



**PRIMARY INDUSTRIES
AND RESOURCES SA**



SOUTH AUSTRALIAN FISHERIES MANAGEMENT SERIES

Ecological Assessment of the South Australian Beach-cast Seagrass and Marine Algae Fishery

*Assessment Report Prepared for Environment Australia, against the Guidelines For
The Ecologically Sustainable Management Of Fisheries*

*For the purposes of Part 13(A) of the Environment Protection and Biodiversity
Conservation Act 1999*

November 2003

Prepared by the Agriculture, Food and Fisheries Division of Primary Industries &
Resources, South Australia

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FOREWORD

The marine and freshwater fisheries resources of South Australia are community owned resources. The role of the Government, as custodian of these resources on behalf of the broader community and future generations, is to ensure that they are used in an ecologically sustainable and economically efficient manner, while at the same time maximising returns to the community.

Experience world-wide has demonstrated that where unrestricted use of marine and freshwater fisheries resources is allowed, there is little incentive for individuals harvesting the resource to conserve fish stocks. Left unmanaged, the increase in fishing effort that results from competition is reflected in lower individual catches in the recreational fishing sector, and over-capitalisation and reduced financial returns in the commercial fishing sector. Loss of these resources to the community can result in significant regional economic problems.

In managing fisheries resources, governments have the primary responsibility of ensuring long-term sustainability. Governments must also ensure that the basis for sharing fisheries resources among all users is clearly understood and accepted as equitable, and that the allocation of fisheries resources and their level of utilisation are consistent with the needs of present and future generations.

To assist decision-making by the Government in managing South Australia's fisheries resources, numerous fishery-specific stakeholder-based fishery management committees were established to provide expertise-based advice to the Minister for Agriculture, Food and Fisheries. These committees are comprised of Government managers, research scientists, commercial and recreational fishers, fish processors and members of the general community. An independent chairperson convenes meetings. Appointment of members and the terms of reference of the committees are embodied in the *Fisheries (Management Committees) Regulations 1995*.

Where there are considered to be threats of serious or irreversible damage to fisheries resources, and resource management decisions must be made in an environment of uncertainty, the Government, in partnership with the fisheries management committee, will take a precautionary approach to the management of South Australia's fisheries resources.

Paul Holloway
MINISTER FOR AGRICULTURE, FOOD AND FISHERIES
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/ /2003

PURPOSE OF REPORT

Primary Industries and Resources South Australia (PIRSA) Fisheries, in association with the South Australian Research and Development Institute (SARDI), have prepared this report.

The purpose of this report is to provide Environment Australia with comprehensive detail of the management arrangements for South Australian beach-cast seagrass and marine algae fisheries, against the '*Guidelines For The Ecologically Sustainable Management Of Fisheries*', set out in the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act).

It is intended that this report serve as the first step in the process to have beach-cast seagrass and marine algae taken from South Australian waters, placed on the list of exempt native species for export, under Part 13(A) of the EPBC Act, for the five year period from 1 January 2004 to 31 December 2008.

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A. INTRODUCTION

A.1. Description of the fishery

In South Australia (SA) the harvesting of beach-cast seagrass and marine algae is a relatively small, but growing, industry. Interest in harvesting has resulted from a rising market demand for seagrass and algal products both locally and internationally. The exploitation of a natural marine resource for financial gain is regarded as a commercial activity under the terms of the *Fisheries Act 1982* ('the Act'). Accordingly, the harvesting of seagrass or algal accumulations from any beach of the State is under the care, control and management of the Fisheries Group of Primary Industries and Resources South Australia (PIRSA).

For the purposes of this report, beach-cast seagrass and seaweed accumulations are referred to as 'wracks.' Wrack is drifting plant matter deposited onto beaches. Technically, wrack may consist of kelp or other detached macroalgae, seagrasses, animal carcasses and other organic matter deposited from the sea onto a beach by waves or winds (Fairweather and Henry 2003). Harvesting includes the removal, clearance, movement, re-location or disturbance of any part of a wrack. It is emphasised that the Plan covers only beach-cast material and does not refer to flora attached to a substrate or drifting in the water column, which is not available for harvesting.

Beach-cast accumulations (wracks) of decaying seagrass and marine algae are considered essential components of coastal ecosystems. They serve several important roles in the ecology of local coastal environments. Wracks contribute to the food web dynamics of beach and near-shore marine communities, including valuable fisheries, by supporting microbial and invertebrate fauna that are preyed upon by higher-level consumers and supplying nutrients that can be utilised by plant and animal communities. Wracks also offer habitat to many bird species, some of high conservation status. Wracks also provide protection to coastal dunes and other important coastal environments.

The collection of beach-cast seagrass and marine algae from South Australia has been carried out in accordance with the 'Management Plan for Harvesting Beach-cast Seagrass and Marine Algae' developed in August 2000.

Prior to May 2003, the beach-cast fishery was managed through the issue of Ministerial exemptions to a small number of operators in the southeast of the State, largely for the purposes of commercial market exploration and development. Three factors are now dictating the need for a formal, planned approach to the development of this fishery:

- The request for exemptions and licences to harvest and export beach wrack is rising.
- In the past, the process of obtaining permission to harvest wrack has often involved negotiation with several different government agencies having overlapping or conflicting jurisdictions. A more streamlined approach is required.
- It is a requirement of the *Environment Protection and Biodiversity Conservation Act 1999* that permits for the export of wild specimens of native flora can only be granted if harvesting activities are subject to management under State legislation.

The current Management Plan describes management and research arrangements that will ensure the long-term protection and sustainability of both the industry and the resource, in accordance with Section 20 of the *Fisheries Act 1982*.

A.2. History of the Fishery

Beach-cast wrack harvesting has been a sporadic activity for many decades in South Australia but the current fishery began developing early in 1990 when two exemptions were granted for commercial harvesting in the southeast of the State. Interest in both algal and seagrass wrack harvesting intensified in 1993, when a number of applications were received by PIRSA for additional operators in the southeast as well as in new areas such as Lady Bay and Port Parham. Over the years, a total of seven permits have been issued, mainly to operators in the southeast of the State, but a small amount of harvesting has occurred at Port Parham and Port Adelaide (North

Haven) as well. These permits were issued (i) for the purposes of market research and development, to identify potential markets for seagrass and algal products and determine if the industry could be viable and (ii) to allow certain seaside councils to improve local beach access and amenity. Currently, commercial wrack harvesting is a small-scale 'developmental fishery' with three licences recently issued to operators who may harvest seagrass and algal material at Kingston and Beachport in the States southeast. These licences are issued for harvest access to either seagrass or macro-algae, but not both on the same licence. Further exemptions are issued on an annual basis, mainly to councils to improve local beach access and amenity, with no guarantee of renewal from year to year.

In the absence of scientific data, and because of concerns regarding the possible impact on coastal fisheries and the environment from the regular or over-harvesting of wrack accumulations, PIRSA has always adopted a 'precautionary approach' to the harvesting of beach-cast wracks. As a result, the fishery has been managed conservatively and average annual harvests have not exceeded approximately 50 - 100 tonnes (t) of algae and 3,000 t of seagrass (and usually much less than this). However, an increase in requests for permission to harvest wracks at several new locations in SA have been received by PIRSA. There has also been pressure from some current harvesters for increased access.

A.2.1. Harvesting

Seagrass

Wrack harvesting currently takes place on beaches around the shoreline of Lacepede and Rivoli Bays (Figure 1), mainly along the Kingston and Beachport foreshores. Each licence holder is provided with access to a specified area of foreshore (usually only a few kilometres). However, within any area, harvesting generally takes place in a concentrated area (generally <1 kilometre) where the largest wrack accumulations occur. Licence conditions specify methods of access and harvesting and any relevant restrictions on harvesting activities considered necessary by PIRSA and are developed in consultation with other agencies such as Department for Environment and Heritage (DEH), Department for Industry and Trade (DIT) and the Department of State Aboriginal Affairs (DOSAA).

Harvesting is sporadic, being carried out opportunistically whenever significant quantities of wrack are deposited on the foreshore. As a result, the majority of harvesting takes place during winter and spring when peak accumulations occur. Beach-cast seagrass wracks are normally harvested using machinery such as bulldozers, front-end loaders and excavators, which load the material onto trucks for removal, offering an efficient alternative to hand harvesting. Whilst no limits apply to the type of machinery that may be used in harvesting the seagrass, the local councils may restrict vehicle access to the beach, hours of operation and access points. In addition, harvesters are not to remove sand from the harvest area, thus extensive use of machinery on small wrack accumulations is highly inefficient.

Macroalgae

Fresh specimens of macroalgae are collected by hand immediately after storms or periods of strong wind, prior to the onset of any degradation or burial by wind-blown sand, from beaches adjacent to offshore limestone reefs. The harvesting of macroalgae is species-specific; that is, the target species is selected specifically for its unique chemical properties. Individual plants are collected by hand, sometimes from amongst wracks of mixed algal composition, and loaded into vehicles for removal. Macroalgae may also be collected as a by-product of seagrass harvesting. It is unclear at this time as to whether any particular species plays a more important ecological role in beach-cast seagrass and macroalgae wrack. In the case of floating seagrass or macroalgae wrack, a specific species may play a greater ecological role. Therefore, harvesters are required to leave a certain amount of total beach-cast wrack but there is no requirement for this composition to be specified.

There is no estimate of the percentage of macroalgae that is usually harvested from a wrack but due to the very large size of such wrack accumulations and the high turn-over rate, it is expected that this percentage would be quite low.

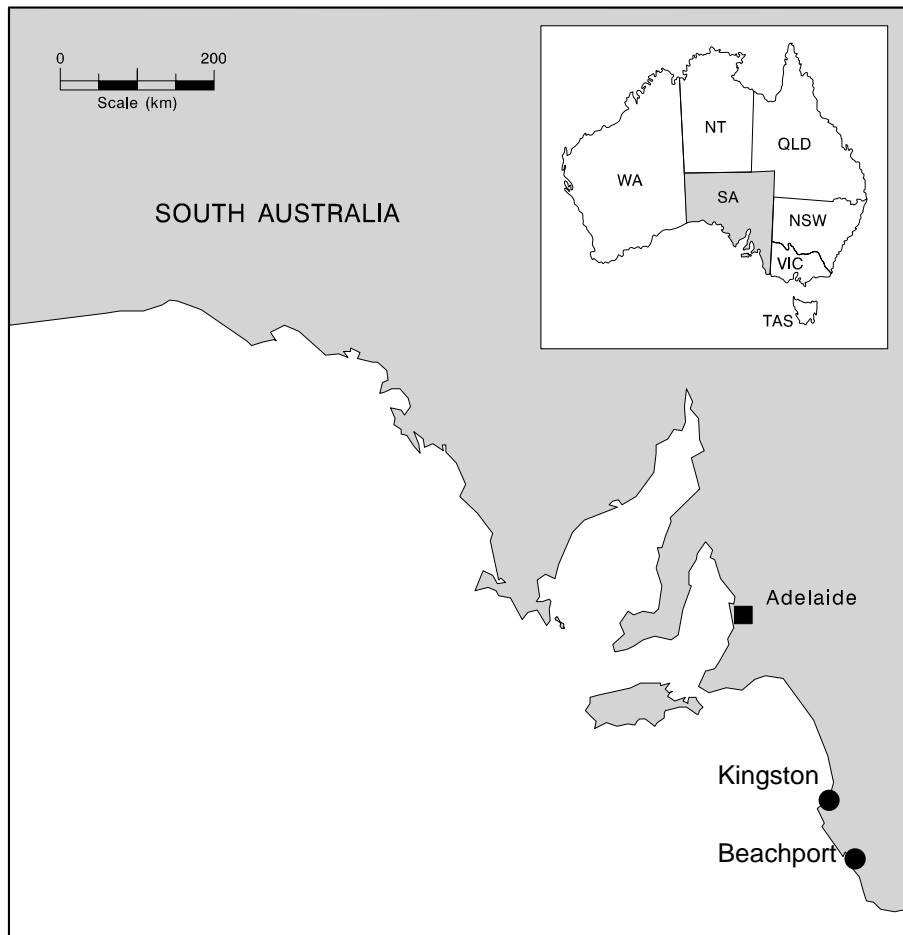


Figure 1: The main harvest areas for beach-cast seagrass and marine algae in South Australia

A.2.2. Utilisation

Beach-cast wrack harvesting has the potential to produce exportable, value-added primary products and thus improve local regional economies. Some of these products may eventually replace existing imported goods. Agencies such as the Southeast Employment Resource Development Enterprise have assisted in establishing certain businesses within the industry (under the New Enterprise Incentive Scheme) in recognition of their potential to contribute to the economic growth of the State and create more employment for the region. The South East Economic Development Board has also expressed support for individual industry operations, which are considered to be in line with its regional strategy for economic growth, export potential, capital investment and job creation.

Seagrass and marine algae are harvested for a variety of uses throughout Australia and overseas. Seagrass wrack is commonly stored in paddocks and allowed to decompose for several years before it is suitable for use as a soil improver or as garden mulch. Algae are processed immediately either via composting or by drying on outdoor racks and crushing. The principal use for algal derivatives is as a food product for abalone aquaculture feed, although they are also used in the production of alginate and agar, mineral supplements, cattle feed, garden fertilisers and pesticides. There is moderate demand for wrack material to supply the domestic market and a number of harvesters are developing products for overseas export. In addition, research is underway into alternative uses of wrack material.

A.2.3. The recreational catch

Access to the resource is to be maintained in accordance with the terms and conditions of the Management Plan for current industries that are dependent upon the harvest of beach-cast seagrass or macroalgae within current designated harvest areas at the time of implementation of this plan.

Members of the public often seek to obtain small amounts of beach-cast seagrass wrack in particular, for use as 'mulch' or fertiliser on domestic gardens. In some cases, local by-laws exist which prohibit this without Council permission. These requests have generally been granted, provided the material is harvested by hand and only small quantities are collected. In a few cases, where the Council believes it is detrimental to the shoreline, this activity is either discouraged or actively prohibited. The recreational harvest of seagrass or macroalgae from within commercial harvest areas is allowed but must be approved by the local Council due to beach access restrictions.

Decisions relating to recreational (non commercial) harvests of beach-cast wrack are the responsibility of the relevant Local Government Authority, where enabled through regulation. Such harvest is to remain small-scale and a strictly non-commercial activity. Coastal Councils seeking to authorise recreational collection must provide PIRSA with a policy on recreational collection for approval. There is currently no estimate of product taken recreationally but this is considered to be a very small amount.

Subject to consultation with PIRSA, Department for Environment and Heritage (DEH) and Department of Transport (DoT), permission by way of an exemption may be granted to coastal Councils for the removal of permanent accumulations of seagrass wrack at locations where Councils can provide appropriate justification (public swimming beaches, boat ramps, recreation areas) for the removal of persistent wrack deposits to improve public amenity values whilst maintaining stability of the beach and dune system.

Wracks that are removed for public amenity purposes are small amounts and are only harvested periodically. In some cases, the wrack accumulations removed are supplied to commercial harvesters for processing. In the case of public amenity harvest, all wrack accumulation is permitted to be harvested, providing that no sand is removed and no harvesting takes place within 4 metres of the toe of the foredune or below the low water level.

A.2.4. Illegal catch

The illegal harvest of beach-cast seagrass and marine algae wrack is not considered to be an issue. South Australia has significant fisheries compliance resources to combat illegal activities. To date there have been no offences within the fishery.

A.3. Biological characteristics

A.3.1. Seagrass

Seagrasses are underwater flowering plants that evolved from land plants around 100 million years ago. There are about 30 different seagrass species from 12 genera in Australia. Seagrasses grow on sandy to muddy substrates, from the intertidal zone to a depth of approximately 40 metres. They are anchored to the substrate by a network of fibrous underground stems or rhizomes. Their distribution is dependent upon temperature and exposure to wave action but, most importantly, upon light. The depth distribution of seagrasses is therefore influenced by water clarity, as this controls light penetration.

In South Australia, seagrass meadows cover approximately 5000 km² of sea floor (Shepherd & Robertson 1989). Combined with meadows in Western Australia and Bass Strait, this constitutes one of the largest temperate seagrass ecosystems in the world (Shepherd & Robertson 1989). Most of these meadows are comprised of *Posidonia* spp. occupying the clear, sheltered waters of Spencer Gulf and Gulf St Vincent (Figure 1). Other major areas of seagrass distribution include the shallow embayments on the western coast of Eyre Peninsula (e.g. Streaky Bay), Lacedpede Bay in

the southeast of the State and areas of Backstairs Passage, wherever suitable substrate occurs (Figure 1).

