Estrees (Inner) Subtidal Aquaculture Zone
Cape D'Estrees (Middle) Subtidal Aquaculture Zone
Cape D'Estrees (Outer) Subtidal Aquaculture Zone
Laura Bay Aquaculture Exclusion Zone**

*Recommended for Gazettal
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CAPE D'ESTREES

AQUACULTURE MANAGEMENT POLICY REPORT

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Policy Report for the Aquaculture (Zones - Cape D'Estrees) Policy

1 Executive Summary

This is a Policy Report to support the Aquaculture (Zones - Cape D'Estrees) Policy 2006, the 'Zone Policy'. The Zone Policy establishes principles for the ecologically sustainable development of aquaculture and associated activities in the Cape D'Estrees region. The Policy aims to provide certainty for industry stakeholders and improved community confidence facilitating the consolidation of the existing aquaculture industry and providing opportunities for moderate development in the Cape D'Estrees region.

The culture of abalone (*Haliotis* spp.) has been developing in South Australia since the early 1990's and is now recognised as a significant contributor to the State's aquaculture industry. The suitability of South Australia's pristine waters, coupled with opportunities for marine based grow out, mobile systems and product development provide an optimistic outlook for South Australia's farmed abalone sector.

Cape D'Estrees currently has a small amount of subtidal abalone aquaculture development. The Policy proposes limited expansion of non-filter feeding subtidal aquaculture. This Policy Report introduces objectives for the development and management of aquaculture resources in the coastal waters adjacent to Cape D'Estrees within a framework of ecologically sustainable development.

The Aquaculture Zone Policy affects the waters immediately adjacent to Cape D'Estrees. Cape D'Estrees is located approximately half way between Ceduna and Smoky Bay on the far west coast of South Australia (Figure 1). At the time this report was prepared, aquaculture use at Cape D'Estrees consisted of 16 hectares of subtidal farming of abalone.

Table 1: Proposed changes to aquaculture use at Cape D'Estrees

Aquaculture Zone	Lease Area Allocation (Hectares)		
	Current	New	Total
Cape D'Estrees (Inner)	16	44	60
Cape D'Estrees (Middle)	0	60	60
Cape D'Estrees (Outer)	0	60	60
Laura Bay Exclusion	0	535	535

An aggregate 5 hectare R&D allocation will be made available as part of the 180 hectares allocated to subtidal non-filter feeding mollusc aquaculture in the Cape D'Estrees Inner, Middle and Outer Zones. The total area covered by this zone policy is 1,270 hectares of which 14% will be made available for aquaculture.

1.1 Proposed Zones

The Policy establishes the following zones:

- Cape D'Estrees (Inner) Subtidal Aquaculture Zone;

- Cape D'Estrees (Middle) Subtidal Aquaculture Zone;
- Cape D'Estrees (Outer) Subtidal Aquaculture Zone; and
- Laura Bay Aquaculture Exclusion Zone.

Approval of leases and licences in these zones will be subject to requirements under the *Aquaculture Act 2001*; assessment of individual site suitability, criteria outlined in the Aquaculture Tenure Allocation Policy, ongoing environmental monitoring and other relevant plans and policies.

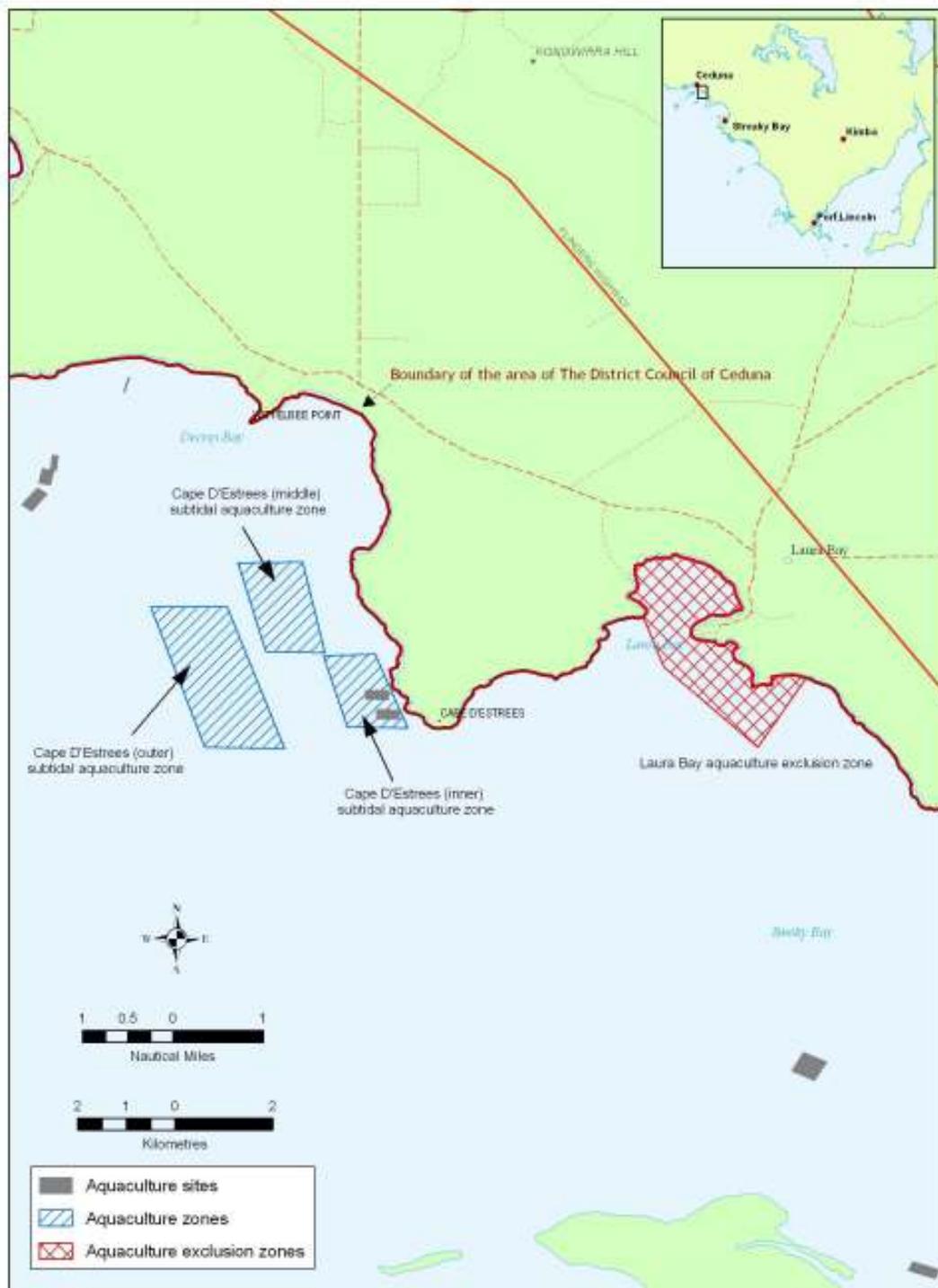


Figure 1: Cape D'Estrees Policy Area

1.1.1 Cape D’Estrees (Inner) Subtidal Aquaculture Zone

The Cape D’Estrees (Inner) Subtidal Aquaculture Zone provides for the development of 60 hectares of subtidal non-filter feeding mollusc aquaculture and associated activities including the culture of algae. This zone covers an area of 145 hectares, of which 16 hectares is already approved.

1.1.2 Cape D’Estrees (Middle) Subtidal Aquaculture Zone

The Cape D’Estrees (Middle) Subtidal Aquaculture Zone provides for the development of 60 hectares of subtidal non-filter feeding mollusc aquaculture and associated activities including the culture of algae. This zone covers an area of 198 hectares.

1.1.3 Cape D’Estrees (Outer) Subtidal Aquaculture Zone

The Cape D’Estrees (Outer) Subtidal Aquaculture Zone provides for the future development of 60 hectares of subtidal non-filter feeding mollusc aquaculture and associated activities including the culture of algae. This zone covers an area of 392 hectares.

1.1.4 Laura Bay Aquaculture Exclusion Zone

The Laura Bay Aquaculture Exclusion Zone covers 535 hectares and establishes a buffer between aquaculture development and areas of high conservation significance.

2 Introduction

This Policy Report, supporting the Policy, was developed to inform and involve all stakeholders in the decision making process for aquaculture allocation in the Cape D’Estrees region. The Policy will promote the orderly and efficient development of the aquaculture industry and recognises the industry as a legitimate user of the State’s marine resources, providing guidance and increased assurances for access to the marine resources for the aquaculture industry.

The aquaculture industry has developed rapidly in recent years. Through its relatively large requirement for labour and material inputs, the industry has shown the potential to increase the complexity and diversity of local economies. In total, the value of aquaculture industry economic output in South Australia was estimated at over \$355 million in 2002/03. In terms of employment, 2,969 jobs were generated through the aquaculture industry including direct, downstream and flow on employment, mainly in rural and regional areas.

Aquaculture in the Cape D’Estrees region has previously been managed under the Far West Aquaculture Management Plan (PISA 1996) and the Murat Bay Aquaculture Management Plan (Bond 1991) prepared under the *Fisheries Act 1982*. With the introduction of the *Aquaculture Act 2001*, there was a need to review this plan. This ensures many community and industry issues are dealt with at the zone planning phase rather than during individual application processes.

