

The South Australian Fisheries Management Series

Paper No 45

**Management Plan for the
South Australian Marine Scalefish Fishery**

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January 2006

Prepared by the Fisheries Division of Primary Industries and Resources South Australia in association with the Marine Scalefish Fishery Management Committee for the purposes of Section 14 of the *Fisheries (Management Committees) Regulations 1995* and the requirements of the *Fisheries Act 1982*.



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This document also contains information in relation to the *Fisheries Act 1982* and associated regulations. This information has been prepared as a summary of the fisheries management arrangements that are in place at the time of publication, and does not replace the legislation. Legislation will change from time to time. It is the responsibility of each individual to ensure that they are aware of the law that applies and to comply with it.

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Paper No 45: Management Plan for the South Australian Marine Scalefish Fishery

ISBN 0 7590 1361 6
ISSN 1322-8072

FOREWORD

Management Plan for the Marine Scalefish Fishery

The South Australian Marine Scalefish Fishery is a multi-species, multi-gear fishery that is both diverse and complex. It contributes significantly toward the socio-economic wellbeing of many South Australians, namely commercial and recreational fishers and other extractive users. The extensive use of the Marine Scalefish Fishery resource by these groups presents a variety of management considerations and consequently a wide variety of regulations are required to address these issues.

However, the basic underlying principle of this Management Plan is to recognise that the Marine Scalefish Fishery is a valuable renewable resource that needs to be carefully managed such that it is sustainable for future generations. The primary role of the South Australian Government, as custodian of this resource on behalf of the broader community and future generations, is to ensure that it is used in an ecologically sustainable and economically efficient manner, while at the same time maximising returns to the community. The Government must also ensure that access to the Marine Scalefish Fishery to all users is clearly understood and accepted as equitable, and that their allocation and level of utilisation are consistent with the needs of present and future generations.

To facilitate better decision-making by the Government in managing the Marine Scalefish Fishery, a fishery-specific stakeholder-based Marine Scalefish Fishery Management Committee (MSFMC) has been established to provide expertise-based advice to the Minister for Agriculture, Food and Fisheries. This Committee is comprised of commercial and recreational fishers, research scientists, Government managers and representatives of the general community, and is chaired by an independent person. Appointment of members and the terms of reference of the committees are embodied in the Fisheries (Management Committees) Regulations 1995.

Where resource management decisions are required in an environment of uncertainty, the Government, in partnership with the MSFMC, will take a precautionary approach to the management of the Marine Scalefish Fishery.

This Management Plan provides a framework to address key challenges facing the future management of the South Australian Marine Scalefish Fishery over the next five years.



Hon Rory McEwen MP
MINISTER FOR AGRICULTURE, FOOD AND FISHERIES
MINISTER FOR STATE/LOCAL GOVERNMENT RELATIONS
MINISTER FOR FORESTS

9 / 01 / 2006

ACKNOWLEDGMENTS

The Marine Scalefish Fishery Management Committee (MSFMC) coordinated a process to finalise this Management Plan. All members of the MSFMC are acknowledged for their individual and collective contributions. Mr Sean Sloan is acknowledged for developing the framework and structure that was adopted in this Management Plan. The following individuals and organisations are acknowledged for specific contributions: Dr Noel Taylor-Moore consulted with the fishing industry during the preparation of earlier drafts of this Management Plan; Ms Kelly Crosthwaite provided legal assistance and the data for Table 3.3 and Table B.1; Mr Angelo Tsolos prepared Figure G.1; South Australian Research and Development Institute – Aquatic Sciences; the South Australian Fishing Industry Council; and the South Australian Recreational Fishing Advisory Council. Mr Will Zacharin, Director of Fisheries, provided valuable comments that improved the manuscript.

The work of Ms Paula Brown during the consultative and development phases of this Plan is gratefully acknowledged.

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1 PURPOSE OF THE MANAGEMENT PLAN

The purpose of this Management Plan is to provide a detailed strategic policy framework that aims towards ensuring ecologically sustainable management of the South Australian Marine Scalefish Fishery. It sets out a formal harvest strategy for the fishery and provides direction for the formulation of regulations contained within the *Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991* and the *Fisheries (General) Regulations 2000*. This Management Plan is intended to provide greater certainty in the day-to-day and long-term management and decision-making processes for all stakeholders.

The Management Plan is set in place to ensure that fish stocks within the waters of South Australia are exploited within biologically acceptable levels and regenerate at rates dependent on the population dynamics and life history characteristics of the species being exploited and the rate of extraction by harvest. Productive fish stocks also rely on the maintenance of sustainable ecosystems and habitat.