The main seagrass species occurring in South Australia are: *Posidonia angustifolia*, *Posidonia australis*, *Posidonia coriacea*, *Posidonia denhartogii*, *Posidonia sinuosa*, *Amphibolis antarctica*, *Amphibolis griffithii*, *Heterozostera tasmanica*, *Halophila australis* and *Zostera muelleri* (Larkum & den Hartog 1989). In low-energy environments such as the two gulfs and Lacedpede Bay, the meadow-forming species *P. angustifolia*, *P. sinuosa*, and *P. australis* are most abundant. *Posidonia* generally requires stable, non-mobile sediments on which to grow and establish dense meadows. *P. coriacea* and *P. denhartogii* generally only occur as small stands or as fringe communities. The four other species, (*A. antarctica*, *A. griffithii*, *H. tasmanica* and *H. australis*) occur either as fringe communities on the edges of blowouts¹ in *Posidonia* meadows, as thin, dispersed populations on mobile sediments or in stands of mixed species composition (Shepherd & Robertson 1989).

Seagrass plants generally shed their leaves annually in early autumn; the blades are initially buoyant, then sink and accumulate in drifts on the seabed. Nutrient levels in the surrounding waters have been shown to play a role in leaf shedding as well. During periods of strong wind and wave activity, particularly in the winter months, surge and swell resuspends and mobilises the detached leaf blades. Persistent onshore winds blow this drift-cast material into the surf zone and at high tide it is washed onto the beach in clumps. Greater than 95% of the beach-cast seagrass in South Australia consists of the blades of *Posidonia* spp. (Management Plan 2000).

The amount, location and timing of wrack deposition depend on the density and areal extent of offshore seagrass meadows as well as on local tidal, current, wind and storm activity. Wrack remains on the shore for variable lengths of time - in some cases only one tidal cycle - or may become stranded above the high water mark and accumulate over weeks or months forming large semi-permanent deposits. Often, beach-cast material is washed back into the surf zone and re-deposited several times resulting in significant longshore movement of wrack. Consequently, large variations in wrack deposits occur from one location to another and on a monthly, weekly or daily basis. Persistent accumulations are often associated with man-made structures such as groynes, breakwaters and jetties. At Kingston for example, there is a large, permanent accumulation of seagrass wrack approximately 2-3 metres deep covering the beach between the southern groyne of the Maria Creek outlet and the town jetty. This accumulation is not harvested.

A.3.2. Macroalgae

The marine macroalgal diversity of temperate Australia is one of the richest in the world, with approximately 123 species of Chlorophyta (green algae), 203 species of Phaeophyta (brown algae) and about 800 species of Rhodophyta (red algae) recorded within southern Australian waters (Womersley 1984). Many of these macroalgal species are endemic to the region. Robe (in the southeast of SA) is regarded as the westerly limit of a number of key taxa including the large kelp (*Macrocystis angustifolia*) and the bull kelp (*Durvillaea potatorum*). South Australia's macroalgal flora is also characterised by a small number of subtropical species, which generally occur in sheltered waters and inlets where temperatures are high enough for the species to survive.

Macroalgae grow on shallow rocky substrates and are common on the numerous inshore limestone reefs that dot the coastline of South Australia. Some species, particularly the kelps, grow to very large size and form dense subtidal beds. During storms and periods of strong winds, large numbers of these macroalgae are uprooted or fragmented by wave action and swell and later washed up on nearby beaches. The supply of cast algae, like seagrass, is highly variable over short time and space scales, but is again most predominant in winter when very large accumulations may occur. Various seaweed species are found within algal beach wracks; their abundance varies depending on location and the source of the material. The species that are targeted by the fishery are primarily several large brown algae (e.g. *Durvillaea potatorum* and *Ecklonia radiata*) and some of the red algae such as *Gracilaria*.

¹ Saucer- or trough-shaped depressions of bare, unvegetated sand in the midst of seagrass meadows (Clarke & Kirkman 1989).

A.3.3. Nutrient Cycling and Food Webs

Several studies, most notably in Western Australia (WA) and South Africa, have highlighted the importance of beach-cast seagrass and macroalgal accumulations as sources of detritus and of particulate and dissolved nutrients which form the basis of beach and inshore marine foodwebs (e.g. Griffiths & Stenton-Dozey 1981; Koop & Griffiths 1982; Lenanton *et al.* 1982; Robertson & Hansen 1982; Griffiths *et al.* 1983). Wracks of dead seagrass and algal material are physically broken down by wave and sand abrasion and are biologically decomposed by the action of bacteria and small invertebrates. Decomposition by bacteria releases nitrogen and phosphorous - nutrients necessary for the growth of offshore seagrass meadows (Bell 1983). In WA, substantially higher concentrations of dissolved nutrients were measured in waters adjacent to beaches covered in decaying wrack material compared with wrack-free beaches, where waters were relatively nutrient-deficient (Bell 1983).

A rich community of detritivores², such as amphipods, isopods (sandflies), coleoptera (beetles) and diptera (flies) rapidly colonises and consumes the decaying vegetation, breaking it down into detritus and particulate carbon (e.g. Griffiths & Stenton-Dozey 1981; Marsden 1991). Griffiths, Stenton-Dozey & Koop (1983) for example recorded 35 species (of which 22 were insects) amongst kelp wrack, which together amounted to more than 97% of the total intertidal faunal biomass. These organisms can reduce the biomass of dead macroalgae to 50% of its initial weight after 2 days and 20% after 14 days, mainly due to consumption by amphipods and dipteran (kelp fly) larvae (Griffiths & Stenton-Dozey 1981; Rieper-Kirchner 1990). Several species of beach flies complete their life cycles within seagrass/algal wrack (Blanche 1992 in Kendrick *et al.* 1995). The herbivorous detritivores are in turn preyed upon by beach-dwelling macrofauna such as beetles, birds and isopods. Griffiths *et al.* (1983) suggest that at some sites on the southwest coast of South Africa, approximately 95% of the food supply of beach macrofauna comes from the regular, enormous influxes of kelp.

Particulate and dissolved carbon and other organic matter released from wracks by bacteria may either remain *in situ* and enter the sand column as a source of nutrients to interstitial fauna, or be leached back into the sea at high tide to support detrital-based benthic communities. Very high concentrations of dissolved organic matter have been recorded in sand below beach-cast kelp and this in turn supports a high biomass of interstitial meiofauna (Koop & Griffiths 1982; Rieper-Kirchner 1990). Peak numbers of nematodes and oligochaetes, for example, often occur beneath rotting seaweed (Koop & Griffiths 1982).

Moreover, nutrients, detritus, particulate carbon, bacteria and prey organisms in wracks are often transported by wave action into the surf zone where they serve as an important food source for particulate suspension (filter) feeders, crustaceans, molluscs and fish (Kirkman & Kendrick 1997). For example, work by Lenanton *et al.* (1982) demonstrated that the main prey item of the juveniles of many important commercial fish species such as school whiting (*Sillago bassensis*), yellow-eyed mullet (*Aldrichetta forsteri*) and tommy ruff (*Arripis georgianus*) is the amphipod *Allorchestes compressa* which lives exclusively on detached macrophytes on the beach and in the surf zone.

Detritus from wracks can also be exported offshore to supply food to demersal and abyssal fauna (Suchanek *et al.* 1985 in Thresher *et al.* 1992; Joselyn *et al.* 1983 in Kendrick *et al.* 1995). In addition, recent work in Tasmania (Thresher *et al.* 1992) strongly suggests that "it might also constitute a widespread and potentially important source of productivity for planktonic ecosystems as well". These authors found evidence that the food chain supporting first-feeding larvae of Tasmanian blue grenadier (*Macruronus novaezelandiae*) - the dominant nektonic (midwater) predator of the region - is based on microbial decomposition of seagrass detritus. First, feeding is often maintained to be a critical period for fish larval survival. Moreover, higher rates of larval growth were associated with periods of frequent winter storms, when offshore transport of seagrass detritus from coastal wrack accumulations is at a maximum (Thresher *et al.* 1992). Thus, the export of detrital material from wracks may significantly affect the reproductive success of one of temperate Australia's dominant fish predators (Thresher *et al.* 1992).

The wrack community therefore constitutes a significant food resource consisting of fragments of seaweed and seagrasses, bacteria, meiofauna and beach macrofauna. It may remain *in situ*, providing food for terrestrial detritivores and consumers (including insects and birds) or it may be

² Animals that feed on dead organic matter

washed back into the sea during storm or high tide events, where it provides food for benthic coastal communities and important feeding sites for shallow water fish species. Particulate matter from the breakdown of wracks also appears to have a direct effect on offshore secondary production.

A.3.4. Birds

Many shorebirds and seabirds are associated with wrack accumulations. These birds make use of the beach-cast vegetation for a variety of purposes including feeding, nesting, shelter during strong winds or storms and camouflage while resting. Wrack-inhabiting organisms are preyed upon by a large number of shorebirds and constitute an important food resource for species such as the vulnerable hooded plover, which feeds on crustaceans, insects and polychaetes (Kendrick *et al.* 1995). In WA, decomposing wrack provides an important winter food source for silver gulls, which feed on kelp fly larvae and amphipods and may time their breeding cycle to coincide with the local availability of wrack (Kendrick *et al.* 1995). On King Island, ruddy turnstones and double-banded plovers are amongst the birds that forage in the bull kelp for small invertebrates. These species have all been recorded feeding in beach-cast vegetation in South Australia.

Wrack accumulations also provide habitat and nursery areas for many birds species. They provide protection and camouflage for nest-sites, eggs, chicks and adults alike (McCulloch 1996).

In South Australia, a total of 40 species of birds have been recorded utilising beach-cast wrack in some way (McCulloch 1996). This includes long-distance migratory birds, waiting out the tide or bad weather in the lee of wrack accumulations, as well as many resident species. Wrack thus constitutes a valuable component of bird habitat (McCulloch 1996).

The orange-bellied parrot migrates from breeding grounds in Tasmania to coastal areas in Victoria and south east South Australia for each summer period. It usually frequents the dune and beach system feeding on the vegetation along the coast. This bird is classified as Nationally Endangered and is subject to a Recovery Plan jointly managed by the Commonwealth, Victoria, South Australia and Tasmania.

A.3.5. Coastal Geomorphology

In contrast to macroalgae, which are subject to very rapid deterioration, seagrasses are composed primarily of cellulose fibre with characteristics that inhibit breakdown of the vegetative matter. Beach-cast seagrass accumulations are therefore typically long-lived, taking as many as 3 - 5 years to fully decompose into detrital matter. As a result, seagrass wrack may accumulate to a height of several metres and serve as a physical barrier between the sea and the dune system, reducing wave energy and providing a degree of protection to the foreshore.

Seagrass wracks also enhance the formation and stabilisation of coastal sand dunes and beaches, their fibrous composition acting as a trap to bind drifting sands and reduce sand erosion in winter. They may also contribute to the fertility and stability of substrates behind the foredunes.

A.4. Management of the Fishery

A.4.1. Scope of the management plan

The *Fisheries Act 1982* provides the broad statutory framework to ensure the management and ecologically sustainable development of South Australia's marine and freshwater fisheries resources.

South Australia has management jurisdiction for beach-cast seagrass and marine algae from the toe of the fore-dune to the low water mark and for seagrass and marine algae out to 200 nautical miles, in the waters adjacent to South Australia, under an Offshore Constitutional Agreement between the South Australian and Commonwealth governments. The regulations that govern the management of the South Australian beach-cast seagrass and marine algae fisheries are established in the *Scheme of Management (Miscellaneous Fisheries) Regulations 1991*. A Management Plan covers commercial, recreational, traditional and illegal fishing activity for beach-

cast seagrass and marine algae undertaken within South Australian waters and provide a statement of the broad policy framework and harvest strategy employed to ensure the ecologically sustainable management of the fishery.

The Beach-Cast Seagrass and Marine Algae Management Plan (2000) does not form part of the *Scheme of Management (Miscellaneous Fisheries) Regulations 1991* and does not have any statutory basis. Responsibility for the preparation of management plans rests with individual fisheries management committees if such a committee exists or with the relevant fisheries manager within PIRSA.

The current Management Plan for seagrass and marine algae operates for a five-year period (from 2000 to 2005) and is subject to annual review and amendments considered necessary by the Director of Fisheries or the Minister for Agriculture, Food and Fisheries. Given recent developments in this fishery and continuing demand for increased access, the Management Plan is currently being reviewed.

It is important to note that a comprehensive review of the Fisheries Act is currently being undertaken by PIRSA in consultation with key stakeholder groups. This review, which is expected to be completed by December 2003, is likely to result in changes to the principal objectives of the Fisheries Act and, in turn, the broad sustainability framework for the management of South Australia's fisheries resources.

A.4.2. Context of the Management Plan

A 'fish' is defined in Section 5 of the *Fisheries Act*, as: "***an aquatic organism of any species and includes the eggs, spat or spawn, or the body or part of the body (including the shell) of such an organism***". Seagrass and algal products, whether drift-cast, beach-cast or attached, are a 'fish' for the purposes of the *Fisheries Act 1982*. The taking of all, or any part of, a 'fish', is conducted under the provisions of the Act, which is administered by PIRSA. The *Fisheries Act 1982* endeavours to ensure the sustainable development of the living aquatic resources of the State.

The Management Plan is a policy document that is used as a guide in the management of the fishery. The legislative regime supporting this process is as follows:

In the administration of the Fisheries Act, the Minister for Agriculture, Food and Fisheries, the Director of Fisheries and the established fisheries management committees must pursue the following objectives, outlined in Section 20 of the Act:

Section 20 of the Fisheries Act 1982 states:

20. *In the administration of this Act, the Minister, the Director and management committees have as their principal objectives:*

- (a) ensuring, through proper conservation, preservation and fisheries management measures, that the living resources of the waters to which this Act applies are not endangered or overexploited; and*
- (b) achieving the optimum utilisation and equitable distribution of those resources.*

PIRSA achieves these objectives, in part by:

- the development of management arrangements for aquatic resources in consultation with stakeholders; and*
- monitoring and promoting community compliance with legislation and regulations.*

Initially, exemptions to the regulations of the Act authorising a person to engage in the removal or disturbance of beach-cast wrack material were issued under Section 48G of the Act. However, Section 48G forms part of 'Division 2 - Protection of Aquatic Habitat' in **aquatic reserves, marine parks and declared waters**. Accordingly, section 48G was subsequently not deemed appropriate for the purpose, as it does not encompass the general protection of aquatic resources outside of

these waters. In light of this, from 1996 the Director of Fisheries began issuing Ministerial exemptions from the *Fisheries Act 1982*, under Section 59 as an interim measure. Licences for the harvesting of beach-cast seagrass or macroalgal wracks have been issued under the *Scheme of Management (Miscellaneous Fisheries Regulations 1991)* and Ministerial exemptions are provided to other applicants who require permission to harvest in an *ad-hoc* fashion, ie to clean up a local beach for amenity purposes.

A.4.3. Consultative process for developing a management plan

South Australian legislation does not prescribe a consultation process for the development or review of fishery management plans. However, in practice the process incorporates:

1. Development or review of a management plan with input from stakeholder groups;
2. Review of the proposed plan by PIRSA and relevant stakeholder groups;
3. Submission of draft plan to the Minister seeking approval for public release of the document;
4. A public comment period of at least 30 days including:
 - Provision of draft plan to stakeholder groups (all relevant licence holders, fish processors, recreational and commercial representative bodies, local councils, community, conservation, indigenous groups and government agencies);
 - Publicising to the wider community the release of the plan;
5. Issues raised by the public are reported to the Minister, and are considered in the management plan;
6. Finalisation of the plan and submission to the Minister for final approval;
7. Distribution of the plan (including posting on relevant website). The Beach-Cast Seagrass and Marine Algae Management Plan is a public document and is available from PIRSA directly or through the PIRSA website (www.pir.sa.gov.au/fishing).
8. Ongoing stakeholder consultations undertaken by PIRSA Fisheries.

The *Fisheries Act 1982* recognises three entities as being responsible for meeting the section 20 obligations of the Act; namely the Minister responsible for fisheries, the Director of Fisheries and individual fishery management committees. In the absence of a specific FMC for seagrass harvesting, this role is undertaken by the Marine Scalefish Fishery Management Committee.

A.5. Management Aims, Objectives and Strategies

Commercial beach-cast seagrass and macroalgal harvesting will be permitted to continue in the southeast of South Australia (easterly of the meridian of longitude 139°E) but prohibited from the shorelines of Gulf St Vincent, Spencer Gulf, West Coast and Kangaroo Island at least for the life of the management plan (5 Years).

The management objectives as set out under the Management Plan for Harvesting Beach-cast Seagrass and Marine Algae, August 2000, are detailed in Table 4.

When addressing the Guidelines for the Ecologically Sustainable Management of Fisheries the management regime developed by PIRSA Fisheries included the following.