This Policy Report introduces objectives for the development and management of aquaculture resources in the coastal waters adjacent to Cape D’Estrees within a framework of ecologically sustainable development.

Objectives

Objective 1: To facilitate sustainable aquaculture development in the region;

Objective 2: To provide a framework for the sharing of coastal resources in the region;

Objective 3: To recognise the legitimate users of coastal resources in the region; and

Objective 4: To provide protection to those areas that are sensitive to alteration or which have conservation value.

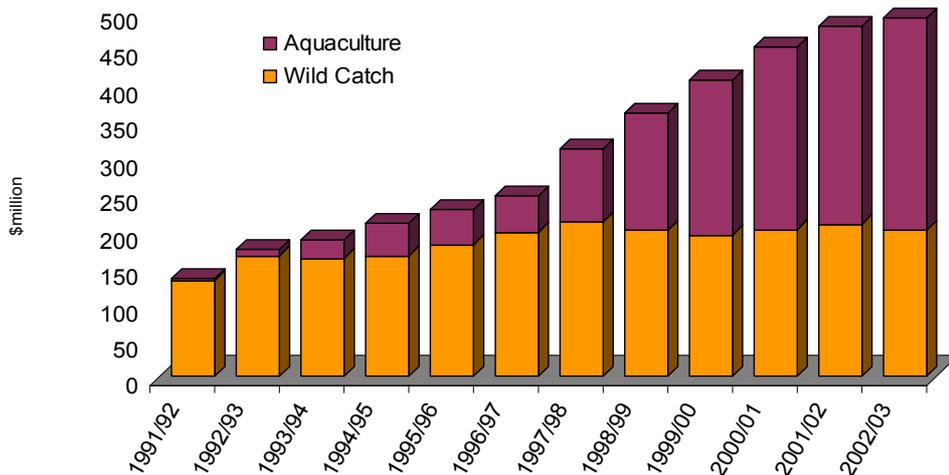
3 Benefits of aquaculture

South Australia's natural geography positions the State well to maximise the opportunities aquaculture present. One attraction for the aquaculture industry is the excellent water quality that stems from the low levels of runoff as a result of the low rainfall and sparse regional population. The State's aquaculture products have a sound reputation in export markets, where a consistent supply and good quality product is able to attract premium prices.

Aquaculture allows producers to plan their harvest to utilise the variability in market demand and to manage processing capacity, storage and transport availability. To improve, maintain and protect this reputation, aquaculture must be appropriately managed to prevent potential negative interactions with the environment and to minimise conflict with other users of the waters and adjacent coast.

3.1 Economic impacts of aquaculture

The aquaculture industry plays an important role in creating wealth and prosperity for the State, particularly in regional communities (Herreria *et al.* 2004). The South Australian Seafood Food Plan estimates the seafood industry (including wild fisheries) will produce \$2 billion by 2015 (SIDSC 2005). However, because the contribution of fisheries is likely to remain static, much of the growth will be met by aquaculture (Figure 2). The Policy will assist in meeting the National Aquaculture Industry Action Agenda targets of \$2.5 billion production from the national aquaculture sector by 2010. South Australia produces 38% of Australia's aquaculture production and 14% of the national seafood production. This trend is reflected worldwide with expectations that, by 2030, aquaculture will produce 50% of the global seafood demand (FAO 2004). The State aquaculture industry body, the SA Aquaculture Council has produced industry targets. They estimate that by 2013 aquaculture production in South Australia will generate a farm gate value of \$650 million.



Source: Pirsa Scorecard

Figure 2: South Australia's aquaculture production trends

The value of the South Australian aquaculture industry output was estimated at over \$355 million in 2002/03, a farm gate value of \$302 million and associated direct business turnover impacts in the processing, transport, retail and food sectors of \$53 million. This activity generated further business turnover (output) of \$286 million in other South Australian industries. The value of the State's aquaculture harvest now represents 60.5% of the State's total seafood production.

All abalone aquaculture production to date has been from land based farms (Figure 3). Production has increased from 21 tonnes to 60 tonnes in the six years to 2002/03. The predicted production from land based farms is anticipated to be 400 tonnes by 2012/13 (SIDSC 2005). The marine based abalone farming sector is yet to produce significant volumes being only recently established. However, should the marine based technology prove successful, the volumes produced could easily surpass the land based farm production and reach 650 tonnes by 2012/13.

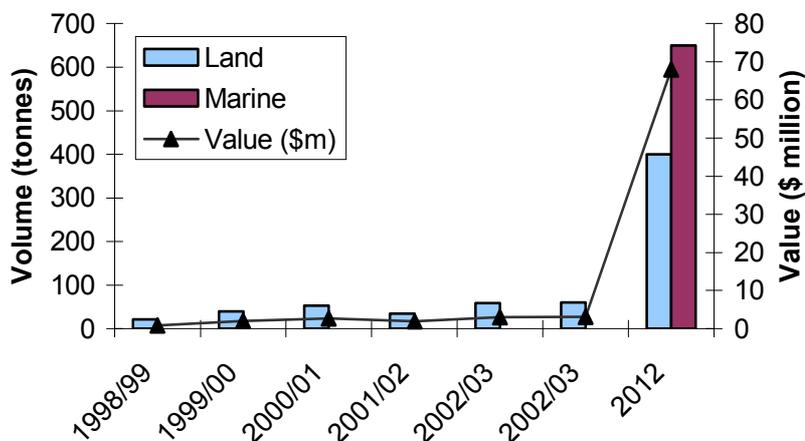


Figure 3: State abalone aquaculture production trends

3.2 Social impacts of aquaculture

In terms of employment 1,361 jobs were generated directly in aquaculture, 253 jobs in downstream activities and approximately 1,355 flow on jobs generated in other sectors of the State's economy in 2002/03.

The aquaculture sector can be seen to provide social benefits through jobs and additional income, which leads to improved social cohesion, increased training opportunities, additional business opportunities and improved social stability, particularly in rural and regional South Australia.

State government predictions are that, by 2010, the population on Eyre Peninsula will decline by 2% if changes to the economic structure are not implemented (DTUPA 2000). The area is experiencing reduced value of agriculture production and decreasing employment in the traditional land based agricultural farming sector. Additionally, the periodic fluctuations typical in agriculture have an effect on the support and service sectors on the Eyre Peninsula.

The positive social impacts of aquaculture employment have been advantageous to towns such as Port Lincoln, Ceduna, Cowell and Arno Bay. Ceduna had a declining population until recently when there has been an increased demand for workers in the town.

3.3 Regional impacts of aquaculture

Aquaculture was responsible for the direct employment of 1,182 people in 2002/03 in the Eyre Peninsula region. Associated downstream activities created employment for 139 people and flow-on business activity was estimated to generate a further 1033 jobs (EconSearch 2004).

The aquaculture industry in South Australia has developed rapidly in recent years. Through its relatively large requirement for labour and material inputs, the industry has shown the potential to increase the complexity and diversity of local economies. The demand for local labour, goods and services can help offset the contraction of other local industry and may assist in alleviating the range of economic and social pressures associated with declining regional economies.

Aquaculture development in the regions has a positive impact through diversified training and employment opportunities, an injection of income and jobs, including new youth job opportunities, into regional areas (many of which are socially and economically disadvantaged).

The jobs on aquaculture farms require locally based, permanent and skilled staff. There is constant employment in fish husbandry, environmental management, processing, boat and net maintenance. This consistent workload balances out the peaks and troughs of tasks and provides ongoing employment including labouring, professional, scientific or managerial positions. Workers tend to live close to their work site, providing significant social cohesion, more business opportunities and greater economic stability to the local area.

The regional impact of the aquaculture industry has, to date, been largely concentrated in the Eyre Peninsula region, reflecting the dominance of tuna

and oyster farming. However, other sectors such as yellowtail kingfish, mussels and abalone have increased significantly in recent years in terms of production volume and value of production and this has resulted in the spread of benefits to other regional areas.

In addition to the regional impacts generated by recurrent expenditures in the aquaculture sector, further economic impacts are generated by the investment of profits, by aquaculture operators, in local ventures. As an example, the current profitability in the tuna farming sector near Port Lincoln underpins substantial local investment by tuna farmers in the local cannery, shipyard, marinas, property (eg hotels) and other industries (eg viticulture).

3.4 Infrastructure factors

Much of South Australia that is best suited to aquaculture development is comparatively remote from major regional centres. Hence, adequate power, water, road and other transport systems are needed to support marine based industry development in the regions. Coupled with this is the need for boat ramps, harbours and breakwater facilities to support marine activities, as the demand for aquaculture increases, so will the need for appropriate infrastructure, which can cater for the current demand and for future expansion.

Ceduna is well serviced by wharves, boat slips and other support services. Immediately adjacent to the Cape D'Estrees area is private land and Ceduna Council is considering how best to provide improved infrastructure and site access. Land based hatcheries, processing sheds and boat ramps need to be as close to the Cape D'Estrees Aquaculture Zones as possible.

Access to coastal areas is deemed essential for aquaculture operators to minimise the distance between marine sites and processing or maintenance sheds. This reduces the operating costs and reduces the movement of boats and trucks through towns. Large sheds are needed for processing and require fresh water and three phase power. Subtidal farming requires infrastructure for large barges with cranes on board, wharves for loading / unloading and boat moorings.