Access to fisheries resources, managed by the Government on behalf of the broader community and future generations, comes with certain obligations for commercial licence holders, recreational participants and traditional fishers regarding the proper management and care of fisheries resources. These obligations are set out in this Management Plan. Information herein provides a reference for the broader community in relation to the management measures that have been introduced to ensure the long-term sustainability and optimal utilisation of Marine Scalefish Fishery resources.

The *Fisheries Act 1982* (the Act) provides a broad statutory framework to ensure the ecologically sustainable management of South Australia's marine, estuarine and freshwater fisheries resources. In administering the *Fisheries Act 1982*, the Minister for Agriculture, Food and Fisheries, the Director of Fisheries and the fisheries management committees must operate in accordance with the following objectives (*Fisheries Act 1982*, Section 20):

- (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*
- (b) *Achieving the optimum utilisation and equitable distribution of those resources.*
- (c) *insofar as this Act applies to the River Murray, seeking to further the objects of the River Murray Act 2003 and the Objectives for a Healthy River Murray under that Act*
- (d) *insofar as this Act applies to the Adelaide Dolphin Sanctuary, seeking to further the objects and objectives of the Adelaide Dolphin Sanctuary Act 2005.*

This Management Plan sets out management strategies and key performance measures to allow for assessment of the degree to which these objectives are being achieved. It formalises a long-standing, informal, ecosystem-based approach to the management of the Marine Scalefish Fishery. It also aims to provide a foundation for management of the fishery to continue moving towards a more integrated management framework, incorporating environmental management principles with standard species and gear-based fisheries management.

This Management Plan does not have any statutory basis. The powers contained within Section 14 of the *Fisheries (Management Committees) Regulations 1995* provide the legal basis for the establishment of this Management Plan. These regulations assign responsibility for the preparation of management plans to individual fisheries management committees. The committee responsible for the preparation of the Management Plan is the Marine Scalefish Fishery Management Committee (MSFMC). Membership of the MSFMC is shown in Appendix C.

2 SCOPE OF THE MANAGEMENT PLAN

2.1 General

The South Australian Marine Scalefish Fishery is a multi-species, multi-gear fishery. The Management Plan for this fishery covers all commercial, recreational and traditional fishing activities undertaken within the marine waters of South Australia targeting the marine species of fish, molluscs, crustaceans, annelid worms and sharks permitted in Schedule 1 of the *Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991* (see Appendix A). Generally, the fishery includes most harvested species, with the exception of rock lobster, prawns, abalone and freshwater fish species. Whilst marine scalefish licence holders have access to blue crabs, there is a separate scheme of management for the blue crab fishery, except for the West Coast blue crab fishery, which remains under jurisdiction of the MSFMC.

The regulations that govern the management of the Marine Scalefish Fishery are the *Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991* and the *Fisheries (General) Regulations 2000* and, as such, this Management Plan should be read in conjunction with these regulations (a summary of provisions that apply to the Marine Scalefish Fishery is provided in Table B.1). This Management Plan is an expression of the policy that applies in relation to the South Australian Marine Scalefish Fishery that will inform the implementation of any discretionary decision-making powers in the legislation as they apply to the fishery.

Regular dialogue and shared responsibility exists between Primary Industries and Resources South Australia (PIRSA)-Fisheries Division and departments of other state governments with regard to fish species that are distributed across several jurisdictions, through national and multi-state management and research forums.

The South Australian Government has entered into an Offshore Constitutional Settlement (OCS) agreement with the Australian Government for the marine scalefish resources from low water mark of the South Australian coastline seaward out to 200 nautical miles. This OCS agreement provides jurisdiction to South Australia for most scalefish generally found inshore, while offshore species fall under Australian Government jurisdiction. State-managed species taken by Australian Government licence holders are regulated by by-catch limits (trip), e.g. 50 kg snapper, and *vice versa*, i.e. Australian Government-managed species taken by marine scalefish licence holders are regulated by by-catch trip limits, e.g. a combined total of 5 school and/or gummy sharks taken outside internal waters.

2.2 Operation of the Management Plan

This Management Plan will operate for a five-year period from 2006 to 2010 inclusive, subject to annual review and amendments that are considered necessary by the MSFMC, the Director of Fisheries or the Minister for Agriculture, Food and Fisheries. The MSFMC will use the Management Plan to guide annual processes for providing advice to the Minister and to the Director on management and research for the fishery. Specifically, the MSFMC will use the reporting framework established in the Management Plan to prepare an annual report on the performance of the fishery against all performance indicators and limit reference points. An annual stock status report will provide the basis for this annual assessment of fishery performance. All stock assessment reports for individual species will address key performance indicators outlined in the Management Plan. This process has been designed to deliver improved public accountability on the management of the fishery.