Table 1: Requirements of a Management Regime for Assessment against Guidelines for Ecologically Sustainable Management of Fisheries

Management Regime Criteria	PIRSA Action
The regime should be documented, publicly available and transparent.	The Management Plan is a public document, available to all members of the public.
The regime should be developed through a consultative process providing opportunity to all interested and affected parties, including the general public.	The steps involved in the consultative process of developing a management plan are outlined in Section A.4.3
The regime should ensure that a range of expertise and community interests are involved in individual fishery management committees and during the stock assessment process.	The Management Plan outlines the range of expertise that was consulted through the development of the plan and the roles that each will play in this fishery.
The regime should be strategic, containing objectives and performance criteria by which the effectiveness of the management measures are measured.	The Management Plan outlines a number of Objectives, Strategies and Performance Indicators for the fishery, see Table 5 below
The regime should be capable of controlling the level of harvest in the fishery using input and/or output controls.	Harvest in the fishery is conducted in small areas and is restricted by area, having to leave a covering of seagrass on the sand and also leave 'exclusion zones' where no harvest is to take place.
The regime should contain the means of enforcing critical aspects of the management arrangements.	Different associated parties play different roles in enforcement, this is outlined throughout this document.
The regime should provide for the periodic review of the performance of the fishery management arrangements and the management strategies, objectives and criteria.	The management plan is reviewed annually with a full revision every 5 years.
The regime should be capable of assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species lives and the fishery operates.	The close relationships with related departments outlined in the Management Plan ensures these objectives are met.
The regime should require compliance with relevant threat abatement plans, recovery plans, the <i>National Policy on Fisheries Bycatch</i> , and bycatch action strategies developed under the policy.	There is no defined bycatch. This is a fishery that is quite specific in its harvest of beach-cast wrack material. For macroalgae harvesting it is advised that harvesting continue to be species-specific so as to leave other species of seaweed available to support beach meio-and macro-fauna.

Table 2: Management milestones for South Australian beach-cast seagrass and marine algae fisheries

Date	Milestone
1990	Fishery started – 2 permits issued
1996	Moratorium of the issue of any new permits
2000	Management Plan completed
	WTO Issued
2003	Licences issued to 3 operators
	Submission to Environment Australia

Table 3: Current management arrangements for the South Australian beach-cast seagrass and marine algae fishery

MANAGEMENT STRATEGY	
Licensing year	1/7 to 30/6
Limited entry (no. of licence holders)	✓(3)
Main species	Macro-algae Seagrass
Recreational licence	Not required
Corporate ownership of licences	✓
Max. no. of masters permitted	3
Max. no. of masters to be used at one time	1
Licence Transferability	✓

The priority for management of the beach-cast seagrass and marine algae fishery is to ensure that annual harvest levels are sustainable so that future generations may benefit from exploitation of the resource. Commensurate with this priority are a number of specific biological, environmental, economic, and social aims and objectives that have been developed to complement the broad directives of the *Fisheries Act 1982*.

Table 4: Management Aims and Tools for the beach-cast seagrass and marine algae fishery in South Australia

Management Aims	Tools
To achieve ecologically sustainable development of the industry, such that there are no adverse effects either on other State fishery resources or on coastal ecosystems generally.	Adopting a precautionary and conservative approach to wrack harvesting and exercising stringent controls on the quantity of material removed;
	Implementing monitoring arrangements which ensure routine reporting of harvest operations;
	Recommending research programs that study the links between wrack deposits on beaches and inshore coastal productivity;
	Ensuring that the method of removal does not cause damage to the adjacent dune area.
To achieve long-term economic stability of the industry	Providing access to sufficient quantity of the resource to ensure that the industry remains commercially viable
	Formalising licensing arrangements, thereby providing security of tenure
	Limiting the number of new entrants to the fishery.
To maintain social and economic justice	Clarifying conditions of entry and exit to the fishery, and resource allocation within the fishery; and
	Streamlining and simplifying administrative processes.

Fisheries managers adopt a 'precautionary approach'³ in the management of the South Australian beach-cast seagrass and marine algae fishery. With the recent introduction of miscellaneous licences, fees will be collected so that consideration can be given to priority research programs. However, before approval for any new harvest areas an Environmental Impact Assessment must be conducted. This environmental assessment must take into consideration the ecological impacts including the nature, amount, function and turnover rate of the wrack available at the site. Regard must be given to whether the wrack is persistent or highly mobile and the likelihood and rate of replenishment. This information will be used to determine whether the wrack accumulation may be harvested sustainably from an area according to the best available evidence.

³ the management committee shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures to prevent overfishing.

A.5.1. Ecological Impacts

In order to control the ecological impacts of the beach-cast seagrass and marine algae fishery, harvesting is to be capped at existing levels (currently 3 Miscellaneous licences) and a component of licence fees from these operators is to be directed towards a research program to determine the relative importance of wrack to coastal trophodynamics and coastal processes. Any increase in access or granting of new licences will be subject to scientific evidence indicating that an increase would be ecologically sustainable. Licence holders must also provide PIRSA Fisheries and Aquaculture with a yearly assessment of the harvest area.

A.5.2. Management action on reaching a target reference point

When one or more of the reference points are reached or exceeded, the following actions will be undertaken:

1. Notify the Minister for Agriculture, Food and Fisheries and participants in the fishery as appropriate,
2. Undertake an examination of the causes and implications of the reference point being triggered,
3. Consult with the industry and PIRSA Fisheries on the need for alternative management strategies or actions, in particular, spatial closures.
4. Provide a report to the Minister for Agriculture, Food and Fisheries and industry, within three months of the initial notification, on the outcomes of a review of the effect of triggering a reference point.

Table 5: Fishery Management Objectives

Fishery Dimension	Objectives	Strategies	Performance Indicator	Trigger Point	Management Response
Biological	Control, measure and regulate all catches/extractions from the resource	Number of licences capped at existing levels	Number of licences issued annually	> 3 licences issued	Apply appropriate regulations
		Component of licence fees directed towards research program determining relative importance of wrack to coastal trophodynamics and coastal processes ⁴	Research program conducted	No research conducted	Report to Director of Fisheries
		Licence holders to provide a yearly assessment ⁵	Annual assessment of harvest area	No annual assessment received	
Ecological	Disturbance by commercial operators to sand dunes, coastal vegetation, fauna and beach surfaces is minimised	Limiting the use of heavy machinery and mechanical harvesters			
		Restricting vehicular access to beach except via established tracks and boat ramps.			
		Direct removal of sand prohibited			
		Harvesters of seagrass wrack to leave a 10cm covering of seagrass	Seagrass cover remaining on beaches in harvest areas	No seagrass cover remaining on beaches in harvest areas	
		Harvesting limited to beyond 4 metres from the toe of the fore-dune	Harvest area within an approved site	Harvesting has taken place <4 metres from the toe of the foredune	
		Harvesting limited to beach-cast wrack deposits and must not be harvested from below the low water mark	Harvest area within an approved site	Harvesting has taken place below the low water mark	
		Harvesting will not be permitted in critical bird habitats or when species of high conservation status are nesting			
		Processing of wrack to be carried out off-site			

⁴ This research has not been conducted in the past, as there were no licence fees collected for exemptions. It is intended that such research will be investigated under the new licence regime. Currently, research being conducted has been funded separately, by the Coast Protection Board.

⁵ As for the research, the new licences in the fishery require this annual report to be provided.

Table 6: Fishery Management Objectives

Fishery Dimension	Objectives	Strategies	Performance Indicator	Trigger Point	Management Response
Social	To provide for reasonable access to wrack resources for all users	Permission may be granted to coastal Councils for the removal of accumulations to improve local beaches and for public amenity purposes	Number of coastal councils with exemptions		
		Access to the resource to be maintained in accordance with the management plan			

ESD ASSESSMENT OF THE MANAGEMENT REGIME AGAINST PRINCIPLES 1 AND 2

The following sections of this assessment report are presented to address the Commonwealth "Guidelines for the Ecologically Sustainable Management of Fisheries." approved by the Commonwealth Government in August 2000.

PRINCIPLE 1

A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover.

1.1.OBJECTIVE 1

The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.

Information requirements:

1.1.1. There is a reliable information collection system in place appropriate to the scale of the fishery. The level of data collection should be based upon an appropriate mix of fishery independent and dependent research and monitoring.

As part of the fishery assessment process administered by SARDI, fishery-dependent and fishery-independent data are collected.

Fishery-Dependent Data

Section 46 of the *Fisheries Act 1982* requires all seagrass/macroalgae wrack harvesters operating under a miscellaneous licence to submit catch and effort return information to the Chief Executive of PIRSA. This information will be available to the Chief Executives of Department of Transport (DoT) and the Department for Environment, Heritage and Aboriginal Affairs (DEH) at their request. This information will be treated confidentially. The return shall be in a form approved by the Minister for Agriculture, Food and Fisheries. The following information will be requested from each wrack harvester:

- A list of the species harvested.
- The weight of each species harvested.
- The exact location of the harvesting activity.
- The method used to collect the resource.
- The method used to process the resource.

-
- The use made of the resource.
 - The volume of product sold each month.
 - Photo points to monitor the adjacent coastline including dune and beach profiles and vegetation line.

The above information should be submitted every month of the life of the licence to:⁶

Chief Executive, PIRSA
C/-PO Box 120
HENLEY BEACH SA 5022

If the seagrass wrack harvester fails to submit catch and effort information, the Director of Fisheries may recommend the imposition of a substantial fine or term of imprisonment under Section 46 of the *Fisheries Act 1982*.

In addition, licence holders must provide PIRSA Fisheries with a yearly assessment of the harvest area.

Fishery-Independent Data

Prior to the approval of any harvest sites, a full environmental impact assessment must be submitted to PIRSA. Any increase in access or the granting of new licences will be subject to scientific evidence indicating that an increase would be ecologically sustainable. The assessment must take into consideration the nature, amount, function and turnover rate of the wrack available at the site. Regard must be given to whether the wrack is persistent or highly mobile and the likelihood and rate of replenishment. This information will be used to determine whether the wrack accumulation may be harvested sustainably from an area according to best available evidence.

The assessments may be undertaken by a consultant engaged by the licence applicant, but must be done according to a prescribed methodology so that it can be verified by PIRSA and DEH. The methodology must stipulate the parameters to be measured including area covered, time period, methods of estimating amount of wrack, species composition of wrack, likely impact on beach ecology, identification of bird nesting or critical habitat.

Currently, there is no ongoing fishery-independent monitoring, however new licensing arrangements may provide a basis for this to be undertaken.

Assessment

1.1.2. There is a robust assessment of the dynamics and status of the species/fishery and periodic review of the process and the data collected. Assessment should include a process to identify any reduction in biological diversity and/or reproductive capacity. Review should take place at regular intervals but at least every three years.

There is currently no research basis from which to determine ecologically sustainable beach-cast harvest levels. There are also no historical records of wrack biomass, composition or turnover rates for any beach in South Australia. Moreover, any assessment of wrack abundance is problematic because of the highly patchy and mobile nature of the resource.

Given the potentially harmful effects of wrack harvesting on beach and near-shore environments and the lack of quantitative scientific data from which to establish a sustainable harvest level, there are good commercial and conservation motives for adopting a precautionary and structured approach to harvesting beach wrack and avoiding a rapid

⁶ This process is regulated under licence condition.

development of the fishery before the wider and more long-term impacts of this activity on dependent coastal ecosystem processes have received some scientific attention.

1.1.3. The distribution and spatial structure of the stock(s) has been established and factored into management responses.

The wrack is unevenly deposited along the foreshore and the time for which the wrack remains stationary on the beach may be highly variable. Transport back into the subtidal zone by wave action, combined with longshore drift results in changes in wrack biomass at time scales of days and weeks. Thus, averaged amounts of beach wrack calculated for a length of coastline are probably over-estimates as wrack is patchily distributed across sites and between seasons (Kendrick *et al.* 1995).

1.1.4. There are reliable estimates of all removals, including commercial (landings and discards), recreational and indigenous, from the fished stock. These estimates have been factored into stock assessments and target species catch levels.

In light of the difficulties in quantifying the amount of wrack available to harvest, it is felt that the most appropriate approach is to apply the precautionary principle and ensure the level of harvest is contained by limiting the numbers of entitlements with controls on the amount of removal being set conservatively. On this basis, the management approach to regulating the fishery is by the use of input controls, such as limiting the location of harvesting and the number of entrants to the fishery and their harvesting operations. To this end, an assessment of each and every proposed area of harvest operations must be carried out which takes into consideration the nature, amount, function and turnover rate of the wrack available at the site. Regard must be given to whether the wrack is persistent or highly mobile and the likelihood and rate of replenishment. This information will be used to determine whether the wrack accumulation may be harvested sustainably from an area according to best available evidence. The assessments may be undertaken by a consultant engaged by the licence applicant, but must be done according to a described methodology so that it can be verified by PIRSA and DEH. The methodology must stipulate the parameters to be measured including area covered, time period, methods of estimating amount of wrack, species composition of wrack, likely impact on beach ecology, identification of bird nesting or critical habitat.

Within an allocated section(s) of beach, the licensee will be permitted to harvest 75% of the allocated species of seagrass or macroalgae with the proviso, in the case of seagrass, that a 10cm covering of vegetation is left on the sand. In the case of macroalgae, harvesting will continue to be selective (species-specific) so as to leave other species of seaweed available to support beach meio- and macro-fauna.

It is an objective that through proposed research programs, a research basis upon which to determine ecologically sustainable beach-cast harvest levels be determined.

Access will be granted to either seagrass or macroalgae, but not both on the same licence. The species composition of the wrack at a particular location will be established during the primary assessment by PIRSA. The particular species, or suite of species, permitted to be harvested, will be endorsed on the licence. Currently, of the three licences that exist, one is for harvest of macroalgae and the remaining two are for beach-cast seagrass harvest.

Except in specific cases where it is required for public amenity purposes, complete removal of all seagrass wrack material from a large section of foreshore will not be permitted. Where the proposed area of operations extends for a long and continuous section of beach, 'exclusion zones' must be interspersed within harvest sites to the effect that no more than 75% of the estimated biomass of seagrass wrack be removed from a region. Exclusion zones are to run from low water mark to the fore-dune / scrub within each designated harvest area. Sections where harvesting is permitted should be located in close proximity to access routes, thus mitigating the need for heavy machinery traversing large sections of beach. It is recognised that until scientific information is available, the distribution of harvest and exclusion zones will

be decided largely subjectively, based on a balance between community, conservation and commercial values.

The selection of harvesting 75% of available wrack and leaving 'chunks' (25%) untouched, further ensures pristine habitat remains for critical bird habitat, prevention of erosion, production of copepods and other organisms and assurance of the continuation of important ecological processes.

Commercial Harvest

The commercial beach-cast seagrass and marine algae fishery is administered with the aid of the *Fisheries Act 1982*, *Fisheries General Regulations 2000*, *Scheme of Management (Beach-cast seagrass and marine algae Fisheries) Regulations 1991* and licence conditions.

Since 1997, South Australian commercial seagrass and macroalgae harvesters have provided data on their fishing activities each month to SARDI Aquatic Sciences. Fishers are required to provide information on species harvested, weight of each species harvested, exact location of the harvesting activity, method used to collect the resource, method used to process the resource, use made of the resource, volume of each product sold each month.

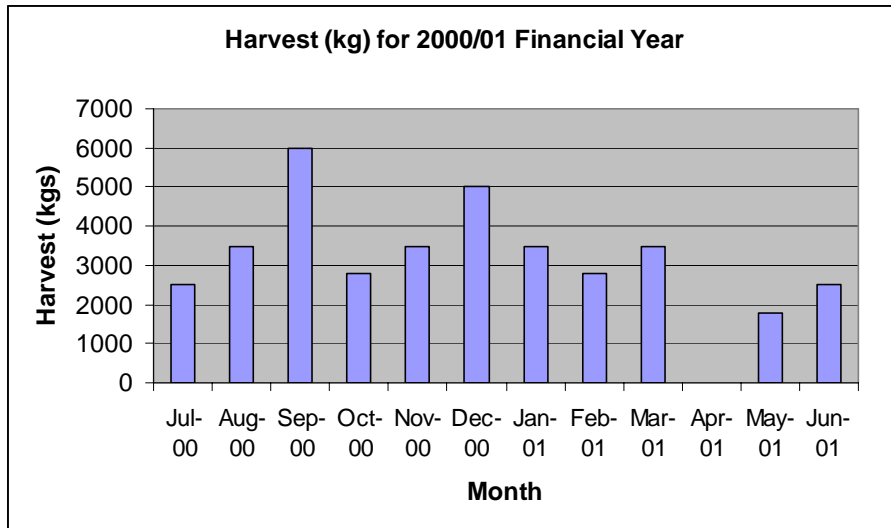


Figure 2: Monthly Harvest Rates of beach-cast seagrass and marine algae for the 2000/01 Financial Year

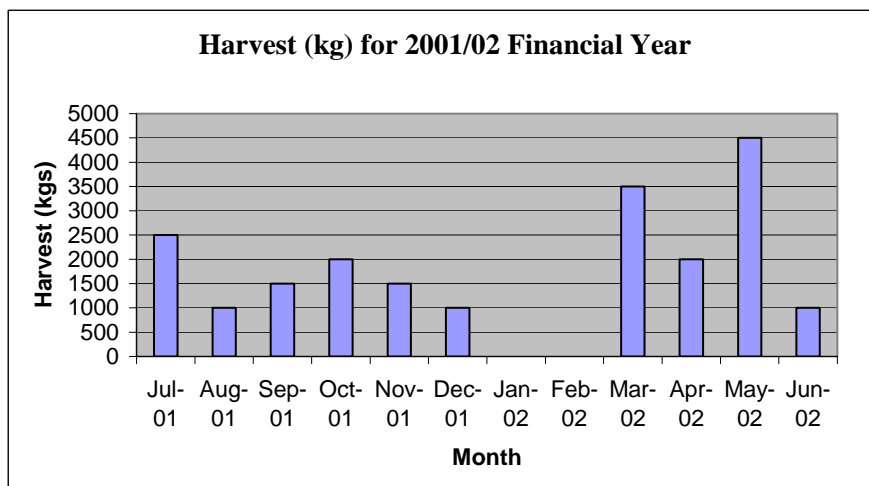


Figure 3: Monthly Harvest Rates of beach-cast seagrass and marine algae for the 2001/02 Financial Year

Table 7: Total harvest (kg) of seagrass and macroalgae by month for the 2000/01 and 2001/02 financial year.