Sealed roads connect the township of Smoky Bay and Ceduna with Adelaide via the Flinders Highway. Ceduna to the north is well serviced by larger infrastructure such as boat ramps, slipways and mooring facilities.

Lack of housing has been a hindrance to the aquaculture industry and has been indentified by a number of Councils as a key blockage to the future development of the aquaculture industry (Planning SA 2003a, 2005).

4 Management Obligations

Management obligations are those requirements an aquaculture operator must undertake according to the *Aquaculture Act 2001* and other relevant legislation. Penalties for failures of compliance include expiation fees, fines and suspension or cancellation of licence.

4.1 Environmental monitoring and management

Environmental regulation is supported through the *Aquaculture Regulations 2005*, which prescribe particulars for waste management, chemical use and environmental monitoring and reporting.

All aquaculture developments are managed with regard to the principles of ecologically sustainable development (ESD). Accordingly, applications to undertake aquaculture are subject to a risk assessment that considers the potential environmental, social and economic risks that may arise should the operation be licensed. This risk assessment process is consistent with the PIRSA Aquaculture Environmental Management Framework and the nationally agreed ESD Framework (Fletcher *et al.* 2004). The environmental risk assessment component considers the nature of the specific activity, relative to the environment in which it will be undertaken, at different spatial scales, namely; at the level of the individual site, at the bay or catchment level and at the regional or whole-of-industry level. Risks are ranked and adaptively managed according to their priority and complexity. Risks ranked unacceptably high require immediate modification of the application or development whereas those ranked as negligible or low may only require monitoring and reporting with a management response only necessary if levels deviate from the expected range. Developments that entail moderately ranked risks may be allowed to proceed with more frequent monitoring and reporting requirements and appropriate management responses. Overall, each operation is required to provide an annual Environmental Monitoring Program (EMP) report that provides information relating to those risks which require ongoing adaptive management.

For subtidal mollusc developments, the potential environmental risks tend to be limited to changes to the seafloor, the incidence of diseases and the use of chemicals. Videos are used to monitor any changes to the seafloor and all licensees are required to provide information on the remaining issues via an annual EMP report.

4.2 Marine mammal and other animal interactions

In this State there have been no reported incidences of negative interactions (such as entrapments or entanglements) between mollusc aquaculture operations and marine animals. The requirement to report interactions form part of licence conditions and Regulations under the *Aquaculture Act 2001*. If interactions occur then modifications to farming practices may be required.

Licensees are required to submit a Seabird and Large Marine Vertebrate Interaction Avoidance Strategy, which satisfies the Minister, at the commencement of operations, as outlined in the Regulations under the *Aquaculture Act 2001*. The strategy will detail what procedures the licensee will implement to minimise the risk and manage incidences of entanglement or entrapment of seabirds, dolphins, seals, sharks and whales. Operators may be audited against the operating practices detailed in their strategy at any time. Failure to comply with the strategy may result in an expiation fee or fine.

The impacts on marine mammals – attraction and entanglement – are considered to be manageable for these developments. The recent recommendations from scientific experts, and from the advisory committee on wildlife issues, the Marine Mammal – Marine Protected Areas Aquaculture Working Group, advised that abalone farms do not pose a threat to seals. Subtidal abalone farms are not considered to attractant marine mammals, particularly as they do not provide the mammals with a source of food.

Similarly, the issue of entanglement is minimal as long as the farm is well maintained and nets and ropes are not allowed to hang loose.

As part of the PIRSA/FRDC Innovative Solutions for Aquaculture Management and Planning projects, a sea lion satellite tracking project will assess the habitat use of sea lions around the Cape D'Estrees region. The results aim to provide information on where aquaculture zones can be located in order to reduce visitations by sea lions.

4.3 Disease

A range of health controls are included in the management of licensed aquaculture activities. All applications for new aquaculture licences are assessed for health risks as part of the ecologically sustainable development assessment. Regulations under the *Aquaculture Act 2001* require that operators report to PIRSA any increases in background mortality and must not move any animals showing signs of clinical disease without Ministerial approval. Requirements designed to manage other on-farm activities are included in a variety of legislation and policy. Diseases of particular concern and those that are regarded as posing particular threats to environmental, economic or social processes are listed as notifiable under the *Livestock Act 1997* and it is an offence under that Act to fail to report the occurrence or suspected occurrence of a notifiable condition. Translocation of organisms is managed through a process of Import Risk Analysis and the outcomes of these analyses, which include factors to reduce risk of disease or pest introductions and consideration of genetic integrity, are included in Orders under the *Livestock Act*, including the *Livestock (Restrictions on Entry of Aquaculture Organisms) Notice 2005*. Use of any therapeutants or treatments can be conducted only under a Ministerial approval (for off-label use as defined by the *Veterinary Practice Act 2003*) or under conditions specified by the Australian Pesticides and Veterinary Medicines Authority either on the label of registered products or included in Minor Use Permits.

Disease issues are seriously considered during the licence application stage by conducting a risk assessment that takes into consideration the proposed culture technique, technology and specific environment of the application.

Activities that may pose a risk, have risk mitigation strategies imposed are carefully monitored, including the reporting of mortalities and translocation activities.

4.4 Exotic species and preservation of biodiversity

The most efficient and therefore economic species for aquaculture production are those that are fast growing. These may not necessarily be native species. There are potential risks associated with the introduction of organisms not from the local environment. For the protection of the aquaculture industry, and of the natural environment, controls must be maintained on the introduction and movement of aquatic organisms, bearing in mind the potential risks involved with aspects of disease and genetic manipulation. The primary concerns associated with the introduction of introduced organisms are that they may form feral populations, which may compete for habitat and reduce the availability of nutrients to local organisms.

Genetically modified organisms proposed for use in South Australia would require approval by the Commonwealth Office of the Gene Technology Regulator. Other potential genetic issues are addressed as part of the ESD risk assessment and licence application process.

4.5 Stock escapes

The escape of aquaculture stock from a site is considered during the ecologically sustainable risk assessment of the application. This is the best stage to consider the level of risk presented by the species under consideration and the technology used.

Consideration will be given to the source of the cultured stock and whether it is present in the area of the farm. Consideration will also be given to the distance to suitable abalone habitat. This distance should be maximised and combined with the slow moving nature of abalone, the chance of recovering escaped stock is high and the survival of escaped stock is low. Research into the survivability of larvae spawned on an aquaculture site is likely to be low (Hawkins *et al.* 2002). Additionally, Benzies (1996) suggests the reversibility of any genetic impacts from abalone aquaculture sites is readily reversible once the farm is removed.

Regulations under the *Aquaculture Act 2001* require operators be proactive, undertaking the development of escape prevention strategies and immediately reporting escaped stock.

4.6 Doing it better - research and adaptive management

Evidence based policies require robust research to inform the decision making process. As such PIRSA Aquaculture has initiated several projects with the FRDC to improve our knowledge and inform our policies, in particular, the FRDC – PIRSA Innovative Solutions for Aquaculture Planning and Management Program. This suite of projects aims to develop tools to ensure a sustainable and competitive aquaculture industry for South Australia. These tools will;

- a) identify more effective ways to manage aquaculture
- b) minimise the regulatory burden on industry
- c) ensure that environmental considerations for South Australian aquaculture remain a clear priority.

Research is currently underway in the areas of;

- a) Environmental audits of marine aquaculture – this project aims to quantify the real and perceived environmental risks surrounding aquaculture and further develop and refine environmental monitoring.
- b) Addressing seal interactions – this project is designed to provide a better understanding of how seals behave in the marine environment and has already produced results of significant conservation value. The data gathered will allow zones to be located taking into consideration knowledge of seal habitat use around Port Lincoln and the West Coast. This project represents a considerable increase in pinniped research nationally.

- c) Spatial impacts and carrying capacity – this project aims to further refine the mathematical modelling of carbon and nutrient deposition from aquaculture farms.
- d) Parasite interactions between wild and farmed yellowtail kingfish – this project aims to proactively assess the risks to both wild and farmed stocks from parasite transmission.

Further projects are planned to develop environmental indicators (allowing the development of more efficient environmental monitoring programs) and also incentive instruments (to encourage participation in proactive environmental management programs).

4.7 R&D area allocation

Research into commercially related new species or technologies and improved environmental management can be hindered by delays in getting approvals and subsequent access to suitable sites. It is inconvenient or unsuitable for researchers to use industry sites for research purposes. This proposal sets aside a small area (size will be industry dependant) that is not for commercial use but will be made available solely for research purposes. A total of five hectares will be made available in any of the Aquaculture Zones, but not in the Aquaculture Exclusion Zones.

4.8 Disaster resilience

Marine based aquaculture is particularly exposed to the uncontrollable elements of the weather. Being prepared to deal with the vagaries of the weather or other disasters, natural or man made, requires foresight and planning to minimise loss of aquaculture stock from such events, and to reduce social and economic disruptions that may arise from them.

Industry must have foresight and be prepared. Foresight is the key to reducing potential costs from disasters. The government planning process must also be flexible. To this end, planning for emergency response is also included in the Aquatic Animals Chapter of the PIRSA Emergency Management Documents and various Aquavetplan Manuals.

4.9 Site Decommissioning

There will be times when an aquaculture site in the zone is no longer being used. In this case the lease contract requires that the site will be rehabilitated and reinstated by the lessee at the expiry of the lease. The lease also requires the operator to be party to an approved indemnity scheme or bank guarantee.