Harvest Rates 2000/01 Financial Year		Harvest Rates 2001/02 Financial Year	
Month	Harvest (kg)	Month	Harvest (kg)
Jul-2000	2500	Jul-2001	2500
Aug-2000	3500	Aug-2001	1000
Sept-2000	6000	Sept-2001	1500
Oct-2000	2800	Oct-2001	2000
Nov-2000	3500	Nov-2001	1500
Dec-2000	5000	Dec-2001	1000
Jan-2001	3500	Jan-2002	0
Feb-2001	2800	Feb-2002	0
Mar-2001	3500	Mar-2002	3500
Apr-2001	0	Apr-2002	2000
May-2001	1800	May-2002	4500
Jun-2001	2500	Jun-2002	1000
TOTAL	37 400 kg	TOTAL	20 500 kg

1.1.5. There is a sound estimate of the potential productivity of the fished stock/s and the proportion that could be harvested.

In light of the difficulties in quantifying the amount of wrack available to harvest, it is felt that the most appropriate approach is to apply the precautionary principle and ensure the level of harvest is contained by limiting the numbers of entitlements with controls on the amount of removal being set conservatively.

Management responses:

1.1.6. There are reference points (target and/or limit) that trigger management actions including a biological bottom line and/or a catch or effort upper limit beyond which the stock should not be taken.

The performance indicators, reference points and management responses for the South Australian beach-cast seagrass and marine algae fishery are described in Tables 5 - 6.

Management responses to be implemented when a reference point is reached will be refined in the next iteration of the Management Plan.

1.1.7. There are management strategies in place capable of controlling the level of take.

The harvesting, removal or disturbance of beach-cast seagrass and algal material is prohibited from:

- All Aquatic Reserves proclaimed under the *Fisheries Act 1982*.
- Foreshore adjacent to land under the care, control and management of the Minister of Environment and Heritage and gazetted as a reserve under the *National Parks and Wildlife Act 1972*, *Wilderness Act 1992*, *Crown Lands Act 1929* or the *Coast Protection Act 1972*.

-
- Areas adjacent to lands under the management of the Department of Defence.
 - Foreshore restricted by Local and/or District Councils for the purpose of non-development, recreation or conservation reserves.

The harvesting of wracks may be subject to specific restrictions relevant to specific locations. Such restrictions will be developed in consultation between PIRSA, DEH and Local Governments and may include provisions for the preservation of rare or endangered terrestrial flora and fauna or the prevention of degradation of foreshores, dunes and coastal vegetation communities. In addition, the local district or metropolitan council can impose restrictions on the timing of harvesting to avoid or minimise conflicts with other beach users.

Subject to consultation with PIRSA, DEH and DoT, permission may be granted to coastal councils for the removal of permanent accumulations of seagrass wrack at locations where councils can provide appropriate justification (public swimming beaches, boat ramps, recreation areas) for the removal of persistent wrack deposits to improve public amenity values whilst maintaining stability of the beach and dune system.

Commercial fishing

Commercial harvest is managed under the *Scheme of Management (Miscellaneous Fisheries Regulations 1991)*. Commercial harvest is currently restricted to 3 operators.

Recreational Fishing

Members of the public often seek to obtain small amounts of beach-cast seagrass wrack in particular, for use as 'mulch' or fertiliser on domestic gardens. In some cases, local by-laws exist which prohibit this without council permission. These requests have generally been granted, provided the material is harvested by hand and only small quantities are collected. In a few cases, where the council believes it is detrimental to the shoreline, this activity is either discouraged or actively prohibited.

Decisions relating to recreational (non commercial) harvests of beach-cast wrack are the responsibility of the relevant Local Government Authority, where enabled through regulation. Such harvest is to remain small-scale and a strictly non-commercial activity. Coastal Councils seeking to authorise recreational collection must provide PIRSA with a policy on recreational collection for approval.

Compliance and Enforcement

PIRSA Fishwatch monitors compliance by harvesters of beach-cast seagrass and marine algae. The strategic aim of PIRSA Fishwatch is "to achieve optimal levels of compliance by all fishers".

Optimal compliance is that which holds the level of non-compliance at an acceptable level, which can be maintained at a reasonable cost for compliance services, whilst not compromising the integrity and sustainability of the fisheries resource.

Two goals are identified in achieving this strategic aim. These are improved voluntary compliance, whereby fishers are encouraged to voluntarily adopt and support fisheries laws for moral and ethical reasons, and effective deterrence whereby the penalties resulting from illegal activity outweigh benefits gained from that activity.

Intelligence is a crucial component of risk management. Intelligence is gathered from field officers, and reports by members of the public, and is reported through the 24-hour Fishwatch hotline (1800 065 522). This offence reporting system has proven effective for other species/fisheries through the number of reports acted upon and a number of resultant convictions.

In addition to fisheries compliance obligations, PIRSA Fishwatch communicates with other Government agencies including Police, National Parks, Lands Titles Office, Business Registrar and Commonwealth Government agencies including Customs and Australian Quarantine Inspection Service (AQIS). Communication protocols exist with non-government industries including banking, hire car and real estate agencies.

Fisheries officers stationed near state borders or those that participate in interstate operations are cross-authorised with other state fisheries authorities. Fisheries Officers are also cross-authorised under other South Australian Acts of Parliament including:

- Harbours and Navigation Act
- National Parks & Wildlife Act
- Historic Shipwrecks Act.

Additionally all State Police Officers are authorised under the *Fisheries Act 1982*.

Management of the fishery by way of input controls significantly reduces the costs and complexities involved with enforcement of regulations and licence conditions. Each licence is to be endorsed with precise information regarding the harvest operation and it is a requirement under the *Scheme of Management (Miscellaneous Fishery Regulations 1991)* that this licence be carried at all times during harvesting activities in a vehicle being used for the purpose of collecting or transporting wrack. Information contained on the licence will include the specific section of foreshore where harvesting is permitted, the species allocated to each harvester and the methods of harvesting allowed. The allocated section of foreshore is clearly defined on the licence so there is no ambiguity in interpretation by either harvesters or fisheries compliance officers. Likewise, the species that may be harvested must be clearly identified by name on the licence and any machinery or vehicles used for harvesting must be marked with the licence number in such a way as to be readily observable and identifiable. Compliance officers will carry out random checks of each harvesting operation to ensure that licence conditions are not being breached. Failure of operators to comply with licence conditions may result in prosecution under the *Fisheries Act 1982* and cancellation of the licence. To date there have been no offences in this fishery.

1.1.8. Fishing is conducted in a manner that does not threaten stocks of by-product species.

Each licence contains specific regulations relating to the methods of harvesting allowed (type and number of items of machinery, exclusion zones, closed seasons). The methods of harvesting must not take sand and thus will not harm commensal species living in this habitat.

It must, therefore, be borne in mind that the removal of beach-cast material may disrupt terrestrial and marine food webs, interfere with nutrient recycling to the near-shore zone and deprive subsurface beach organisms of dissolved organic materials (Anderson *et al.* 1989). This net loss of organic matter from the shoreline will impact upon sandy beach ecosystems in a way that cannot as yet be predicted and must be determined through future research and monitoring.

Beach-cast wrack also clearly constitutes a valuable component of bird habitat for many species of sea and shore birds, including some that are listed as threatened or vulnerable. Harvesting of wrack may adversely affect bird species that are dependent upon undisturbed seagrass wracks for feeding, resting, nesting and raising chicks⁷. It also has the potential to incur damage to the foreshore, interfere with beach stability and contribute to coastal erosion.

⁷ For instance, DEH has identified Cape Jaffa and the area of Kingston Beach north of the Blackford Drain and adjacent to an Urban Coastal Zone Reserve as important habitat for Orange-bellied Parrots. Also the extensive tidal flats associated in Gulf St Vincent and Spencer Gulf provide valuable habitat for shorebirds and waterbirds, some of which are species of national and international importance.

However, harvesting of beach-cast seagrass and marine algae wrack is not believed to threaten any stocks of by-product species.

1.1.9. The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective.

The current Management Plan aims to establish a suitable regulatory regime and to ensure the orderly development of the fishery. This shall include continual monitoring and assessment. The performance indicators outlined in this submission have recently been developed and as this fishery further develops, the continued use of management controls including input controls supported by licencing, and controls on harvest methods and area controls, will ensure that this fishery remains sustainable in the long-term.

Uncertainties in the biomass available for harvesting (ie the biomass is dependent upon environmental conditions which dislodge the seagrass and macroalgae) give reason to be particularly cautious at this early stage of development. Thus, the harvest areas are small and interspersed with closed areas. This in itself is a precautionary management response that will ensure that better information is collected over time and seagrass and marine algae accumulations are maintained as critical habitat. Once more information is obtained, a more comprehensive assessment of the wrack accumulations can be conducted.

In the absence of scientific data, and because of concerns regarding the possible impact on coastal fisheries from the regular or over-harvesting of wrack accumulations, PIRSA has always adopted a 'precautionary approach' to the harvesting of beach-cast wracks. As a result, the fishery has been managed conservatively and average annual harvests have not exceeded approximately 50 - 100 tonnes (t) of algae and 3,000 tonnes of seagrass (and usually much less than this) for the entire period of the fishery. However, an increase in requests for permission to harvest wracks at several new locations in SA have been received by PIRSA. There has also been pressure from some current harvesters for increased access. In 1996, in response to the increased interest in wrack harvest, PIRSA declared a moratorium on the issue of any new permits in the fishery, pending the development of a management plan. The Management Plan has been completed and to date no new permits/licences have been issued. However, three permit holders have been issued with a licence under the *Scheme of Management (Miscellaneous Fisheries Regulations 1991)*.

1.2 OBJECTIVE 2:

Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

Management responses

1.1.10. A precautionary recovery strategy is in place specifying management actions, or staged management responses, which are linked to reference points. The recovery strategy should apply until the stock recovers, and should aim for recovery within a specific time period appropriate to the biology of the stock.

The beach-cast seagrass and marine algae fishery is a developing fishery with a low number of operators. The small harvest amounts that have been taken from long term wrack accumulations ensure that the precautionary principle is applied and that there has been no fishing of the stock to a point below any defined reference point.

1.2.1 If the stock is estimated as being at or below the biological and/or effort bottom line, management responses such as a zero targeted catch, temporary fishery closure or a 'whole of fishery' effort or quota reduction are implemented.

Management responses such as those outlined above are not applicable at this time due to the relatively short time frame and minimal harvest effort that has been applied to the fishery.

PRINCIPLE 2

Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.

2.1 OBJECTIVE 1

The fishery is conducted in a manner that does not threaten bycatch species.

The South Australian beach-cast seagrass and marine algae fishery is target-specific and has no bycatch.

There is the unavoidable removal of commensal organisms during harvest. However, the low harvest rates and exclusion zones ensure that these species are not threatened.

2.2 OBJECTIVE 2

The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species, and avoids or minimises impacts on threatened ecological communities.

The international conventions “The Convention on Migratory Species (Bonn)” and the “Convention on Biological Diversity” place obligations on Australia that may have implications for this management plan.

Australia is a signatory to two bilateral agreements on migratory shore birds, one with Japan, the other China. The Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA) list migratory species of shore birds for which beach-cast wrack provides a basis to their food chain.

In order to address the issue of migratory birds and to protect nesting or aggregation sites, a number of measures are being implemented. The restriction placed upon harvesters to ensure that no more than 75% of wrack is harvested ensures that significant habitat remains in place for such species. In addition, studies are currently being undertaken to identify any critical habitat that should be protected. The highly mobile nature of much of the harvested wrack may already prevent colonisation of migratory birds and other species.

The harvest of marine algae is currently undertaken by hand on highly mobile wrack accumulations, thus meaning that it would be unlikely that birds or other similar species would be impacted by this harvest. Furthermore, seagrass wrack is harvested from only small areas.

The proclamation of the *Environment Protection and Biodiversity Act 1999* in July 2000 will provide statutory cover for these international obligations where actions impact on matters of national environmental significance. As beach-cast wrack supports migratory shorebird food chains as well as providing habitat to endangered species of wildlife, such as the hooded plover and the orange-bellied parrot, the actions of harvesting the wrack will require monitoring to ensure impacts are not serious.

Discussions are being held between DEH and PIRSA to consider environmental issues such as endangered species and migratory shorebirds. In South Australia, a number of important habitats for endangered bird species are protected. The measures taken in this fishery consider the objectives and needs of the orange-bellied parrot (OBP) Recovery Plan: Management Phase 1998 – 2002 (see Appendix II). Currently, there have been no requirements to report interactions but this may be considered in the next iteration of the Management Plan.

The contribution of decomposing seagrass and seaweed to productivity in marine ecosystems has also been shown to be both measurable and significant. Both in the surf zone and on the beach, wracks are important sites for the nutrient recycling which sustains nearshore primary and secondary production in coastal waters. South Australia’s waters are generally nutrient-poor and the decomposition of beach-cast wrack may supply a vital source of particulate and dissolved organic matter to the State’s coastal ecosystems. Moreover, the large supply of detritus and prey organisms released during wrack breakdown supports marine food webs, including some that lead to commercially important fish species. This suggests that the removal of wrack material from beaches may have implications for other fisheries that are dependent upon nearshore productivity (Kendrick *et al.* 1995). This has particular significance for seagrass wrack harvesting in the two gulfs in South Australia where there are few, if any, other nutrient inputs to the system and productivity is low (Smith & Veeh 1989). It may, however, be of less importance in more nutrient-rich coastal marine environments (Kendrick *et al.* 1995) such as the southeast of SA, and perhaps also off the west coast of Eyre Peninsula (refer Figure 1), where seasonal upwelling events return nutrient-rich bottom waters to the surface layers. In the southeast there is also an additional input of nutrients to the inshore zone via a series of agricultural drains.

It must, therefore, be borne in mind that the removal of beach-cast material may disrupt terrestrial and marine food webs, interfere with nutrient recycling to the nearshore zone and deprive subsurface beach organisms of dissolved organic materials (Anderson *et al.* 1989). This net loss of organic matter from the shoreline will impact upon sandy beach ecosystems in a way that cannot as yet be predicted and must be determined through future research and monitoring.

2.3 OBJECTIVE 3

The fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally.

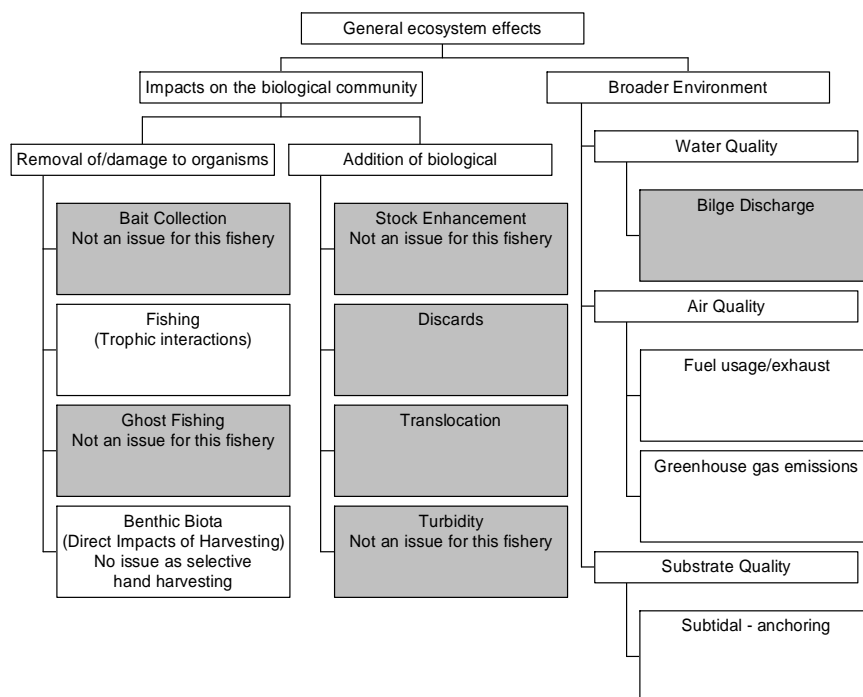


Figure 4: Component tree describing the general ecosystem effects of beach-cast seagrass and marine algae fishing in South Australia (Shaded areas indicate those of no significance to the fishery).

Information requirements:

2.3.1 Information appropriate for the analysis in the assessment is collated and/or collected covering the fisheries impact on the ecosystem and environment generally.

Little information exists on the ecological impacts of harvesting beach-cast seagrass and marine algae. The Management Plan states that prior to any site being approved for harvesting, an ecological assessment must be conducted. The existing sites for which licences have been approved have had ecological assessments undertaken.

The assessment must take into consideration the nature, amount, function and turnover rate of the wrack available at the site. Regard must be given to whether the wrack is persistent or highly mobile and the likelihood and rate of replenishment. This information will be used to determine whether the wrack accumulation may be harvested sustainably from an area according to best available evidence. The assessments may be undertaken by a consultant engaged by the licence applicant, but must be done according to a described methodology so that it can be verified by PIRSA and DEH. The methodology must stipulate the parameters to be measured including area covered, time period, methods of estimating amount of wrack, species composition of wrack, likely impact on beach ecology, identification of bird nesting or critical habitat.

Assessment:

2.3.2 Information is collected and a risk analysis, appropriate to the scale of the fishery and its potential impacts, is conducted into the susceptibility of each of the following ecosystem components to the fishery.

Impacts on ecological communities

Beach-cast seagrass and algal wracks serve several important ecological functions in environments extending from the supralittoral⁸ to the abyssal⁹ and encompassing both benthic¹⁰ and pelagic¹¹ systems. Sandy beaches are characterised by an absence of attached macrophytes and hence an almost complete lack of *in situ* primary production (Griffiths, Stenton-Dozey & Koop 1983). The import of detached macrophytes from offshore beds provides organic material that delivers nutrients to the interstitial food chain as well as acting as the primary food source for intertidal fauna (Marsden 1991). The macrofauna in particular relies entirely on material imported from the sea to meet its nutritional requirements. Wrack, therefore, provides a rich food supply that is not only persistent, but also concentrated high up on the beach.

Therefore, there are a number of potential environmental impacts associated with beach cleaning that include: direct impacts to the beach and nearshore environments; disruption of the natural cycle of beach nourishment from nearshore sand dynamics; and impacts to significant sites and features. Off-beach environmental impacts relate mainly to the disposal of beach litter such as plastics, glass and fishing wastes, as well as wrack, at municipal landfills or other locations (Fairweather and Henry 2003).

However, the limited areas from which wrack in South Australia is harvested and the 'exclusion zones' will serve to maintain nearshore environments and maintain beach nourishment and ecological processes.

Impacts on food webs

The removal of beach-cast material may disrupt terrestrial and marine food webs, through the removal of important food species from different levels of the food chain. However, the use of dispersion zones allows for the maintenance of important habitat and therefore links in terrestrial and marine food webs.

Impacts on the Physical Habitat

Fairweather and Henry (2003) highlight a number of potential impacts from removing wrack which include: pollution and emission impacts from the combustion and noise from machinery; disturbance of fauna from the presence of human workers; removal of natural ecological components including wrack itself (i.e. as a form of organic matter, nutrient source, habitat and refuge) or sediments; and the loss of dune vegetation and seed reserves, if cleaning extends up into foredunes. Sound emissions may scare off nesting or feeding birds and hydrocarbon-based pollution such as exhaust fumes and oil leaks may also occur.

The harvest conditions imposed on beach-cast seagrass and marine algae harvesters ensure that there is minimal impact on the physical habitat. Harvesters must take away no sand from their harvest areas, use exclusion zones where wrack is to be maintained for ecological reasons and are only able to access the beach from existing ramps or access tracks. Local councils will restrict hours of access and administer any seasonal access restrictions as necessary to prevent problems through sound emissions and to ensure that all vehicles and machinery are registered and in good condition to ensure minimal damage to the beach

⁸ above the high water mark

⁹ pertaining to the ocean depths

¹⁰ of or on the sea bed

¹¹ of or in the water column

ecosystem. In addition, harvesters are restricted to only removing wrack that is farther than four metres from the toe of the foredune.

Impacts on Water Quality – Bilge discharge

The harvest of beach-cast wrack is a land-based activity and thus has little or no impact upon water quality. The only potential for water quality impact is through the use of machinery in the harvest areas. It is believed that there will be minimal impact from the use of this machinery as it is for only short time periods and the harvesters are not to harvest from below the low water mark, thus giving them no reason to enter the water.

Management responses:

2.3.3 Management actions are in place to ensure significant damage to ecosystems does not arise from the impacts described in 2.3.1

A number of management actions or responses are in place to minimise significant damage to related ecosystems. These include the strict regulation of harvest areas including no harvest within 4 metres of the foredune, no harvest below the low water mark, no sand to be removed, the use of exclusion zones, leaving a covering of seagrass on the beach in harvest areas and only allowing harvesters to harvest wrack from small areas.

2.3.4 There are decision rules that trigger further management responses when monitoring detects impacts on selected ecosystem indicators beyond a predetermined level, or where action is indicated by application of the precautionary approach.

Harvesters are required to submit a yearly assessment on their harvest areas (described earlier). The dynamic nature of wrack accumulations means that the turnover naturally may be as high, if not higher than the precautionary amounts allowed to be harvested under strict input controls. Thus, PIRSA believe that the precautionary approach in minimising harvest licences, harvest areas and the input controls linked with this provide sufficient ability to detect any impacts and take appropriate management action.

Detailed assessments of all areas before the issue of a licence to harvest that area provide vital information on the potential for any ecological impact and this is taken into consideration before approval of harvest areas.

2.3.5 The management response, considering uncertainties in the assessment and precautionary management actions, has a high chance of achieving the objective

The highly precautionary nature of the input controls and access granted to this fishery ensures that the development of the fishery will prevent serious ecological impacts.

LIST OF ACRONYMS

Table 8: Acronyms used throughout the report and their expanded meanings

Abbreviation	Meaning
EPBC	Environment Protection and Biodiversity Act
ESD	Ecologically Sustainable Development
DEH	Department for Environment and Heritage
DoT	Department of Transport
FRDC	Fisheries Research and Development Corporation
GVP	Gross Value of Product
PIRSA	Primary Industries and Resources South Australia
R & D	Research and Development
SAFIC	South Australian Fishing Industry Council
SARDI	South Australian Research and Development Institute
SARFAC	South Australian Recreational Fishing Advisory Council
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch

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APPENDIX I – Licensing System

Licensing System as per current Management Plan

1. The most appropriate arrangements for granting access to beach-cast seagrass and macroalgae resources are by means of a fishery licence under the *Scheme of Management Miscellaneous Fishery*. The following conditions are to apply with regard to licensing regulations governing terms and conditions of access and operation in the fishery:
2. That existing permit holders be offered a licence in the fishery. If a current permit holder does not exist, or the current permit holder does not wish to make an application for a licence, the licence may then be issued through a prescribed tender process.
3. A licence can be granted to a body corporate or a natural person.
4. The Director of Fisheries shall only issue a licence once licence fees (or the first instalment thereof) have been paid. The cost of a licence is determined by the Minister and will be based on the costs of administering and managing the fishery. The licence fee includes funds for an assessment by PIRSA of the beach-cast wrack in the proposed area of harvesting on a yearly basis(see Section 6.3.2) and costs of audit of monitoring systems. Licence fees are charged on a yearly basis.
5. A limit of one licence shall be issued for each designated harvest area in which the Director of Fisheries considers a sufficient volume of the resource exists to support a sustainable harvest. Each licensee is therefore afforded sole access to a nominated section or sections of shoreline and a particular species allocation (see Section 6.3.2 and Section 6.3.3). There should be no spatial overlap in the areas of operation among licenses
6. Each Licence contains specific regulations relating to the methods of harvesting allowed (access routes, type and number of items of machinery, exclusion zones, closed seasons). The methods of harvesting will be set as part of the initial assessment process and will involve consultation with PIRSA, DEH, DoT and Local Government. These regulations are subject to change at the discretion of the Director of Fisheries, on consultation with the harvester and other relevant authorities.
7. The holder of a licence must provide the Chief Executive of PIRSA with catch and effort results for each calendar month in which the licence is current (see Section 6.3.4). A form approved by the Minister for Primary Industries is to be used for this purpose. The licence holder must also supply photo point monitoring of beach and dune profile, and vegetation line.
8. All councils proposing to remove and on-sell beach-cast seagrass are required to hold a licence under the terms and conditions of this management plan. Councils may sub-contract a licensed harvester to collect seagrass under the terms and conditions of this plan from specific areas of foreshore where those areas are under the care, control and management of the Council.
9. Beach-cast licences will be transferable but access rights to a particular section of beach may not be traded as this is not the jurisdiction of PIRSA.

10. Each licensee will be permitted to nominate a total of two 'Masters'¹² who may harvest the resource on their behalf on their section(s) of foreshore.

Licence application process as per current Management Plan

Current and potential wrack harvesters must submit an application to harvest beach-cast wrack for each intended area of operations on the application form shown in Appendix 1. This application must include a detailed description of the anticipated methods of harvest. The prescribed fee for assessing an application for a Miscellaneous Fishery beach-cast licence must accompany the application form and will include costs for assessment of locations by PIRSA. Submission of an application form for beach-cast wrack harvesting does not guarantee that a licence will be issued.

Before PIRSA grants access to the resource, it will first give due consideration to the possible impact of the activity on the coastal environment. As numerous agencies are involved in this issue through their relative statutory obligations, it is necessary to implement a standard consultation arrangement that provides a clear process by which wrack harvest applications will be routinely assessed including the issues referred to in 6.2.1 above. An inter-departmental assessment protocol will be used to facilitate assessment by PIRSA, DEH and DoT to determine the suitability and conditions of each harvest application.

Inter-departmental Assessment Protocol as per current Management Plan

1. Licence application is received by PIRSA with specific details of the operation documented on the application form (Appendix 1).
2. All applications to harvest wracks will first be screened by PIRSA Fisheries & Aquaculture who will assess the overall merits of the application and ensure that it complies with the objectives of the Management Plan for the fishery. PIRSA will also assess the relative abundance of wrack at the location and a sustainable resource allocation (see Section 6.3.2). To this end, PIRSA may seek scientific advice and information from a research agency. PIRSA will also consult with relevant Local Government about the suitability of proposed operations before the application proceeds further.
3. If there are no objections to the harvest operation on the basis of resource sustainability and beach ecology, the application will proceed to the next stage of the licence assessment process. PIRSA will consult Local Government and DEH about the suitability of the proposed operation with regard to coastal land use and local planning and development issues and obtain advice and recommendations relating to any terms and conditions that should be imposed on the harvest operation. DoT will be informed of the application and asked to identify if there are any other existing or intended DoT lease commitments to the said area of land.
4. PIRSA will note and review comments and suggestions received from all other stakeholders, the application will be forwarded to the Director of Fisheries with recommendations regarding suggested allocation and harvest conditions to be incorporated onto the licence.
5. A final assessment will be made by the Director of Fisheries, who will review the information and advice obtained during the inter-departmental review process and either approve or reject the licence application, or advise that it should be modified. Approval must be granted by all relevant agencies in order for an application to be approved.
6. If approved, the Director of Fisheries will issue a Miscellaneous Beach-cast Fishery Licence pursuant to the *Fisheries Act 1982*.
7. PIRSA will advise DoT on foreshore access licence requirements.

¹² An employee of the licence holder who has been nominated to operate the licence in their absence.

8. The above protocol will ensure that PIRSA retains overall control of all proposed harvesting operations. The application may at any stage be rejected or returned to the applicant for modification or amendment if the application compromises management objectives for the fishery or current development arrangements for the region.

APPENDIX II – Orange Bellied Parrot Recovery Plan

Outline of the relevant sections of the Orange-Bellied Parrot (OBP) Recovery Plan: Management Phase 1998 - 2002

3.2.7 Habitat protection and food supply at Carpenter Rocks

Orange-bellied Parrots have been recorded at Carpenter Rocks more often than at any other site in South Australia in recent times (Gibbons 1984). The nature of the habitat at this site is most recently described by Casperson (1995). Experimental manipulation of the strandline and sowing seeds has shown potential to augment supply of sea rocket, *C. maritima*, a food of the Orange-bellied Parrot. This work will be continued, as necessary, in years when the natural growth of *C. maritima* is minimal due to storms or other conditions. In future this action may make the site a suitable place for releasing captive bred birds.

Management and control of important Orange-bellied Parrot habitat is under the Carpenter Rocks Site Management Plan (Owers 1994) and will be maintained by cooperation with the Port MacDonnell Council and the community.

3.2.8 Maintain feral predator control at Kingston and other known feeding sites

Casperson (1995) describes the known feeding sites of Orange-bellied Parrots in South Australia. Trapping for feral cats was done by volunteers in May 1996 at the feeding and roosting sites used by the birds at Carpenter Rocks. A site at Kingston, because of its proximity to a rubbish dump, has a high feral cat population and therefore high risk to birds using the area. Feral cat monitoring and trapping has been, and will continue to be done by volunteers belonging to Friends of Parks Groups at this and in other reserves (eg *The Tattler* No 7, ENR) with the support of local government and ENR as required. Extensive fox baiting programs were conducted in autumn and spring in south-eastern South Australia during 1996 (T Owers pers comm) and will continue throughout the life of this plan. This will also help to protect birds at feeding and roosting sites and may also protect released captive bred birds in future.

3.2.9 Maintain policy on recreational vehicle access to known habitats and feeding areas

As a result of management policy on Coorong ocean beaches (eg ENR, *The Tattler* No7), known Orange-bellied Parrot feeding sites in South Australia are less accessible to, and less able to be disturbed by, recreational off-road vehicles. This Recovery Plan supports ENR and local government in continuing to cooperate on managing access to best protect the coastal values on the Coorong.

APPENDIX III – Process for exemptions and licences

Internal PIRSA Policy – October 2003

Amenity Purposes – Local District Councils (section 59 or Miscellaneous Licences)

1. PIRSA to review the site, size of harvest area, method of harvesting and the time of year the wrack is to be harvested.
2. Initial discussion to be held with DEH and DOSAA to determine if any issues exist for the given area.
3. Assess whether the wrack is to be harvested by a commercial harvester or by the Council.
4. Recreational access to the removed wrack should be allowed by the Council.
5. The Council is to provide annual reports to PIRSA Fisheries on:
 - a. Estimates of the weight of wrack removed
 - b. The areas wrack is removed from
 - c. Quarterly photo monitoring of harvest areas
 - d. Photo monitoring pre and post-harvest activity
6. Seek approval from DEH, DOSAA
7. The section 59 exemption or miscellaneous licence should be ‘copied’ to DEH.

New Access

1. Consult with DEH (Coastal Protection Board), LGA (to ensure they approve access to the proposed area) and DOSAA (advice on potential heritage sites).
2. Request a full Environmental Impact Assessment from a scientist approved as capable by PIRSA. This is to be funded by the applicant and shall accompany the full application and a draft business plan.
3. The application, including EIA and Business Plan to be reviewed by a panel incorporating PIRSA, DEH and LGA.
4. If the application is supported, Native Title Notification and Aboriginal Heritage will need to be undertaken and formal local government approval sought.

APPENDIX IV – Management Plan

SOUTH AUSTRALIAN FISHERIES MANAGEMENT SERIES

DRAFT

**MANAGEMENT PLAN FOR HARVESTING BEACH-
CAST**

SEAGRASS & MARINE ALGAE

AUGUST 2000

Primary Industries & Resources South Australia
Fisheries

25 Grenfell Street, Adelaide
GPO Box 1625 ADELAIDE 5001

Foreword

Management of Marine Resources in South Australia

Marine resources in South Australia are common property resources. The role of the Government, as custodian of marine resources on behalf of the general community, is to ensure that marine resources are used in an ecologically sustainable manner and as efficiently as possible, while yielding a reasonable return to the community. This ensures that the benefits of the use of marine resources are maximised within the community.

Experience world-wide has shown that where there is unrestricted use of marine resources, there is little incentive for individuals harvesting the resource to conserve it and competition amongst users often leads to resource depletion. Left unmanaged, the increase in harvesting effort that results from competition is reflected in lower individual catches, over-capitalisation and reduced financial benefits. Loss of marine resources to the community can result in significant regional economic problems.

In carrying out management of beach-cast seagrass and macroalgae, PIRSA has the responsibility of ensuring that the basis for the sharing of the resource among all users is clearly understood and accepted as equitable, and that the allocation of fisheries resources and their level of utilisation are consistent with the needs of present and future generations.