5 Policy status

This Policy Report supports the Aquaculture (Zones-Cape D'Estrees) Policy. The Policy has been finalised following the release and public consultation of the draft Policy in March 2005. The final Policy has been developed under the *Aquaculture Act 2001* and it is intended that this policy will be reviewed after five years. The format of the final policy has changed slightly from that available as the draft policy following advice from Parliamentary Counsel.

The Zone Policy will be recognised under the *Development Act 1993*. Aquaculture Zone Policies will be reflected in the relevant Development Plan.

The Policy has been designed to guide the development of an ecologically sustainable aquaculture industry within the sustainable limits of available marine resources and their existing use. The Policy is not designed as a comprehensive management framework for the protection of the whole marine environment. The Policy cannot consider all issues for individual aquaculture applications to the detail required for a complete assessment of the environmental risks of an application. Each application within a zone will be subject to an Ecologically Sustainable Development Assessment as part of the licence application process in accordance with the PIRSA Aquaculture Environmental Management Framework Policy. However, the Policy does provide certainty for developers and those concerned with broader environmental and stakeholder impacts.

5.1 Consistency

The Policy seeks to further the objectives of the State Government goals and strategies contained in the South Australia Strategic Plan and is consistent with the objectives of that Strategy. The policy was developed within the framework of key objectives established in the South Australian Government's Food Plan and Directions for Regional South Australia. Additionally, the policy is consistent with the provisions of the *Environment Protection Act 1993*, *Native Vegetation Act 1991*, *Harbors and Navigation Act 1993* and *Coast Protection Act 1972*.

The *Development Act 1993* recognises Aquaculture Management Policies prepared under the *Aquaculture Act 2001*. Aquaculture Management Policies will be reflected in the relevant Development Plan. This will provide for aquaculture development to be identified as an appropriate use within the relevant zone.

The Planning Strategy for Regional South Australia, January 2003, contains a number of strategies relevant to the development of this policy. In particular, the draft policy is consistent with strategies relating to diversifying primary production into new areas to replace or complement existing activities and the integrated and sustainable management of natural resources in a manner that maintains ecological processes.

Australia's Oceans Policy sets in place a framework for integrated and ecosystem-based planning and management for Australia's marine jurisdictions. It promotes ecologically sustainable development of the ocean resources and encourages internationally competitive marine industries, whilst ensuring the protection of marine biological diversity. The key tool is Regional Marine Planning i.e. planning based on large areas that are ecologically similar, and seeks to integrate the use, management and conservation of marine resources at the ecosystem level.

The Great Australian Bight Marine Park is a Commonwealth Marine Protected Area. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* is used to manage the Commonwealth Marine Protected Area. By defining the IUCN (the World Conservation Union) category, this defines the level of protection and hence whether activities are controlled in the Park.

Marine Plans establish an overarching strategic planning framework to guide State and local government planners and natural resource managers in the development and use of the marine environment. Fundamental to these Marine Plans is an ecologically-based zoning model. Each of these zones are supported by goals and objectives.

Marine Parks (or Marine Protected Areas) protect an area by managing some or all of the human activities that take place within it. Marine Park Zoning plans are designed to achieve long-term conservation of the biodiversity within a marine park, whilst providing opportunities for ecologically sustainable use. The zoning plans for each Marine Park (of which 19 are proposed for South Australia) will feature a combination of zones and special purpose areas to manage activities and uses within marine parks. Aquaculture policies will be prepared having regard to Marine Plan and Marine Park objectives and boundaries. However, consultation between the Department of Environment and Heritage and PIRSA Aquaculture continues to ensure aquaculture, and the management arrangements in place ensuring ecologically sustainable development, are appropriately recognised within Marine Parks and Marine Plans.

The Policy has been prepared having regard to the *Natural Resource Management Act (NRM) 2004*. The intent of this Act is to establish an integrated system of natural resource management that will assist in achieving sustainable natural resource management in South Australia. Both the *Aquaculture Act 2001* (and Policies prepared under it) and the NRM legislation are underpinned by ecologically sustainable development principles and are intended to complement each other. Natural Resource Management Regional Plans are required to recognise best practice by an industry sector. The *Aquaculture Act 2001* and management policies established under it provide a very good basis for managing the industry against best practice.

Relevant provisions of the Land Not Within A Council Area (Coastal Waters) Development Plan provide that aquaculture development should be undertaken in an 'ecologically sustainable way', in 'a manner which recognises the social and economic benefits to the community' and so as 'to conserve environmental quality, in particular water quality, and other aspects of the coastal environment including sea floor health, visual qualities, wilderness, ecosystems, and biodiversity'. Additionally, aquaculture should be undertaken 'in a manner which recognizes other users of marine and coastal areas and ensures a fair and equitable sharing of marine and coastal resources' and minimizes 'conflict between water and land based users', 'adverse impact on the visual amenity of the coastal environment and unspoilt views adjacent to the coast' and 'adverse impacts on sites of ecological, economic, cultural, heritage or scientific significance.' The draft Policy is consistent with these provisions in that it seeks to ensure the ecologically sustainable development of the aquaculture industry and recognise and respect other users of the marine resource.

This Policy has been developed contemporaneously with the Ceduna Council's Draft Smoky Bay Plan Amendment Report (July 2005) currently out for comment. This recognises that further development of the aquaculture industry is currently restricted by the lack of residential housing available for

employees. The Ceduna Plan Amendment Report proposes an Aquaculture Park for focussing land based activities ancillary to aquaculture, land based waste management sites, appropriate traffic routes for moving boats to and from the ramp and an increase in the housing allotments.

The Policy was developed within the context of the Environment Protection Act and the Environment Protection (Water Quality) Policy 2003 (the “Water Quality Policy”).

The Water Quality Policy established under the Environment Protection Act came into operation on 1 October 2003. The principal object of this Policy is to achieve the sustainable management of waters by protecting or enhancing water quality while allowing economic and social development. In particular, the Water Quality Policy requires all reasonable and practicable measures to be taken to avoid the discharge or deposit of waste into any waters or onto a place from which it is reasonably likely waste will enter any waters. The Water Quality Policy prescribes water quality criteria that must not be contravened and prohibits the discharge or deposition of pollutants into any waters that results in:

- Loss of seagrass or other native aquatic vegetation; or
- Reduction in numbers of any native species of aquatic animal or insect; or
- Increase in numbers of any non-native species of aquatic animal or insect; or
- Reduction in numbers of aquatic organisms necessary to a healthy aquatic ecosystem; or
- Increase in algal or aquatic plant growth; or
- Water becoming toxic to vegetation on land; or
- Water becoming harmful or offensive to humans, livestock or native animals; or
- Increased turbidity or sediment levels.

The Objects of the Environment Protection Act include the promotion of the principles of ecologically sustainable development and, in particular, to prevent, reduce, minimise and, where practicable, eliminate harm to the environment. Section 25 of the Environment Protection Act imposes a “general environmental duty not [to] undertake an activity that pollutes, or might pollute, the environment unless...all reasonable and practicable measures to prevent or minimise any resulting environmental harm [are taken]”. This duty is enforceable through environment protection orders. The Environment Protection Act also provides that communities must be able to provide for their economic, social and physical well-being.

The Environment Protection Act defines general offences relating to environmental harm and environmental nuisance. Environmental harm is “material environmental harm if...it consists of an environmental nuisance of a high impact or on a wide scale, it involves actual or potential harm to the health or safety of human beings that is not trivial, or other actual or potential environmental harm (not being merely an environmental nuisance) that is not trivial or it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$5,000”. Serious environmental harm is

defined as “environmental harm which involves actual or potential harm to the health or safety of human beings that is of a high impact or on a wide scale or other actual or potential environmental harm (not being merely an environmental nuisance) that is of a high impact or on a wide scale, results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$50,000.”

This Policy is consistent with the provisions of the Water Quality Policy and Environment Protection Act in that it seeks to minimise or prevent harm to the environment associated with aquaculture.

South Australia’s Food Plan was developed with the objective of increasing the food industry’s contribution to the South Australian economy to \$15 billion by 2010. The Food Plan identifies eight strategies to accelerate the food industry’s growth. The Policy is aligned with strategies relating to market driven food exports, sustainable production and a committed government. Aquaculture Management Policies support the growth of the food industry – specifically the seafood industry – by allocating and managing marine tenure in which the industry can grow sustainably. In addition, the policy is consistent with the objectives of the South Australia Seafood Food Plan in that it seeks to consolidate existing industry and allow appropriate expansion in aquaculture production.

The South Australian Government’s regional development policy Directions for Regional South Australia, identifies a number of objectives for regional development. The Policy is aligned with objectives relating to planning and infrastructure building, responsive government and economic generation.

The *Harbors and Navigation Act 1993* vests the seabed in the fee simple with the Minister responsible for administration of that Act. That is, section 15 (1) of the Harbors and Navigation Act vests all adjacent and subjacent land in the Minister for Transport.

Adjacent land is land extending from the low water mark on the seashore or the edge of any navigable waterway or body of water to the nearest road or section boundary, or to a distance of fifty metres from high water mark (whichever is the lesser distance). Subjacent land is land underlying navigable waters within the jurisdiction.

Matters of title and jurisdiction related to the territorial sea adjacent to the State are further addressed in the *Coastal Waters (State Powers) Act 1980*, *Seas and Submerged Lands Act 1973* and *Coastal Waters (State Title) Act 1980* of the Commonwealth. Under the *Aquaculture Act 2001*, plans such as aquaculture policies can be prescribed in State waters. State waters being those waters adjacent the State and territorial sea, and other navigable waters declared as such by regulation.

Section 15 (4) of the *Harbors and Navigation Act* provides that “the Crown Lands Act 1929 does not apply to land vested in the Minister under this Act but the Crown may, with the concurrence of the Minister, exercise any other power that it has to grant a lease or licence over its land in relation to land vested in the Minister under this Act.”

Part 6 of the *Aquaculture Act* provides for the grant of aquaculture leases in “State waters or State waters and adjacent land within the meaning of the

Harbors and Navigation Act". Section 20 of the *Aquaculture Act* provides that the grant of aquaculture leases is subject to the concurrence of the Minister responsible for administration of the *Harbors and Navigation Act*. The Policy is consistent with these provisions as they relate to the jurisdiction of the *Aquaculture Act* and the requirement for concurrence.

The *Coast Protection Act 1972* establishes the Coast Protection Board. The Coast Protection Board has a number of functions including... 'to protect the coast from erosion, damage, deterioration, pollution and misuse'. The Policy is consistent with the provisions of the Coast Protection Act in that it seeks to protect the coast by minimising any risk of erosion, damage, deterioration, pollution and misuse of the resource, through appropriate siting of Aquaculture Zones and Aquaculture Exclusion Zones, the specification of appropriate types and levels of aquaculture development and the encouragement for the development of suitably located and designed infrastructure.

The *Native Vegetation Act 1991* sets out objectives relating to native vegetation in South Australia. Objectives relevant to this policy include 'the conservation of the native vegetation of the State in order to prevent further reduction of biological diversity and further degradation of the land and its soil and the limitation of the clearance of native vegetation to clearance in particular circumstances including circumstances in which the clearance will facilitate the management of other native vegetation or will facilitate the efficient use of land for primary production.' The Policy is consistent with these objectives in that it seeks to minimise impacts on native vegetation through appropriate siting of Aquaculture Zones and Aquaculture Exclusion Zones around sensitive habitats.

5.2 Consultation

This Policy Report and Zone Policy has been developed with input from other government agencies, regional stakeholders, local governments and industry. Draft aquaculture policies and the related reports were referred to prescribed bodies and relevant public authorities. Following the release of the draft policy for consultation in March 2005, further public meetings were held in the local community and interested persons invited to make written submissions in relation to the draft policy. Two people attended the public meeting held in Ceduna.

Following consultation, the Minister must consult with and consider the advice of the Aquaculture Advisory Committee on all matters raised as a result of public consultation. Following approval of the draft policy by the Minister the draft policy must be referred to the Environment, Resources and Development Committee (ERDC) of Parliament. The ERDC may approve the Policy, seek amendments to the policy or object to the policy. In the event that the ERDC objects to the draft policy the policy must be laid before both Houses of Parliament where it may be disallowed by either house.

6 Marine resources in the area

Detailed and independent investigations of many aspects of the area were carried out by consultants (PPK & SARDI 2002, PB & SARDI 2003) prior to

the development of the Policy. The scientific reports indicated areas suitable for the various forms and classes of aquaculture.

6.1 Physical characteristics

The coast in the Cape D'Estrees area consists of cliffs with bay head beaches. The cliffs are formed from eroded calcarenite deposited as dunes and consolidated. Cape D'Estrees ranges in elevation from 5 to 42 metres above sea level. There are several offshore islands adjacent to the area. The surrounding land is used for farming and there are no towns nearby.

The Cape D'Estrees marine system is a relatively shallow system consisting of a number of linked bays including Tourville, Denial, Murat, Bosanquet, D'Ecres and Smoky Bay and is approximately 40 kilometres wide and 8 kilometres long (Figure 4). The mouth of the system opens to the southwest at a maximum depth of approximately 20 metres. Most of the system has a depth of less than 8 metres. Water exchange between the Ceduna system and the Great Australian Bight occurs through the Yalata and Waterwitch Channels and a number of smaller channels. Based on a tidal prism study of the region water flow is high with an exchange period of approximately one day (Petruševics 1995). Water exchange is tidally driven with a lesser wind influence.

The area has a Mediterranean climate with hot, dry summers and cool, wet winters. Temperatures range between 15° and 29° Celcius in the summer and between 6° and 17° Celcius during the winter. The average annual rainfall is three hundred and eighty millimetres (380 mm) (PB & SARDI 2003).

Data from the Bureau of Meteorology Ceduna Station shows that south to south westerly winds prevail for most of the year, except in July when north to north westerly winds occur. Extreme wind conditions occur in January when winds over 16 knots occur 23% of the time from the west (PB & SARDI 2003).

The site is relatively exposed to the open ocean with some protection afforded by St Peters Island. The most frequently occurring winds create a seabed depth of feel of 1.8 to 7.5 metres. Due to the fine to medium sediments on the site this may result in resuspension of sediments during south-easterly winds.

The Cape D'Estrees region has low currents with high flushing rates. The predicted average current speed in summer is 3.5 cm/s (max. 10.1 cm/s), for autumn is 3.7 cm/s (max. 9.4 cm/s), for winter 2.7 cm/s (max 8.5 cm/s) and for spring is 3.7 cm/s (max. 8.8 cm/s) (Petruševics et al. 1998).

Sea surface temperatures vary seasonally from 23°C in summer to 14.4°C in winter. Salinity ranges from 35.6 to 38.5 ppt (PPK & SARDI, 2002).

Water depth in the Cape D'Estrees region ranges from five metres in inshore areas to eleven metres offshore. Average depth is approximately ten metres.

Sediments in the Cape D'Estrees region show a strong spatial gradient related to the level of exposure they receive. The more seaward sediments are very coarse and grade to very fine on the inshore sites (PB & SARDI 2003).

The seagrass *Posidonia* dominates the waters adjacent Cape D'Estrees at depths down to approximately 5 metres. Further offshore substrate ranges

from rocky bottom to bare sand. Rocky substrates are characterised by diverse invertebrate and algae communities.

The waters of the Ceduna region receive little fresh water input and experience high evaporation. Salinity is elevated to approximately 35-41 ppt and water temperature ranges between 12-25°C. Dissolved oxygen levels generally range between 7-9 mg l⁻¹ and pH is approximately 8 (Petruševics et al. 1998).

The depth of the zone and the habitat type make the area suitable to subtidal aquaculture. However, the organisms cultured in this environment must be able to tolerate suspended sediments.

6.2 Current aquaculture in the area

The Cape D'Estrees area supports 16 hectares of subtidal abalone development (Figure 1). Although the land based abalone farming sector in this State is well developed, the marine based sector is relatively new.

Significant intertidal oyster aquaculture areas are located in Smoky Bay, thirteen kilometres to the South and St. Peter Island six kilometres to the North. These areas are to be covered in another Zone Policy.

6.3 Abalone

The main species being considered for abalone culture in South Australia are greenlip abalone (*Haliotis laevis*) and blacklip abalone (*H. rubra*). The novel nature of the industry means a variety of different technologies are expected to be used in perfecting the farming techniques. Technologies currently being trialled include the use of longlines, similar to subtidal mussel culture structures, from which cages are suspended, or utilising fish farm cages with abalone cages inside them.

Many farms are not proposing to utilise additional feed, other than the naturally growing algae on the cages. This will result in reduced potential for environmental change from excess feed. However, to support conservative planning practices, allocation of hectares within the Cape D'Estrees Zones has been carried out assuming the abalone farms are going to be provided with supplementary feed.

6.4 Carrying capacity and filter feeder allocation

Filter feeding organisms such as oysters feed on microscopic organic particles including phytoplankton (Van den Enden 1994), detritus (Quayle 1988) and protozoa (Le Gall 1997) and rely on natural production for food supply. Consequently, the maximum sustainable stocking density, or carrying capacity, for filter feeding organisms in a region is determined by the natural productivity of adjacent waters. The successful oyster industry to the north and south of the Cape D'Estrees Zones rely on production of natural food supplies. In order to minimise any potential impact on the established oyster industry in these areas, the Cape D'Estrees Aquaculture Zones will not provide for further filter feeding development. Only non-filter feeding molluscs, such as abalone, will be considered for culture in these Zones.

7 Considerations for aquaculture development

Aquaculture development in Cape D'Estrees is limited by the physical characteristics of the region and other marine resource users. The Zones are located away from navigational channels and from conservation areas. A one kilometre buffer is provided in the waters around the Laura Bay Conservation Park in the Laura Bay Aquaculture Exclusion Zone.

7.1 Infrastructure

The major hindrances to aquaculture development are often the lack of supporting land based infrastructure. During early stages of industry development this may be evident as a lack of hatcheries or some other link in the production process. As the industry matures more employment is created and pressure shifts to the provision of suitable housing for workers. Land based planning needs to address waste management issues, the movement of large boats and trucks through town sites and plan for consolidation of aquaculture ancillary activities.

Ceduna Council is working to provide supporting land based infrastructure for the Cape D'Estrees aquaculture industry and the Ceduna Plan Amendment Report currently out for public comments provides for an Aquaculture Park to consolidate land based aquaculture activity in Smoky Bay.