Where scientific data or evidence on some biological parameter necessary for sustainable beach-cast harvesting is lacking, management decisions must be made in accordance with a precautionary approach. PIRSA endeavours to ensure through the implementation of this management plan that only ecologically sustainable volumes of beach-cast seagrass and marine algae are permitted for harvest.

Rob Kerin
DEPUTY PREMIER
MINISTER FOR PRIMARY INDUSTRIES,
NATURAL RESOURCES AND REGIONAL DEVELOPMENT

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1. INTRODUCTION

In South Australia (SA) the harvesting of beach-cast seagrass and marine algae is a relatively small, but growing, industry. Interest in harvesting has resulted from a rising market demand for seagrass and algal products both locally and internationally. The exploitation of a natural marine resource for financial gain is regarded as a commercial activity under the terms of the *Fisheries Act 1982* ('the Act'). Accordingly, the harvesting of seagrass or algal accumulations from any beach of the State is under the care, control and management of the Fisheries & Aquaculture Group of Primary Industries and Resources South Australia (PIRSA).

Beach-cast accumulations (wracks) of decaying seagrass and seaweed are considered essential components of coastal ecosystems. They serve several important roles in the ecology of local coastal environments. Wracks contribute to the food web dynamics of beach and nearshore marine communities, including valuable fisheries, by supporting microbial and invertebrate fauna that are preyed on by higher level consumers and they supply nutrients that can be utilised by plant and animal communities. Wracks also offer habitat to many bird species, some of high conservation status.

Hitherto, the beach-cast fishery has been managed by an *ad-hoc* system of permits issued on a limited 'first come, first served' basis to a small number of operators in the southeast of the State, largely for the purposes of research and development (R&D). Three factors are now dictating the need for a formal, planned approach to the development of this fishery:

- Demand for permits to harvest and export beach wrack is rising and several applications to begin harvesting in new areas are pending.
- In the past, the process of obtaining permission to harvest wrack has often involved negotiation with several different government agencies having overlapping or conflicting jurisdictions. A more streamlined approach is required.
- It is a requirement of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982* that permits for the export of wild specimens of native flora can only be granted if harvesting activities are subject to management under State legislation.

This document outlines a Management Plan ('the Plan') for harvesting beach-cast seagrass and marine macroalgae (seaweed) in South Australia. It describes management and research arrangements that will ensure the long-term protection and sustainability of both the industry and the resource, in accordance with Section 20 of the *Fisheries Act 1982*.

For the purposes of this Management Plan, beach-cast seagrass and seaweed accumulations are referred to as "wracks". Harvesting includes the removal, clearance, movement, re-location or disturbance of any part of a wrack. It is emphasised that the Plan covers only beach-cast material and does not refer to flora attached to a substrate or drifting in the water column, which will not be available for harvesting.

2. DESCRIPTION OF THE RESOURCE

2.1. SEAGRASS

Seagrasses are underwater flowering plants that evolved from land plants around 100 million years ago. There are about 30 different seagrass species from 12 genera in Australia. Seagrasses grow on sandy to muddy substrates, from the intertidal zone to a depth of approximately 40 metres. They are anchored to the substrate by a network of fibrous underground stems or rhizomes. Their distribution is dependent upon temperature and exposure to wave action but, most importantly, upon light. The depth distribution of seagrasses is therefore influenced by water clarity, as this controls light penetration.

In South Australia, seagrass meadows cover approximately 5000 km² of sea floor (Shepherd & Robertson 1989). Combined with meadows in Western Australia and Bass Strait, this constitutes one of the largest temperate seagrass ecosystems in the world (Shepherd & Robertson 1989). Most of these meadows are comprised of *Posidonia* spp. occupying the clear, sheltered waters of Spencer Gulf and Gulf St Vincent (Figure 1). Other major areas of seagrass distribution include the shallow embayments on the western coast of Eyre Peninsula (e.g. Streaky Bay), Lacedpede Bay in the southeast of the State and areas of Backstairs Passage, wherever suitable substrate occurs (Figure 1).

The main seagrass species occurring in South Australia are: *Posidonia angustifolia*, *Posidonia australis*, *Posidonia coriaceae*, *Posidonia denhartogii*, *Posidonia sinuosa*, *Amphibolis antarctica*, *Amphibolis griffithii*, *Heterozostera tasmanica*, *Halophila australis* and *Zostera muelleri* (Larkum & den Hartog 1989). In low-energy environments such as the two gulfs and Lacedpede Bay, the meadow-forming species *P. angustifolia*, *P. sinuosa*, and *P. australis* are most abundant. *Posidonia* generally requires stable, non-mobile sediments on which to grow and establish dense meadows. *P. coriaceae* and *P. denhartogii* generally only occur as small stands or as fringe communities. The four other species, (*A. antarctica*, *A. griffithii*, *H. tasmanica* and *H. australis*) occur either as fringe communities on the edges of blowouts¹³ in *Posidonia* meadows, as thin, dispersed populations on mobile sediments or in stands of mixed species composition (Shepherd & Robertson 1989).

Seagrass plants generally shed their leaves annually in early autumn; the blades are initially buoyant, then sink and accumulate in drifts on the seabed (Shepherd pers. comm.). During periods of strong wind and wave activity, particularly in the winter months, surge and swell resuspends and mobilises the detached leaf blades. Persistent onshore winds blow this drift-cast material into the surf zone and at high tide it is washed onto the beach in clumps. Greater than 95% of the beach-cast seagrass in South Australia consists of the blades of *Posidonia* spp. (Shepherd pers. comm.).

The amount, location and timing of wrack deposition depend on the density and areal extent of offshore seagrass meadows as well as on local tidal, current, wind and storm activity. Wrack remains on the shore for variable lengths of time - in some cases only one tidal cycle - or may become stranded above the high water mark and accumulate over weeks or months forming large semi-permanent deposits. Often, beach-cast material is washed back into the surf zone and re-deposited several times resulting in significant longshore movement of wrack. Consequently, large variations in wrack deposits occur from one location to another and on a monthly, weekly or daily basis. Persistent accumulations are often associated with man-made structures such as groynes, breakwaters and jetties. At Kingston for example, there is a large, permanent accumulation of seagrass wrack approximately 2 metres deep covering the beach between the southern groyne of the Maria Creek outlet and the town jetty.

¹³ Saucer- or trough-shaped depressions of bare, unvegetated sand in the midst of seagrass meadows (Clarke & Kirkman 1989).

2.2. MACROALGAE

The marine macroalgal diversity of temperate Australia is one of the richest in the world, with approximately 123 species of Chlorophyta (green algae), 203 species of Phaeophyta (brown algae) and about 800 species of Rhodophyta (red algae) recorded within southern Australian waters (Womersley 1984). Many of these macroalgal species are endemic to the region. Robe (in the southeast of SA) is regarded as the westerly limit of a number of key taxa including the large kelp (*Macrocystis angustifolia*) and the bull kelp (*Durvillaea potatorum*). South Australia's macroalgal flora is also characterised by a small number of subtropical species, which generally occur in sheltered waters and inlets where temperatures are high enough for the species to survive.

Macroalgae grow on shallow rocky substrates and are common on the numerous inshore limestone reefs that dot the coastline of South Australia. Some species, particularly the kelps, grow to very large size and form dense subtidal beds. During storms and periods of strong winds, large numbers of these macroalgae are uprooted or fragmented by wave action and swell and later washed up on nearby beaches. The supply of cast algae, like seagrass, is highly variable over short time and space scales, but is again most predominant in winter when very large accumulations may occur. Various seaweed species are found within algal beach wracks; their abundance varies depending on location and the source of the material. The species that are targeted by the fishery are primarily several large brown algae (e.g. *Durvillaea potatorum* and *Ecklonia radiata*) and some of the red algae such as *Gracilaria*.

3. DESCRIPTION OF THE FISHERY

3.1. HISTORY

Beach-cast wrack harvesting has been a sporadic activity for many decades in South Australia but the current fishery began developing early in 1990 when two permits were granted for commercial harvesting in the southeast of the State. Interest in both algal and seagrass wrack harvesting intensified in 1993, when a number of applications were received by PIRSA for additional operators in the southeast as well as in new areas such as Lady Bay and Port Parham. Over the years, a total of seven permits have been issued, mainly to operators in the southeast of the State, but a small amount of harvesting has occurred at Port Parham and Port Adelaide (North Haven) as well. These permits were issued (i) for the purposes of market research and development, to identify potential markets for seagrass and algal products and determine if the industry could be viable and (ii) to allow certain seaside councils to improve local beach access and amenity. Currently, commercial wrack harvesting is a small-scale 'developmental fishery' with fewer than six registered permit holders who harvest seagrass and algal material at Kingston and Beachport. Permits are issued on an annual basis with no guarantee of renewal from year to year.

In the absence of scientific data, and because of concerns regarding the possible impact on coastal fisheries from the regular or over-harvesting of wrack accumulations, PIRSA has always adopted a 'precautionary approach' to the harvesting of beach-cast wracks. As a result, the fishery has been managed conservatively and average annual harvests have not exceeded approximately 50 - 100 tonnes (t) of algae and 3,000 t of seagrass (and usually much less than this) for the entire period of the fishery. However, an increase in requests for permission to harvest wracks at several new locations in SA have been received by PIRSA. There has also been pressure from some current harvesters for increased access. In 1996, in response to the increased interest in wrack harvest, PIRSA declared a moratorium on the issue of any new permits in the fishery, pending the development of a management plan.

3.2. HARVESTING

Wrack harvesting currently takes place on beaches around the shoreline of Lacedpede and Rivoli Bays (Figure 1), mainly along the Kingston and Beachport foreshores. Each permit holder is provided with access to a specified area of foreshore and/or an allocated quota of wrack material. Permit conditions

specify methods of access and harvesting and any relevant restrictions on harvesting activities considered necessary by PIRSA or other relevant government agencies.

Harvesting is sporadic, being carried out opportunistically whenever significant quantities of wrack are deposited on the foreshore. As a result, the majority of harvesting takes place during winter and spring when peak accumulations occur. Beach-cast seagrass wracks are normally harvested using machinery such as bulldozers, front-end loaders and excavators which load the material onto trucks for removal. One harvester has investigated the utility of collecting seagrass wrack with a bailing machine towed behind a tractor.

Fresh specimens of macroalgae are collected immediately after storms or periods of strong wind, prior to the onset of any degradation or burial by wind-blown sand, from beaches adjacent to offshore limestone reefs. Seaweed harvesting is species-specific; that is, the target species is selected specifically for its unique chemical properties. Individual plants are collected by hand, sometimes from amongst wracks of mixed algal composition, and loaded into vehicles for removal. Macroalgae may also be collected as a by-product of seagrass harvesting.

3.3. UTILISATION

Seagrass and marine algae are harvested for a variety of uses throughout Australia and overseas. Seagrass wrack is commonly stored in paddocks and allowed to decompose for several years before it is suitable for use as a soil improver or as garden mulch. Algae are processed immediately either via composting or by drying on outdoor racks and crushing. Algal derivatives are used in the production of alginate and agar, mineral supplements, cattle feed, garden fertilisers, and pesticides. There is moderate demand for wrack material to supply the domestic market and a number of harvesters are developing products for overseas export. In addition, research is underway into alternative uses of wrack material.

4. STAKEHOLDERS

4.1. MANAGEMENT AND REGULATORY AUTHORITIES

Various agencies in all three tiers of government have been involved with beach-cast wrack harvesting through their relevant statutory obligations. These include the Department of Transport, the Department for Environment and Heritage, PIRSA Fisheries & Aquaculture, Local Government and Environment Australia (Commonwealth Government).

4.1.1. Primary Industries & Resources South Australia (PIRSA)

A 'fish' is defined in Section 5 of the *Fisheries Act 1982* (the Act), as: "***an aquatic organism of any species and includes the eggs, spat or spawn, or the body or part of the body (including the shell) of such an organism***". Seagrass and algal products, whether drift-cast, beach-cast or attached, are a 'fish' for the purposes of the *Fisheries Act 1982*. The taking of all, or any part of, a 'fish', is conducted under the provisions of the Act, which is administered by PIRSA. The *Fisheries Act 1982* endeavours to ensure the sustainable development of the living aquatic resources of the State. Two of the prime objectives of the Act are:

- (a) *ensuring, through proper conservation, preservation and fisheries management measures, that the living resources of the waters to which this Act applies are not endangered or over exploited; and*
- (b) *achieving the optimum utilisation and equitable distribution of those resources.*

PIRSA achieves these objectives, in part by:

- *the development of management arrangements for aquatic resources in consultation with stakeholders;*
- *monitoring and promoting community compliance with legislation and regulations.*

There are at present no formal management arrangements or licensing regulations in place for the harvesting of beach-cast seagrass or macroalgal wracks. Initially, permits authorising a person to engage in the removal or disturbance of beach-cast wrack material were issued under Section 48G of the Act; however, Section 48G forms part of 'Division 2 - Protection of Aquatic Habitat' in **aquatic reserves, marine parks and declared waters**. Accordingly, section 48G was subsequently not deemed appropriate for the purpose, as it does not encompass the general protection of aquatic resources outside of these waters. In light of this, from 1996 the Director of Fisheries began issuing Ministerial exemptions from the *Fisheries Act 1982*, under Section 59 as an interim measure. Recent amendments to legislation and policy now dictate that a separate *Scheme of Management* be drafted for the fishery and that harvesting operations be conducted in accordance with the terms and conditions defined in the regulations promulgated under that *Scheme of Management*.

4.1.2. Department of Transport (DoT)

The Minister for Transport is the custodian of the seabed of the State under the *Harbours and Navigation Act 1993*. The seabed is defined as "all land submerged up to the high tide mark or to property adjacent or subjacent to the high tide mark". (Part 3 of the *Harbours and Navigation Act 1993* defines 'adjacent and subjacent' as land extending from the high-water mark on the shore to the nearest road or section boundary, or to a distance of 50m, which ever is the lesser distance¹⁴). The Department of Transport (DoT) is also responsible for managing commercial activities which take place on foreshore lands between the high and low water marks.

If the land is not a reserve under the *National Parks and Wildlife Act 1972*, or an Aquatic Reserve or a Marine Park under the *Fisheries Act 1982*, then the Minister for Transport may, by proclamation, place any adjacent or subjacent land belonging to the Minister for Transport in the care, control and management of any Minister or Authority such as a local or district council.

4.1.3. Department for Environment and Heritage (DEH)

Coast Protection Board

The Coast Protection Board which is serviced by the Coast and Marine Section (CMS) of DEH is responsible for the management of natural resources in the coastal zone such as sand dunes, coastal vegetation etc. CMS has expressed concern at the removal of seagrass wracks from South Australian beaches because of their role in the formation and stabilisation of sand dunes, prevention of soil erosion and general protection of the foreshore as well as their importance to littoral and coastal food webs, and in providing habitat to many bird species (see Section 5).

Biodiversity and Heritage Division

The Biodiversity and Heritage Division is responsible for the care, control and management of all activities occurring on lands and/or waters entitled to the Minister for Environment, Heritage and Aboriginal Affairs. Proposals to conduct commercial activities on such lands and/or waters are subject to the discretion of the Director for National Parks and Wildlife. Lands and/or waters entitled to the Minister include National Parks, Conservation Parks/Reserves, Regional Reserves, Game Reserves, Recreation Parks and Wilderness Protection Areas. Coastal parks/reserves may be declared to low water mark incorporating the management of the beach within the park/reserve.

¹⁴Land which forms part of a reserve under the *National Parks and Wildlife Act 1972*, or is in the care and control of a council (but not within a harbour) is excluded from the provisions of the Act.

4.1.4. Local Government

Seagrass harvesting is regarded as a commercial activity and Local Government must therefore determine (i) if harvesting seagrass wracks constitutes development for the purposes of the *Development Act 1993* and (ii) whether the land that the harvesting activity takes place on is regulated for a specific purpose under the Council's Development Plan.

The Minister of Transport has vested the care, control and management of coastal lands under the jurisdiction of the Harbors and Navigation Act to the sea-side local government Councils.

In addition, Councils may control vehicular access to the beach and/or enforce by-laws regarding the nature and manner of any activities conducted on the foreshore. A survey of all 34 seaside Councils in South Australia established that 12 of them have promulgated by-laws that either implicitly or explicitly prohibit the removal of plant material from the beach without Council permission. Many of the others also restrict the collection of seagrass to small amounts for personal domestic use.

4.1.5. Environment Australia

The Commonwealth controls trade in wildlife and wildlife products through provisions of the *Wildlife Protection (Regulation of Exports and Imports) Act 1982 (Wildlife Protection Act)*. Generally commercial export of wild harvested native plant and animal specimens may occur where the specimens are harvested under an approved management program (Section 10) or where the specimens have been declared as controlled specimens (Section 10A). Currently there are two individual harvest operations approved as controlled specimens. PIRSA will submit this management plan to Environment Australia for approval under the *Wildlife Protection Act*.