7.2 Environmental quality

The ability to culture high quality, healthy aquaculture products, which are safe for human consumption and suitable for market requirements needs the best marine environmental conditions available. Substandard environmental conditions will impact the economics of a business through higher mortality rates, slower growth rates and more disease prone stock.

Substandard water quality may result from poor site selection either in terms of the species and technology requirements or in areas where outside factors may have an impact on production.

Suitable aquaculture sites may be impacted by terrestrial pollution and nutrient input through poor land management practices leading to urban or agricultural runoff entering the marine environment. With increasing levels of coastal development, this is a significant risk to the aquaculture industry.

The *Natural Resource Management Act 2004* will play an overarching role in coordinating regional natural resource management (NRM) issues. These will be coordinated through the State NRM Council, and will be implemented by the regional NRM Groups. The *Natural Resource Management Act 2004* has jurisdiction including coastal waters of the State, and will address potential interactions of terrestrial resource management and marine resource issues.

7.3 Commercial and recreational fishing

At the time this report was prepared, aquaculture use at Cape D'Estrees consisted of sixteen hectares (16 ha) of subtidal farming of abalone.

The Policy proposes limited expansion of non-filter feeding subtidal aquaculture. The Policy will create three zones, each permitting up to 60 hectares of development. The maximum farming area, therefore, will be 180 hectares for subtidal non-filter feeding mollusc farms. The total area covered

by this zone policy is 1,270 hectares and 14% of this area will be available for allocation to aquaculture development.

7.3.1 Commercial fishing

The abalone fisheries in this area are minor. The area proposed occupies less than 1% of abalone fishing block 3A. This block contributed 0.1% of the Western zone greenlip catch and 0.8% of the Western zone blacklip catch (Edyvane 1999). It is also unlikely that farms will be located over the hard substrates that are required for abalone, further decreasing the likelihood of interaction between the proposed farms and abalone fishing.

Southern rock lobster catch in this area is also small. The area in question forms part of rock lobster fishing block 10. In 1996/97 0.24% of the Southern rock lobster take was caught from this block. As mentioned above, it is also unlikely that farms will be located over hard substrates, so interactions between the potential farms and rock lobster fishing are likely to be minimal.

There is no prawn fishing undertaken in the area in question, so this impact statement, therefore, will concentrate on the marine scale and recreational fisheries.

Marine scale fishery

Seven hundred and twenty licence holders have access to the marine scalefish fishery. The sector has access to twenty nine species or groups of related teleosts, four types of crustaceans, seven types of mollusc, polychaete annelids and all species of elasmobranchs except great white sharks. Scalefish are taken predominantly by nets, longlines and lines. The total annual commercial catch of fish in the marine scalefish fishery is approximately five thousand (5,000) tonnes. Access to the commercial marine scalefish fishery is limited to holders of a Marine Scalefish Fishery Licence. Other management restrictions include closed seasons and size limits. In addition, rock lobster licence holders also have access to harvest marine scalefish stocks.

Fishing activity in the Cape D'Estrees area includes longline fishing for snapper and whaler sharks and line and net fishing for King George whiting, snapper and squid. Blue crabs and sand crabs are taken using various types of pots. Marine scalefishers may also take five gummy or school sharks per trip in this area. Due to the size of Marine Scalefish Block 9, which includes Cape D'Estrees, information about the specific fishing use of the proposed zone area is not available.

Area-specific impact

The region around St. Peter Island and Tourville, Smoky and Denial Bays provides relatively small proportion of the marine scalefish catch. Approximately 0.73% of South Australia's total scalefish catch came from this region during 1996/97. King George whiting, calamari and snapper dominating catches.

Most fishing for marine scalefish will be largely unaffected by the proposed changes in aquaculture activities. Longline or line fisheries may be affected, but this impact can be assessed only on a case-by-case basis. Commercial and recreational snapper fishers are particularly secretive about the location of snapper 'drops'. Commercial and recreational snapper fishers, however,

actively fish the areas around the edges of the aquaculture leases in other parts of South Australia (fishSA.com, 2004). It is possible that the structures associated with aquaculture provide artificial habitat for fish that are targeted commercially and by recreational anglers.

7.3.2 Recreational fishing

Participation in recreational fisheries in South Australia is not controlled and approximately 24% of South Australia's population over 5 years of age and around 29% of households participated in recreational fishing at least once a year (Henry and Lyle 2003). Take by recreational fishers in South Australia is managed through controls on devices used, size limits, bag and boat limits, closed seasons and closed areas, including aquatic reserves. Recreational fishing around Cape D'Estrees centres on line fishing for King George whiting, Australian salmon, snapper, tommy ruff and southern calamari.

Area-specific fishing impact

Recreational fishing around Cape D'Estrees includes shore fishing (although recent changes in accessibility have affected the shore-based fishing), which will not be affected by the proposed developments. Boat fishing occurs in the areas around the edges of the current aquaculture leases at Cape D'Estrees (Perry Will, Ceduna Boat Charter, personal communication). Fishing effort is concentrated around other aquaculture sites in South Australia, e.g. near Whyalla (fishSA.com, 2004). At present, no research has been conducted to determine whether subtidal abalone farms have an impact on fish stocks. Potential impacts from subtidal aquaculture on fish are through loss of feed resources or physical displacement. Most research has concentrated on the aggregative effects of finfish farming. Recent research examining the effects of a kingfish farm on fish populations, found no difference in fish numbers between farm and control (representative non-farmed) sites. It is therefore considered unlikely that the presence of an abalone farm will have a measurable impact on nearby fish stocks.

Areas of significance to the local community are included in the exclusion zone, together with a buffer exclusion zone around the Laura Bay Conservation Park. These areas will not be subject to any aquaculture development. The location of individual farming areas in new zones will take into account the activities of commercial and recreational fishers.

Subtidal aquaculture developments may affect recreational or commercial fishers. The current level of spatial data on the marine scalefish fishery, does not allow resolution of patterns of catch within fishing blocks. Potential impacts can be assessed only on a case-by-case basis as the impact is highly dependent on the location of individual farms. Issues of use relating to specific developments will be assessed and considered during the licensing process.

7.4 Navigation

The Cape D'Estrees area is used heavily for recreational and commercial navigation. Cape D'Estrees is situated 20 kilometres east of Ceduna and the Thevenard Port, which is the only major port facility located on the far west coast. There are several minor recreational and commercial fishing jetties in

the region with the closest to Cape D'Estrees being a recreational jetty at Smoky Bay approximately 10 kilometres to the southeast.

Aquaculture should be located to minimise impacts on navigational safety. Aquaculture sites must be marked for marine safety and navigation in accordance with the requirements of the Department of Transport, Energy and Infrastructure.

There is one shipwreck in Laura Bay. It is protected from potential impacts from development by being enclosed in the Aquaculture Exclusion Zone. There are also known to be unlocated shipwrecks in the vicinity of Cape D'Estrees. Developers should consult with a Maritime Heritage Officer from the Heritage Branch of the Department for Environment and Heritage to identify possible shipwreck locations before submitting an aquaculture application.

The aquaculture developer needs to be aware that there is legislation that protects shipwrecks and that it is an offence to interfere with, disturb, damage, or dispose of an historic shipwreck or relic, punishable on conviction of a fine of up to \$50 000 or 5 years imprisonment.

Aquaculture developers are advised that a 550 metre radius buffer zone applies around the historic shipwreck, and that no aquaculture development should take place within this area, under the *Development Act 1993*.

7.5 Tourism

There are opportunities for positive synergies between aquaculture and tourism. Tourism activities associated with the aquaculture sector, such as recreational fishing and farm tours, provide an additional source of income and employment for regional economies with a well developed aquaculture sector. Good planning will reduce the negative conflicts between aquaculture and tourism.

Tourism in the Eyre Peninsula Region generated in excess of \$200 million of local revenue from over 400,000 visitors in 2002 (SATC 2003). Major tourism events in the area include the Streaky Bay Snapper Fishing Competition and the Ceduna Oyster Fest. Tourism therefore provides a significant opportunity for broadening the economic base (District Council of Streaky Bay 2004). Coastal locations are important for satisfying visitors' demand for escape, relaxation, recreation, ecotourism and adventure.

South Australia's Seafood and Aquaculture Trail is a self-drive trail that promotes aquaculture related tourism products in the region. There are sixteen tours available on Eyre Peninsula between Whyalla and Ceduna.

7.6 Indigenous heritage

PIRSA Aquaculture recognises the Far West people are the traditional owners of the land in the region. Fourteen indigenous heritage sites are located west of Cape D'Estrees in the Bosanquet and Decres Bay region. Four heritage sites are located to the west in Laura Bay. This area is within the Laura Bay Aquaculture Exclusions Zone and will not be impacted by aquaculture development. In the Cape D'Estrees area there are two Native Title Claims, which may affect subtidal waters, being made in the area, the Far West Claim

and Wirangu No 2 Claim. There are no indigenous land use agreements in this area at this time.

7.7 Reserves and conservation areas

There are no marine reserves or marine parks in this area (Figure 5). The Eyre and St. Peter Island is part of the Nuyts Archipelago Conservation Park, which is on the Register of the National Estate. They are both relatively undisturbed and contains mangroves and samphire flats.

The Great Australian Bight Marine Park declared under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* is 250 kilometres to the west and is unaffected by the Policy.