Approval of a state-wide management plan will supersede the approval of the individual harvest operations. Export permits will still be required and the applicant proposing to export would have to provide evidence to Environment Australia that the activity is in accordance with State law and the approved management plan.

National and international Obligations

The international conventions "The Convention on Migratory Species (Bonn)" and the "Convention on Biological Diversity" place obligations on Australia that may have implications for this management plan.

Australia is a signatory to two bilateral agreements on migratory shore birds, one with Japan, the other China. The Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA) list migratory species of shore birds for which beach-cast wrack provides a basis to their food chain.

The proclamation of the Environment Protection and Biodiversity Act 1999 in July 2000 will provide statutory cover for these international obligations where actions impact on matters of national environmental significance. As beach-cast wrack supports migratory shorebird food chains as well as providing habitat to endangered species of wildlife such as the hooded plover and the orange-bellied parrot the actions of harvesting the wrack will require monitoring to ensure impacts are not serious.

4.2. COMMERCIAL HARVESTING SECTOR

Currently, the fishery is comprised of one commercial beach-cast algal harvester and three commercial seagrass wrack harvesters, all of whom operate in the southeast of the State between Kingston and Beachport (Figure 1). Previous permit holders in the Robe and Port Parham areas are no longer active. The permits are in most cases owner-operated and each operator also carries out product development and marketing.

4.3. COMMUNITY AND CONSERVATION GROUPS

A wide variety of community and conservation groups have a stake in the preservation of coastal and nearshore marine environments. Much of South Australia's coastline is relatively pristine and provides highly valued recreational and tourism opportunities to the South Australian community as well as to overseas visitors. The general public, as well as all interested organisations, will be offered the opportunity to provide comment on the management plan for the beach-cast fishery.

5. ECOLOGICAL IMPORTANCE OF BEACH-CAST WRACK

5.1. NUTRIENT CYCLING AND FOOD WEBS

Several studies, most notably in Western Australia (WA) and South Africa, have highlighted the importance of beach-cast seagrass and macroalgal accumulations as sources of detritus and of particulate and dissolved nutrients which form the basis of beach and inshore marine foodwebs (e.g. Griffiths & Stenton-Dozey 1981; Koop & Griffiths 1982; Lenanton *et al.* 1982; Robertson & Hansen 1982; Griffiths *et al.* 1983). Wracks of dead seagrass and algal material are physically broken down by wave and sand abrasion and are biologically decomposed by the action of bacteria and small invertebrates. Decomposition by bacteria releases nitrogen and phosphorous - nutrients necessary for the growth of offshore seagrass meadows (Bell 1983). In WA, substantially higher concentrations of dissolved nutrients were measured in waters adjacent to beaches covered in decaying wrack material compared with wrack-free beaches, where waters were relatively nutrient-deficient (Bell 1983).

A rich community of detritivores¹⁵, such as amphipods, isopods (sandflies), coleoptera (beetles) and diptera (flies) rapidly colonises and consumes the decaying vegetation, breaking it down into detritus and particulate carbon (e.g. Griffiths & Stenton-Dozey 1981; Marsden 1991). Griffiths, Stenton-Dozey & Koop (1983) for example recorded 35 species (of which 22 were insects) amongst kelp wrack, which together amounted to more than 97% of the total intertidal faunal biomass. These organisms can reduce the biomass of dead macroalgae to 50% of its initial weight after 2 days and 20% after 14 days, mainly due to consumption by amphipods and dipteran (kelp fly) larvae (Griffiths & Stenton-Dozey 1981; Rieper-Kirchner 1990). Several species of beach flies complete their life cycles within seagrass/algal wrack (Blanche 1992 in Kendrick *et al.* 1995). The herbivorous detritivores are in turn preyed upon by beach-dwelling macrofauna such as beetles, birds and isopods. Griffiths *et al.* (1983) suggest that at some sites on the southwest coast of South Africa, approximately 95% of the food supply of beach macrofauna comes from the regular, enormous influxes of kelp.

Particulate and dissolved carbon and other organic matter released from wracks by bacteria may either remain in situ and enter the sand column as a source of nutrients to interstitial fauna, or be leached back into the sea at high tide to support detrital-based benthic communities. Very high concentrations of dissolved organic matter (DOM) have been recorded in sand below beach-cast kelp and this in turn supports a high biomass of interstitial meiofauna (Koop & Griffiths 1982; Rieper-Kirchner 1990). Peak numbers of nematodes and oligochaetes for example often occur beneath rotting seaweed (Koop & Griffiths 1982).

Moreover, nutrients, detritus, particulate carbon, bacteria and prey organisms in wracks are often transported by wave action into the surf zone where they serve as an important food source for particulate suspension (filter) feeders, crustaceans, molluscs and fish (Kirkman & Kendrick 1997). For example, work by Lenanton *et al.* (1982) demonstrated that the main prey item of the juveniles of many important commercial fish species such as school whiting (*Sillago bassensis*), yellow-eyed mullet (*Aldrichetta forsteri*) and tommy ruff (*Arripis georgianus*) is the amphipod *Allorchestes compressa* which lives exclusively on detached macrophytes on the beach and in the surf zone.

¹⁵ Animals that feed on dead organic matter

Detritus from wracks can also be exported offshore to supply food to demersal and abyssal fauna (Suchanek *et al.* 1985 in Thresher *et al.* 1992; Joselyn *et al.* 1983 in Kendrick *et al.* 1995). In addition, recent work in Tasmania (Thresher *et al.* 1992) strongly suggests that "it might also constitute a widespread and potentially important source of productivity for planktonic ecosystems as well". These authors found evidence that the food chain supporting first-feeding larvae of Tasmanian blue grenadier (*Macruronus novaezelandiae*) - the dominant nektonic (midwater) predator of the region - is based on microbial decomposition of seagrass detritus. First feeding is often maintained to be a critical period for fish larval survival. Moreover, higher rates of larval growth were associated with periods of frequent winter storms, when offshore transport of seagrass detritus from coastal wrack accumulations is at a maximum (Thresher *et al.* 1992). Thus, the export of detrital material from wracks may significantly affect the reproductive success of one of temperate Australia's dominant fish predators (Thresher *et al.* 1992).

The wrack community therefore constitutes a significant food resource consisting of fragments of seaweed and seagrasses, bacteria, meiofauna and beach macrofauna. It may remain in situ, providing food for terrestrial detritivores and consumers (including insects and birds) or it may be washed back into the sea during storm or high tide events, where it provides food for benthic coastal communities and important feeding sites for shallow water fish species. Particulate matter from the breakdown of wracks also appears to have a direct effect on offshore secondary production.

5.2. BIRDS

Many shorebirds and seabirds are associated with wrack accumulations. These birds make use of the beach-cast vegetation for a variety of purposes including feeding, nesting, shelter during strong winds or storms and camouflage while resting. Wrack-inhabiting organisms are preyed upon by a large number of shorebirds and constitute an important food resource for species such as the vulnerable Hooded Plover, which feeds on crustaceans, insects and polychaetes (Kendrick *et al.* 1995). In WA, decomposing wrack provides an important winter food source for Silver Gulls, which feed on kelp fly larvae and amphipods and may time their breeding cycle to coincide with the local availability of wrack (Kendrick *et al.* 1995). On King Island, Ruddy Turnstones and Double-banded Plovers are amongst the birds that forage in the bull kelp for small invertebrates. These species have all been recorded feeding in beach-cast vegetation in SA as well.

Wrack accumulations also provide habitat and nursery areas for many birds species. They provide protection and camouflage for nest-sites, eggs, chicks and adults alike (McCulloch 1996).

In South Australia, a total of 40 species of birds have been recorded utilising beach-cast wrack in some way (McCulloch 1996). This includes long-distance migratory birds, waiting out the tide or bad weather in the lee of wrack accumulations, as well as many resident species. Wrack thus constitutes a valuable component of bird habitat (McCulloch 1996).

The orange-bellied parrot migrates from breeding grounds in Tasmania to coastal areas in Victoria and south east South Australia for each summer period. It usually frequents the dune and beach system feeding on the vegetation along the coast. This bird is classified as Nationally Endangered and is subject to a Recovery Plan jointly managed by the Commonwealth, Victoria, South Australia and Tasmania.

5.3. COASTAL GEOMORPHOLOGY

In contrast to macroalgae, which are subject to very rapid deterioration, seagrasses are composed primarily of cellulose fibre with characteristics that inhibit breakdown of the vegetative matter. Beach-cast seagrass accumulations are therefore typically long-lived, taking as many as 3 - 5 years to fully decompose into detrital matter. As a result, seagrass wrack may accumulate to a height of several metres and serve as a physical barrier between the sea and the dune system, reducing wave energy and providing a degree of protection to the foreshore.

Seagrass wracks also enhance the formation and stabilisation of coastal sand dunes and beaches, their fibrous composition acting as a trap to bind drifting sands and reduce sand erosion in winter. They may also contribute to the fertility and stability of substrates behind the foredunes.

6. MANAGEMENT OF BEACH-CAST WRACK HARVESTING

6.1. MANAGEMENT OBJECTIVES

The principal objectives of the *Fisheries Act 1982* are to ensure that the living aquatic resources of the State are not endangered or over-exploited and that optimum utilisation and equitable distribution of these resources is achieved. In the case of beach wrack, the dangers of over-exploitation apply not so much to the wrack itself (which is, after all, dead or dying) as to the organisms and communities dependent upon it as a source of nutrients, food, shelter and refuge. Thus, these general objectives have been interpreted specifically for the case of the beach-cast fishery in terms of the following aims.

AIMS:

- **TO ACHIEVE ECOLOGICALLY SUSTAINABLE DEVELOPMENT OF THE INDUSTRY, SUCH THAT THERE ARE NO ADVERSE EFFECTS EITHER ON OTHER STATE FISHERY RESOURCES OR ON COASTAL ECOSYSTEMS GENERALLY**

BY:

- » adopting a precautionary and conservative approach to wrack harvesting and exercising stringent controls on the quantity of material removed
- » implementing monitoring arrangements which ensure routine reporting of harvest operations
- » recommending research programs that study the links between wrack deposits on beaches and inshore coastal productivity
- » ensuring that the method of removal does not cause damage to the adjacent dune area

- **TO ACHIEVE LONG-TERM ECONOMIC STABILITY OF THE INDUSTRY**

BY:

- » guaranteeing access to a sufficient quantity of the resource to ensure that the industry remains commercially viable
- » formalising licensing arrangements, thereby providing security of tenure
- » limiting the number of new entrants to the fishery

- **TO MAINTAIN SOCIAL AND ECONOMIC JUSTICE**

BY:

- » clarifying conditions of entry and exit to the fishery, and resource allocation within the fishery
- » streamlining and simplifying administrative processes

6.2. MANAGEMENT ISSUES AND STRATEGIES

6.2.1. Ecological Impacts

It is clear from Section 5 that beach-cast seagrass and algal wracks serve several important ecological functions in environments extending from the supralittoral¹⁶ to the abyssal¹⁷ and encompassing both

¹⁶ above the high water mark

benthic¹⁸ and pelagic¹⁹ systems. Sandy beaches are characterised by an absence of attached macrophytes and hence an almost complete lack of *in situ* primary production (Griffiths, Stenton-Dozey & Koop 1983). The import of detached macrophytes from offshore beds provides organic material that delivers nutrients to the interstitial food chain as well as acting as the primary food source for intertidal fauna (Marsden 1991). The macrofauna in particular relies entirely on material imported from the sea to meet its nutritional requirements. Wrack therefore provides a rich food supply that is not only persistent, but also concentrated high up on the beach.

The contribution of decomposing seagrass and seaweed to productivity in marine ecosystems has also been shown to be both measurable and significant. Both in the surf zone and on the beach, wracks are important sites for the nutrient recycling which sustains nearshore primary and secondary production in coastal waters. South Australia's waters are generally nutrient-poor and the decomposition of beach-cast wrack may supply a vital source of particulate and dissolved organic matter to the State's coastal ecosystems. Moreover, the large supply of detritus and prey organisms released during wrack breakdown supports marine food webs, including some that lead to commercially important fish species. This suggests that the removal of wrack material from beaches may have implications for other fisheries that are dependent upon nearshore productivity (Kendrick *et al.* 1995). This has particular significance for seagrass wrack harvesting in the two gulfs in South Australia where there are few, if any, other nutrient inputs to the system and productivity is low (Smith & Veeh 1989). It may however be of less importance in more nutrient-rich coastal marine environments (Kendrick *et al.* 1995) such as the southeast of SA, and perhaps also off the west coast of Eyre Peninsula (Figure 1), where seasonal upwelling events return nutrient-rich bottom waters to the surface layers. In the southeast there is also an additional input of nutrients to the inshore zone via a series of agricultural drains.

It must therefore be borne in mind that the removal of beach-cast material may disrupt terrestrial and marine food webs, interfere with nutrient recycling to the nearshore zone and deprive subsurface beach organisms of dissolved organic materials (Anderson *et al.* 1989). This net loss of organic matter from the shoreline will impact upon sandy beach ecosystems in a way that cannot as yet be predicted and must be determined through future research and monitoring.

Beach-cast wrack also clearly constitutes a valuable component of bird habitat for many species of sea and shore birds, including some that are listed as threatened or vulnerable. Harvesting of wrack may adversely affect bird species that are dependent upon undisturbed seagrass wracks for feeding, resting, nesting and raising chicks²⁰. It also has the potential to incur damage to the foreshore, interfere with beach stability and contribute to coastal erosion.

Given the potentially harmful effects of wrack harvesting on beach and nearshore environments and the lack of quantitative scientific data from which to establish a sustainable harvest level, there are good commercial and conservation motives for adopting a precautionary and structured approach to harvesting beach wrack and avoiding a too-rapid development of the fishery before the wider and more long-term impacts of this activity on dependent coastal ecosystem processes have received some scientific attention.

STRATEGY 1: Harvesting by existing operators to be capped at existing levels and a component of licence fees from operators be directed towards a research program to determine the relative importance of wrack to coastal trophodynamics and coastal processes. Any increase in access or granting of new licences will be subject to scientific evidence indicating that an increase would

¹⁷ pertaining to the ocean depths

¹⁸ of or on the sea bed

¹⁹ of or in the water column

²⁰ For instance, DEH has identified Cape Jaffa and the area of Kingston Beach north of the Blackford Drain and adjacent to an Urban Coastal Zone Reserve as important habitat for Orange-bellied Parrots. Also the extensive tidal flats associated in Gulf St Vincent and Spencer Gulf provide valuable habitat for shorebirds and waterbirds, some of which are species of national and international importance.

be ecologically sustainable. Licence holders must also provide PIRSA Fisheries and Aquaculture with a yearly assessment of the harvest area.

STRATEGY 2: Commercial beach-cast seagrass and macroalgal harvesting will be permitted to continue in the southeast of South Australia (easterly of the meridian of longitude 139°E) but prohibited from the shorelines of Gulf St Vincent, Spencer Gulf, West Coast and Kangaroo Island at least for the life of this plan (5 Years).

STRATEGY 3: Disturbance by commercial operators to sand dunes, coastal vegetation, fauna and beach surfaces is to be minimised by:

- 1. restricting vehicular access to the beach except via established tracks and boat ramps**
- 2. limiting the use of heavy machinery and mechanical harvesters**
- 3. The direct removal of sand is prohibited and harvesters of seagrass wrack are to leave a 10 cm covering (depth) of seagrass remaining behind on harvested sections of beach except in the case of authorised removal for public amenity purposes in areas identified by Local Government**
- 4. Harvesting is limited to beyond 4 metres from the toe of the fore dune to minimise potential for machinery to damage the coastal vegetation**
- 5. Harvesting is Strictly limited to beach wrack deposits and material must not be harvested from below the low water mark**
- 6. Harvesting will not be permitted in areas considered to be critical bird habitat or at times when species of high conservation status are nesting in accordance with DEH recommendations**
- 7. Processing of harvested material is to be carried out off-site**

6.2.2. Public Amenity

One of the benefits from harvesting wracks is to increase the amenity values of coastal beaches for recreation and tourism. Tourism is regarded as a major economic activity in many seaside suburbs and towns. Seagrass wrack accumulations tend to adversely affect recreational use and enjoyment of beaches and coastal public venues. The decomposition process often produces hydrogen sulphide gas, which has a highly unpleasant odour, and attracts plagues of beach flies (Kirkman & Kendrick 1997). Metropolitan and District Councils are therefore interested in removing seagrass from beaches which are recognised as important local tourism assets as well as at specific sites (such as boat ramps and marinas) where wracks are regarded as a problem. This has the potential of cleaning up and beautifying popular tourist beaches and thereby benefiting both local residents and visitors. Kingston for example receives a large influx of visitors during the summertime, many of whom stay at the town caravan park on the foreshore. To improve the recreational amenity value of the foreshore and allow direct access from the caravan park to the beach, DC Lacepede has removed significant quantities of seagrass wrack from the Kingston beach between the jetty and the boat ramp for a number of years. In the past, this material was simply bulldozed up the foreshore, levelled and sown to lawn.

STRATEGY 4: Subject to consultation with PIRSA, DEH and DoT, permission may be granted to coastal Councils for the removal of permanent accumulations of seagrass wrack at locations where Councils can provide appropriate justification (public swimming beaches, boat ramps, recreation areas) for the removal of persistent wrack deposits to improve public amenity values whilst maintaining stability of the beach and dune system.

6.2.3. Regional Development

Beach-cast wrack harvesting has the potential to produce exportable, value-added primary products and thus improve local regional economies. Some of these products may eventually replace existing imported goods. Agencies such as the Southeast Employment Resource Development Enterprise have assisted in establishing certain businesses within the industry (under the New Enterprise Incentive

Scheme) in recognition of their potential to contribute to the economic growth of the State and create more employment for the region. The South East Economic Development Board has also expressed support for individual industry operations which it considers to be in line with its regional strategy for economic growth, export potential, capital investment and job creation.

STRATEGY 5: Access to the resource is to be maintained in accordance with the terms and conditions of this plan for current industries that are dependent upon the harvest of beach-cast seagrass or macroalgae within current designated harvest areas at the time of implementation of this plan

6.2.4. Recreational Collection

Members of the public often seek to obtain small amounts of beach-cast seagrass wrack in particular, for use as 'mulch' or fertiliser on domestic gardens. In some cases, local by-laws exist which prohibit this without Council permission. These requests have generally been granted, provided the material is harvested by hand and only small quantities are collected. In a few cases, where the Council believes it is detrimental to the shoreline, this activity is either discouraged or actively prohibited.

STRATEGY 6: Decisions relating to recreational (non commercial) harvests of beach-cast wrack are the responsibility of the relevant Local Government Authority, where enabled through regulation. Such harvest is to remain small-scale and a strictly non-commercial activity. Coastal Councils seeking to authorise recreational collection must provide PIRSA with a policy on recreational collection for approval.

6.3. MANAGEMENT ARRANGEMENTS

6.3.1. Licensing System

The most appropriate arrangements for granting access to beach-cast seagrass and macroalgal resources are by means of a fishery licence under the *Scheme of Management Miscellaneous Fishery*. The following conditions are to apply with regard to licensing regulations governing terms and conditions of access and operation in the fishery:

1. That existing permit holders be offered a licence in the fishery. If a current permit holder does not exist, or the current permit holder does not wish to make an application for a licence, the licence may then be issued through a prescribed tender process.
2. A licence can be granted to a body corporate or a natural person.
3. The Director of Fisheries shall only issue a licence once licence fees (or the first instalment thereof) have been paid. The cost of a licence is determined by the Minister and will be based on the costs of administering and managing the fishery. The licence fee includes funds for an assessment by PIRSA of the beach-cast wrack in the proposed area of harvesting on a yearly basis (see Section 6.3.2) and costs of audit of monitoring systems. Licence fees are charged on a yearly basis.
4. A limit of one licence shall be issued for each designated harvest area in which the Director of Fisheries considers a sufficient volume of the resource exists to support a sustainable harvest. Each licensee is therefore afforded sole access to a nominated section or sections of shoreline and a particular species allocation (see Section 6.3.2 and Section 6.3.3) There should be no spatial overlap in the areas of operation among licenses
5. Each Licence contains specific regulations relating to the methods of harvesting allowed (access routes, type and number of items of machinery, exclusion zones, closed seasons). The methods of harvesting will be set as part of the initial assessment process and will involve consultation with PIRSA, DEH, DoT and Local Government. These regulations are subject to change at the

discretion of the Director of Fisheries, on consultation with the harvester and other relevant authorities.

6. The holder of a licence must provide the Chief Executive of PIRSA with catch and effort results for each calendar month in which the licence is current (see Section 6.3.4). A form approved by the Minister for Primary Industries is to be used for this purpose. The licence holder should also supply photo point monitoring of beach and dune profile, and vegetation line.
7. All councils proposing to remove and on-sell beach-cast seagrass are required to hold a licence under the terms and conditions of this management plan. Councils may sub-contract a licensed harvester to collect seagrass under the terms and conditions of this plan from specific areas of foreshore where those areas are under the care, control and management of the Council.
8. Beach-cast licences will be transferable but access rights to a particular section of beach may not be traded as this is not the jurisdiction of PIRSA.
9. Each licensee will be permitted to nominate a total of two 'Masters'²¹ who may harvest the resource on their behalf on their section(s) of foreshore.

6.3.1.1. Licence application process

Current and potential wrack harvesters must submit an application to harvest beach-cast wrack for each intended area of operations on the application form shown in Appendix 1. This application must include a detailed description of the anticipated methods of harvest. The prescribed fee for assessing an application for a Miscellaneous Fishery beach-cast licence must accompany the application form and will include costs for assessment of locations by PIRSA. Submission of an application form for beach-cast wrack harvesting does not guarantee that a licence will be issued.

Before PIRSA grants access to the resource, it will first give due consideration to the possible impact of the activity on the coastal environment. As numerous agencies are involved in this issue through their relative statutory obligations, it is necessary to implement a standard consultation arrangement that provides a clear process by which wrack harvest applications will be routinely assessed including the issues referred to in 6.2.1 above. An inter-departmental assessment protocol will be used to facilitate assessment by PIRSA, DEH and DoT to determine the suitability and conditions of each harvest application.

6.3.1.2. Inter-departmental Assessment Protocol

1. Licence application is received by PIRSA with specific details of the operation documented on the application form (Appendix 1).
2. All applications to harvest wracks will first be screened by PIRSA Fisheries & Aquaculture who will assess the overall merits of the application and ensure that it complies with the objectives of the Management Plan for the fishery. PIRSA will also assess the relative abundance of wrack at the location and a sustainable resource allocation (see Section 6.3.2). To this end, PIRSA may seek scientific advice and information from a research agency. PIRSA will also consult with relevant Local Government about the suitability of proposed operations before the application proceeds further.
3. If there are no objections to the harvest operation on the basis of resource sustainability and beach ecology, the application will proceed to the next stage of the licence assessment process. PIRSA will consult Local Government and DEH about the suitability of the proposed operation with regard to coastal land use and local planning and development issues and obtain advice and

²¹ An employee of the licence holder who has been nominated to operate the licence in their absence.

recommendations relating to any terms and conditions that should be imposed on the harvest operation. DoT will be informed of the application and asked to identify if there are any other existing or intended DoT lease commitments to the said area of land.

4. PIRSA will note and review comments and suggestions received from all other stakeholders, the application will be forwarded to the Director of Fisheries with recommendations regarding suggested allocation and harvest conditions to be incorporated onto the licence.
5. A final assessment will be made by the Director of Fisheries, who will review the information and advice obtained during the inter-departmental review process and either approve or reject the licence application, or advise that it should be modified. **Approval must be granted by all relevant agencies in order for an application to be approved.**
6. If approved, the Director of Fisheries will issue a Miscellaneous Beach-cast Fishery Licence pursuant to the *Fisheries Act 1982*.
7. PIRSA will advise DoT on foreshore access licence requirements.

The above protocol will ensure that PIRSA retains overall control of all proposed harvesting operations. The application may at any stage be rejected or returned to the applicant for modification or amendment if the application compromises management objectives for the fishery or current development arrangements for the region.

6.3.2. Resource Allocation

There is currently no research basis from which to determine ecologically sustainable beach-cast harvest levels. There are also no historical records of wrack biomass, composition or turnover rates for any beach in the State. Moreover, any assessment of wrack abundance is problematic because of the highly patchy and mobile nature of the resource. The wrack is unevenly deposited along the foreshore and residence time on the beach may be highly variable. Transport back into the subtidal zone by wave action, combined with longshore drift results in changes in wrack biomass at time scales of days and weeks. Thus, averaged amounts of beach wrack calculated for a length of coastline are probably over-estimates as wrack is patchily distributed across sites and between seasons (Kendrick *et al.* 1995).

In light of the difficulties in quantifying the amount of wrack available to harvest, it is felt that the most appropriate approach is to apply the precautionary principle and ensure the level of harvest is contained by limiting the numbers of entitlements with controls on the amount of removal being set conservatively. On this basis the management approach to regulating the fishery is by the use of input controls, such as limiting the location of harvesting and the number of entrants to the fishery and their harvesting operations. To this end, an assessment of each and every proposed area of harvest operations must be carried out which takes into consideration the nature, amount, function and turnover rate of the wrack available at the site. Regard must be given to whether the wrack is persistent or highly mobile and the likelihood and rate of replenishment. This information will be used to determine whether the wrack accumulation may be harvested sustainably from an area according to best available evidence. The assessments may be undertaken by a consultant engaged by the licence applicant, but must be done according to a described methodology so that it can be verified by PIRSA and DEH. The methodology must stipulate the parameters to be measured including area covered, time period, methods of estimating amount of wrack, species composition of wrack, likely impact on beach ecology, identification of bird nesting or critical habitat etc. Costs resulting from the assessment process will be incurred by the licence applicant. This does not guarantee that the applicant will be granted permission to harvest the wrack. Licence holders must also provide PIRSA Fisheries and Aquaculture with a yearly assessment of the harvest area.

The applicant funding the assessment process will be entitled to first right of access to the resource on a particular section, or sections, of the foreshore. This may or may not be the entire length of beach proposed in the original licence application. The proportion thereof will be determined during the licence assessment process (see Section 6.3.1.2). Within the allocated section(s) of beach, the licensee will be permitted to harvest 100% of the allocated species of seagrass or macroalgae with the proviso, in the case of seagrass, that a 10cm covering of vegetation is left on the sand (see Section 6.2.1). In the case of macroalgae, it is strongly advised that harvesting continue to be selective (species-specific) so as to leave other species of seaweed available to support beach meio- and macro-fauna.

Access will be granted to either seagrass or macroalgae, not both on the same licence. The species composition of the wrack at a particular location will be established during the primary assessment by PIRSA. The particular species or suite of species permitted to be harvested will be endorsed on the licence.

Except in specific cases where it is required for public amenity purposes, complete removal of all seagrass wrack material from a large section of foreshore will not be permitted. Where the proposed area of operations extends for a long and continuous section of beach, 'exclusion zones' must be interspersed within harvest sites to the effect that no more than 25% of the estimated biomass of seagrass wrack be removed from a region. Exclusion zones are to run from low water mark to the fore-dune / scrub within each designated harvest area. Sections where harvesting is permitted should be located in close proximity to access routes, thus mitigating the need for heavy machinery traversing large sections of beach. It is recognised that, until scientific information is available, the distribution of harvest and exclusion zones will be decided largely subjectively, based on a balance between community, conservation and commercial values.

6.3.3. Restriction of Access

The harvesting, removal or disturbance of beach-cast seagrass and algal material is prohibited from:

- All Aquatic Reserves proclaimed under the *Fisheries Act 1982*.
- Foreshore adjacent to land under the care, control and management of the Minister of Environment and Heritage and gazetted as a reserve under the *National Parks and Wildlife Act 1972*, *Wilderness Act 1992*, *Crown Lands Act 1929* or the *Coast Protection Act 1972*.
- Areas adjacent to lands under the management of the Department of Defence.
- Foreshore restricted by Local and/or District Councils for the purpose of non- development, recreation or conservation reserves.

The harvesting of wracks may be subject to specific restrictions relevant to specific locations. Such restrictions will be developed in consultation between PIRSA, DEH and Local Governments and may include provisions for the preservation of rare or endangered terrestrial flora and fauna or the prevention of degradation of foreshores, dunes and coastal vegetation communities. In addition, the local District or Metropolitan Council can impose restrictions on the timing of harvesting to avoid or minimise conflicts with other beach users.

6.3.4. Monitoring

Section 46 of the *Fisheries Act 1982* requires all seagrass/macroalgae wrack harvesters operating under a Beach-cast Licence to submit catch and effort return information to the Chief Executive of PIRSA. This information will be available to the Chief Executives of DoT and DEH at their respective requests. This information will be treated confidentially. The return shall be in a form approved by the Minister for Primary Industries, Minister for Minerals and Energy and Minister for Regional Development. The following information will be requested from each wrack harvester:

- A list of the species harvested.

- The weight of each species harvested.
- The exact location of the harvesting activity.
- The method used to collect the resource.
- The method used to process the resource.
- The use made of the resource.
- The volume of product sold each month.
- Photo points to monitor the adjacent coastline including dune and beach profiles and vegetation line.

The above information should be submitted every month of the life of the licence to:

Chief Executive, PIRSA
C/-PO Box 120
HENLEY BEACH SA 5022

If the seagrass wrack harvester fails to submit catch and effort information, the Director of Fisheries may recommend the imposition of a substantial fine or term of imprisonment under Section 46 of the *Fisheries Act 1982*.

6.3.5. Compliance

Management of the fishery by way of input controls significantly reduces the costs and complexities involved with enforcement of regulations and licence conditions. Each licence is to be endorsed with precise information regarding the harvest operation and it is a requirement under the *Scheme of Management (Miscellaneous Fishery)* that this licence be carried at all times during harvesting activities in a vehicle being used for the purpose of collecting or transporting wrack. Information contained on the licence will include the specific section of foreshore where harvesting is permitted, the species allocated to each harvester and the methods of harvesting allowed. The allocated section of foreshore is clearly defined on the licence so there is no ambiguity in interpretation by either harvesters or Fisheries Compliance Officers. Likewise, the species that may be harvested must be clearly identified by name on the licence and any machinery or vehicles used for harvesting must be marked with the licence number in such a way as to be readily observable and identifiable. Compliance Officers will carry out random checks of each harvesting operation to ensure that licence conditions are not being breached. Failure of operators to comply with licence conditions may result in prosecution under the Fisheries Act 1982 and cancellation of the licence.

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8. APPENDICES

8.1. APPENDIX 1. Beach-cast Wrack Harvesting Application Form

I.....
(Given names) (Surname)

of.....
(Residential Address)

.....Post Code.....

MAKE APPLICATION FOR THE ISSUE OF A LICENCE TO COLLECT BEACH-CAST ALGAL/SEAGRASS WRACK MATERIAL UNDER THE *FISHERIES ACT 1982*.

IN SUPPORT OF THIS APPLICATION I SUBMIT THE FOLLOWING INFORMATION

1. PERSONAL DETAILS

Postal Address:.....

..... **Post Code**

Telephone No: Home: Business:

Fax:.....

Date of Birth...../...../.....

2. ADDITIONAL DETAILS

Please answer the following questions. If you answer 'yes', please give details.

I. All the schemes of management for commercial fisheries in South Australia provide for a policy of one person per licence. Attachment 1 summarises the policy and you should read this carefully. If necessary, seek legal advice before you answer the following questions.

A. Are you the holder of a licence in respect to any other fishery?
(e.g. Commonwealth, a fishery licence in another state)

YES / NO

If Yes, give details.....

.....
.....
.....

B. Are you an associate of a person who holds a licence in respect of any fishery or do you have an interest in any other fishery licence of which you are not a holder?

YES / NO

If Yes, give details.....

.....
.....
.....

II. With respect to this licence, have you or do you propose to enter into an agreement, understanding, lease or any other arrangement with any other person, persons, council or body corporate:

YES / NO

If Yes, give details.....

.....
.....
.....
.....

III. Have you been convicted, or do you have charges or prosecution action pending, of an offence involving a breach of any legislation relating to fishing in any State or Territory of the Commonwealth during the preceding three years?

YES / NO

If Yes, give details.....

.....
.....
.....

3. APPLICATION ASSESSMENT DETAILS *(attach additional information if required)*

Local / District Council:

Section and Hundred on which harvesting is to take place:

.....

Identify any other beach-cast wrack harvesting operations within 50 Kilometres of your proposed harvest site:

.....

Describe the specific area harvesting is to take place, including boundaries (*A topographic map is to accompany the application, marked with the areas harvesting will take place*):

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Describe the wrack material to be harvested, its composition (*species*), distribution on the foreshore, approximate volume, etc:

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Describe the technique to be used to harvest the wrack material, including a description of any machinery to be used and details of the number of persons involved:.....

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Describe the intended use of the material, potential markets (domestic or international), the pre-treatment process prior to sale and the ideal volume of seagrass required to meet market expectations:

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Will the wrack material be stored? If YES, locate the area and storage facilities in which the wrack material will be retained:

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4. STATUTORY DECLARATION

I of

..... DO SOLEMNLY AND SINCERELY DECLARE as follows:

- 1) That I am the person making this application for a Miscellaneous Fishery Licence.
- 2) That the answers and information I have given to paragraphs 1, 2 and 3 of this application are true and correct.

AND I MAKE this solemn declaration conscientiously believing the same to be true and by virtue of the provisions of the Oaths Act, 1936.

DECLARED AND SUBSCRIBED at:

by the said this day of 19.....
(Signature of Applicant)

Before me

A Justice of the Peace in and
for the State of South Australia