7.8 Sensitive Habitats

The area considered for zoning included sensitive habitats that have been avoided in the placement of the final zone boundaries. The eastern boundary of the investigation area was found to have *Posidonia* and the southern boundary has important invertebrate assemblages. The remaining area was found to have invertebrate and algae assemblages that would be sensitive to some types of aquaculture, such as finfish farming. The area contained in the Aquaculture Zones has a benthic habitat which is predominantly invertebrate assemblage over rocky substrate, and invertebrate assemblage on sandy substrate, and hence much less likely to be adversely affected by any aquaculture operations.

7.9 Protected species

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* addresses the protection of matters of national environmental significance. A search was conducted of the web site to obtain a list of the protected and threatened species that are considered to potentially occur in the region. This data is derived primarily from general distribution maps, and thus it is likely that at least some of the species listed will not occur.

Listed species fall into the following five groups:

- Seabirds, which may be adversely affected by activity around any feeding, roosting or nesting sites in the area.
- Great white shark, which some fear may become entangled in mooring lines from subtidal mollusc culture units although this has never been reported.
- Marine mammals, including Australian Sea Lions, Blue Whale, Southern Right Whale and the Humpback Whale, which would have the potential to become entangled in nets or mooring lines. There have not been any reported entanglements of these species in shellfish culture systems in this State.
- Sygnathid fishes, many of which are likely to be present, especially in the seagrass, algal and reef assemblages. It is known that at least some seahorses are abundant around finfish cages, using them as an alternative habitat to seagrass beds and algal assemblages. Thus it is likely that these species will not be adversely affected.

- A number of terrestrial species may be affected by land based access to aquaculture sites, however, it should be noted that any coastal development or user of the coastal environment could have this same potential for impact. Aquaculture, by definition, is no more or less likely to have these impacts and applications for land based facilities undergo a complex ESD assessment that includes consideration of coastal protection.

Data was obtained from the *Environment Conservation and Biodiversity Conservation Act 1999*, online database (www.ea.gov.au/epbc) on the 6th October 2005 using an area search with a 1 km buffer around the zones.

The management of aquaculture in South Australia is designed to minimise any potential for impact on the above listed protected species. Aquaculture operators are bound by all environmental legislation including the *Coastal Protections Act*, *Environment Protection Act*, the Water Quality Policy and other environmental plans and policies. The outcomes from the Aquaculture Advisory Committee subcommittee, the Marine Mammal-Marine Protected Areas Aquaculture Working Group, found that Australian Sea Lions face a very low risk of entanglement or entrapment with mollusc aquaculture structures.

Reporting of adverse interactions with wildlife is covered by *Aquaculture Regulations 2005*, which also requires that licence holders must submit a Seabirds and Large Marine Vertebrates Interaction Avoidance Strategy for approval by the Minister.

7.10 Fisheries nursery and juvenile habitats

Concerns have been raised that aquaculture could affect commercially important fisheries (such as marine scalefish or prawns) either through direct impacts on the fishing grounds or indirect impacts on the fish population. It is argued that impacts on the fish population could result from effects on the habitat or food source of any life stage of the fish. The common species of commercial concern in this area are prawns and King George Whiting. Research on adult fish assemblages in Fitzgerald Bay by Williams (2004) has suggested that fish farm structures had no detectable impact on the demersal fish assemblages.

The early life stages of fish and prawns involve larval stages where the prawns and fish live in the water column feeding on plankton. Larval prawns are filter feeders, feeding on organic detritus and plankton, for up to a month (Carrick *et al.* 2005). The food resources are naturally renewed and cultured filter feeding organisms such as oysters might be seen to compete for the limited food supply.

For prawns, these early life stages have a very low survival rate, with less than 1% surviving to two years (Tanner 2001). For aquaculture to have an effect on prawn populations, there would have to be an effect over and above the greater than 99% natural mortality. This is extremely unlikely due to distance separation and segregation of trophic competition such that nutrient sources for the juvenile fisheries tend to be geographically distinct from aquaculture areas.

Juvenile fish and prawns often spend part of their life cycle in inshore habitats including seagrasses and mangroves (Bryars 2004). Prawns for example may spend a year or more in the vicinity of seagrass habitat in their juvenile phase. However, they are generally found closer to mangroves (Skilleter 2005). Aquaculture sites in the area are sited to avoid these sensitive areas.

Impacts of aquaculture are further limited by the limited scale of aquaculture compared to the available feeding habitat for these species. The Policy has a maximum aquaculture allocation of 180 hectares.

To prevent the potential for adverse impacts, allocation of aquaculture for filter feeding organisms is done conservatively. In this case to prevent impact on other filter feeding aquaculture, such as the surrounding oyster growing areas and because of the issue of sediment resuspension, this Zone Policy will only allow development of non-filter feeding organisms, such as abalone.

8 Aquaculture Zones

Development at Cape D'Estrees has been restricted by the presence of seagrass in the area, the adjacent conservation areas, navigational channels in the area and, to a certain degree, its remoteness.

The seagrass *Posidonia* dominates the waters adjacent Cape D'Estrees at depths down to approximately five metres. The zones have been located in depths of water greater than five metres and this will avoid the seagrass communities.

The potential for aquaculture development in Cape D'Estrees area is limited by the amount of area physically suitable to the species and technology being used. The area is too shallow for finfish farms. The area is also unsuitable for filter feeders as the sediments are too easily disturbed. The non-filter feeding organisms cultured in this area will have to be able to withstand periodic suspension of the sediments.

The Aquaculture (Zone - Cape D'Estrees) Policy affects the waters immediately adjacent to Cape D'Estrees. Cape D'Estrees is located approximately half way between Ceduna and Smoky Bay on the far west coast of South Australia (Figure 1). At the time this report was prepared, aquaculture use at Cape D'Estrees consisted of sixteen hectares (16 ha) of subtidal farming of abalone. The maximum aquaculture area will be 180 hectares for subtidal non-filter feeding mollusc aquaculture. The total area covered by this zone policy is 1,270 hectares and 14% of this area will be available for allocation.



Figure 4: Cape D'Estrees depth analysis

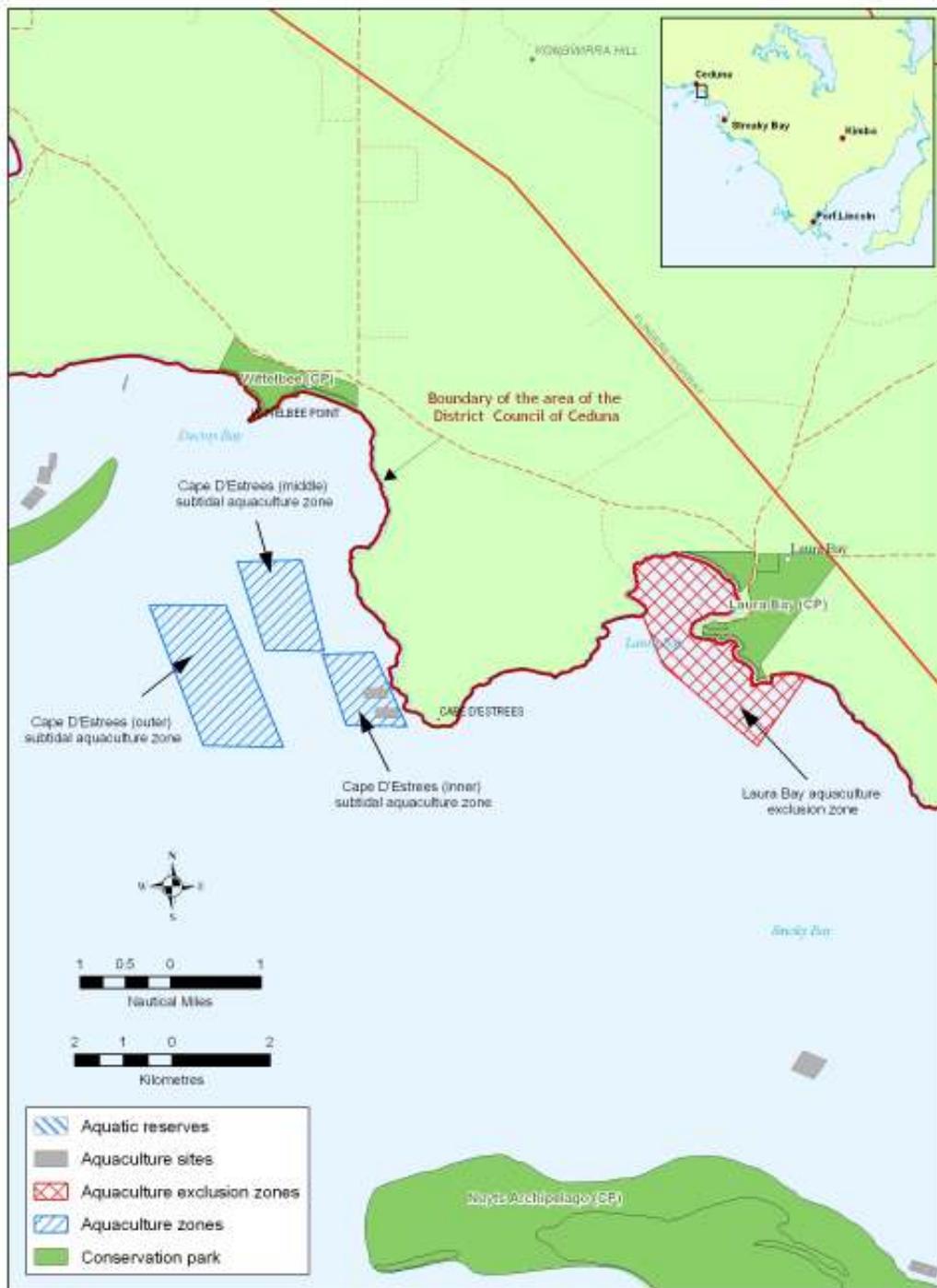


Figure 5: Cape D'Estrees conservation areas

Cape D'Estrees Zones

The Zone Policy establishes the following zones:

- Cape D'Estrees (Inner) Subtidal Aquaculture Zone,
- Cape D'Estrees (Middle) Subtidal Aquaculture Zone,
- Cape D'Estrees (Outer) Subtidal Aquaculture Zone, and
- Laura Bay Aquaculture Exclusion Zone.

Approval of leases and licences in these zones will be subject to requirements under the *Aquaculture Act 2001*; assessment of individual site suitability, criteria outlined in the Aquaculture Tenure Allocation Policy, ongoing environmental monitoring and other relevant plans and policies.

8.1.1 Cape D'Estrees (Inner) Subtidal Aquaculture Zone

The Cape D'Estrees (Inner) Subtidal Aquaculture Zone provides for the development of 60 hectares of subtidal non-filter feeding mollusc aquaculture and associated activities, such as the culture of algae. At the time this report was prepared 16 hectares was allocated. The seagrass *Posidonia* dominates the waters adjacent Cape D'Estrees at depths down to approximately five metres, however, this zone has been located to avoid seagrass communities.

8.1.2 Cape D'Estrees (Middle) Subtidal Aquaculture Zone

The Cape D'Estrees (Middle) Subtidal Aquaculture Zone provides for the development of 60 hectares of subtidal non-filter feeding mollusc aquaculture and associated activities such as the culture of algae. The substrate ranges from rocky bottom to bare sand. Rocky substrates are characterised by diverse invertebrate and algae communities. This zone has been located to avoid rocky substrates.

8.1.3 Cape D'Estrees (Outer) Subtidal Aquaculture Zone

The Cape D'Estrees (Outer) Subtidal Aquaculture Zone provides for the future development of 60 hectares of subtidal non-filter feeding mollusc aquaculture and associated activities such as the culture of algae. The substrate underlying this zone is likely to be largely bare sand (Edyvane 1999).

8.1.4 Laura Bay Aquaculture Exclusion Zone

The Laura Bay Aquaculture Exclusion Zone covers 535 hectares and establishes a buffer between aquaculture development and areas of high conservation significance. Laura Bay Conservation Park has been proclaimed to conserve remnant mallee vegetation and coastal associations. The policy establishes a one kilometre buffer between aquaculture development and the boundary of the Laura Bay Conservation Park and sensitive habitats in the Laura Bay region.

9 Triple Bottom Line Impact Assessment

Triple bottom line or sustainability reporting highlights the impact of this policy on the economic, social and environmental aspects of the community. This is important as the development of the aquaculture industry is a growing component of the State's economy, particularly regional development. The

State government and community will not support any policy that does not promote balanced ecologically sustainable development (ESD).

Sustainability reporting requires understanding all components of ESD. In the first instance this requires having indicators to represent the three components of ESD – economic, social and environmental factors.

There is an array of indicators in the literature (GRI 2002, DPC 2004) and over time more indicators will be developed. The State Strategic Plan has some 79 indicators, and this policy will assist in supporting the achievement of a number of these strategies (DPC 2004). However, not all the indicators in the literature are readily measurable, particularly at the small scale of this Policy. Over time our ability to report at these finer scales will improve. For the purpose of considering the impact of this policy on the community of Ceduna, some simple indicators have been developed.

9.1 Economic indicators

The aquaculture industry can have significant impact through direct economic effects. For the purposes of this report, the indicator being used is the farm gate value of the aquaculture industry in Cape D'Estrees Aquaculture Zones. In the future reporting under economic impacts could identify the value chain impacts and include the flow-on and value-added economic impacts.

The current allocation for aquaculture sites in Cape D'Estrees allows for a potential farm gate production of \$230,000.

9.2 Social indicators

Social indicators are the least researched factors of ESD. For this analysis direct full time equivalent jobs, household income and aquaculture resource dependency have been used. Development of future indicators may involve education levels, population impacts and other measures of social and community capital.

Current allocation in the Cape D'Estrees Aquaculture Zones creates jobs for one person. The current resource dependency on the aquaculture industry in Ceduna is 5.8% (% of people working who are employed in the aquaculture industry including those employed in flow-on and value added sectors).

9.3 Environmental indicators

There has been research into the environmental changes associated with subtidal mollusc farming, and some results derived from the annual environmental monitoring program required as part of the operators licence conditions. Based on the information received from the farmers there is negligible environmental change from subtidal mollusc farming. If this level of change was used as an indicator, reporting would remain consistently negligible. Future indicators may utilise environmental monitoring program indicators developed as the environmental monitoring programs are refined.

Given an already favourable environmental performance it was decided to utilise potential conservation indices, assuming that there is a general conservation benefit from non-development of an area. The first indicator examines the area of bay under development. The second examines the area precluded from development in Aquaculture Exclusion Zones.

9.4 Presenting the balanced ESD analysis

Balanced presentation of the indicators is difficult as the value of, or the relative impact on, an indicator is not necessarily equal for all indicators. However, understanding the direction the indicator moves and the reasons why is more important to developing smart policy. The indicators have been grouped and graphed in a spider graph (modified from R. Esvelt of PIRSA Scorecard Group). This allows visualisation of the relative impacts from a number of ESD components.

The spider graph (Figure 7) demonstrates which indicators are affected by this proposed policy. By measuring along the axes, the difference between the current and the future situation can be estimated. By presenting both the current and future situation concomitantly, it is possible to identify how the Policy will affect the community. The axes bear a logarithmic scale and are graphed as a percent change (100% represents no change to an indicator), less than 100% represents a negative change to the indicator and greater than 100% is a positive impact on the indicator.

9.5 Economic impact

The Cape D'Estrees aquaculture zones have the potential to cater for increased aquaculture production that will increase the economic impact in the area. The increased tonnages may produce a farm gate value of \$2.57 million (Figure 6). This is an increase of \$2.35 million, from the current production potential of \$230,000 (Table 4).

9.6 Social impact

The Cape D'Estrees aquaculture zones have the potential to increase the number of jobs and the household income in the area (Table 4). The District Council of Ceduna has had an overall population increase of 133 persons in the 10 year period between 1991 and 2001. The sub period of 1991 to 1996 actually experienced a population decline of 5 persons, with a significant turnaround and population increase of 138 persons between 1996 and 2001. However, the additional employment is unlikely to have consequences for population growth in Ceduna. This is due to the low resource dependency on aquaculture. The aquaculture resource dependency will increase slightly from 5.8% to 6.5% as a result of the Policy.

9.7 Environmental impact

The Laura Bay Exclusion Zone Policy outlines a significant gain in the conservation indicator, from zero to 535 hectares. The other conservation protection indicator, the area available for development of aquaculture, displays an increase by 146 hectares from 16 hectares to 180 hectares.

It is important to appreciate the increase in production is commensurate with the number of jobs created, the proposed economic impact and the area under development and that environmental monitoring indicates minimal environmental impact. This suggests that the policy is being proposed in a manner that does balance the three ESD components, and that with the introduction of the Exclusion Zone, there are significant environmental positives in this policy.

9.8 Triple Bottom Line Summary

The spider graph demonstrates the large positive impacts on the ecologically sustainable development through increased economic impacts, jobs, household income and conservation areas. There is a small loss on the environmental indicator, representing a loss of 146 hectares to other marine resource users to allow the aquaculture development to occur.

Table 2: Cape D'Estrees Policy Triple Bottom Line Analysis

Economic impact	Current	New	Total
Farm gate value (\$m)	0.23	2.35	2.58
Social			
Jobs (Direct)	1	11	12
Household Income (\$m)	0.06	1.36	1.42
Resource dependency on aquaculture	5.8	0.70	6.5
Environmental			
Exclusion Area (ha)	0	535	535
Aquaculture Area (ha)	16	164	180

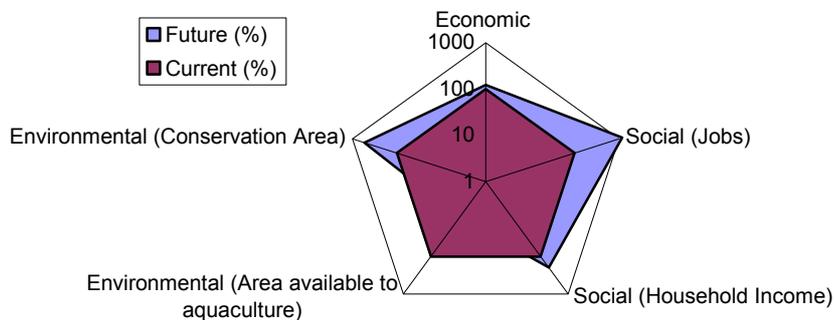


Figure 6: Triple Bottom Line Sustainability reporting

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