2.3 Review of the Management Plan

This Management Plan is a working document that reflects current understanding of the Marine Scalefish Fishery and, as such, is expected to change over time. This Management Plan will be periodically reviewed and improved as advancements in knowledge and management are made. However, no major departure from the stated management arrangements will occur unless the MSFMC is otherwise directed by the Minister for Agriculture, Food and Fisheries during the life of this Management Plan. In 2010, PIRSA Fisheries, in association with the MSFMC and key stakeholders, will undertake a major review of this Management Plan, including the strategic research and monitoring plan.

PIRSA Fisheries, in consultation with key stakeholder groups and the broader community, is currently undertaking a comprehensive review of the *Fisheries Act 1982*. This review, which is expected to be completed in 2006, may result in changes to the broad framework for administering and managing South Australia's fisheries resources. If necessary, this Management Plan will be updated to ensure that it is consistent with the requirements of the new legislation.

2.4 Key Policy Drivers

This Management Plan aims to achieve outcomes that are consistent with broader Government objectives for the management of marine resources. Key policy drivers identified for the development of this Management Plan include:

- The National Strategy for Ecological Sustainable Development
- The Precautionary Principle, as set out in the Intergovernmental Agreement on the Environment
- The Australian Government 'Guidelines for the Ecologically Sustainable Management of Fisheries,' as set out in the Australian Government *Environmental Protection and Biodiversity Conservation Act 1999*
- The National Policy on Fisheries By-catch

2.4.1 National Strategy for Ecological Sustainable Development

The principles of Ecological Sustainable Development (ESD) have been incorporated into fisheries legislation and management frameworks throughout Australia in recent years. The Australian Government suggested the following definition for ESD in Australia:

'Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased' (Commonwealth of Australia, 1992).

The goal of the National Strategy for ESD (Commonwealth of Australia, 1992) is:

'Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.'

To achieve this goal, the following core objectives were developed (Commonwealth of Australia, 1992):

- To enhance individual and community wellbeing and welfare by following a path of economic development that safeguards the welfare of future generations
- To provide for equity within and between generations

- To protect biological diversity and maintain essential ecological processes within life-support systems.

In addition to the core objectives, the following guiding principles need to be considered for a balanced approach in pursuing the goal of ESD (Commonwealth of Australia, 1992):

- Decision-making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations
- Where there are threats of serious irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (i.e. a precautionary approach needs to be adopted)
- The global dimension of environmental impacts of actions and policies should be recognised and considered
- The need to develop a strong, growing and diversified economy that can enhance the capacity for environmental protection should be recognised
- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised
- Cost-effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- Decisions and actions should provide for broad community involvement on issues that affect them.

The goal, core objectives and guiding principles for the National Strategy for ESD have shaped the way in which natural resources are currently being managed throughout Australia. In 2000, the Australian Standing Committee on Fisheries and Aquaculture initiated a process to develop a National ESD Reporting Framework for all Australian fisheries (Fletcher et al., 2002). This National ESD Reporting Framework provides for a consistent national approach to reporting on fishery performance against all elements of ESD.

The National ESD Reporting Framework highlights that implementing ESD in the day-to-day management of fisheries requires consideration of not only the impacts of fishing on target species, but also the impacts of fishing on non-target species and the wider ecosystem. Linked to this is a recognition that the economic health of a fishery also relies on maintaining essential ecological processes. In addition, governments and key stakeholder groups must be able to satisfy the wider community that the management systems in place are adequate and that fisheries are providing sufficient socio-economic benefits to justify any negative impacts they may have (Fletcher et al., 2002).

This Management Plan takes into the account the approach suggested in the National ESD Reporting Framework and aims to provide for regular assessment of fishery performance against all aspects of ESD.

2.4.2 The Precautionary Approach

There is no international consensus on the definition of a precautionary approach, but it is generally understood that it is applied as a risk management tool. A well-known approach to precaution is Principle 15 of the Rio Declaration of the United Nations Conference on Environment and Development:

‘In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.’ (FAO, 1995).

The FAO International Code of Conduct for Responsible Fisheries prescribes a precautionary approach to the management of all fisheries, in all aquatic ecosystems, and regardless of their jurisdictional nature, recognises that most problems affecting the management of fisheries results from a lack of precaution in management regimes when faced with high levels of uncertainty (FAO, 1995).

The precautionary approach to fisheries management recognises that changes in fisheries systems are only slowly reversible, difficult to control, not well understood and subject to changing environmental and human values (FAO, 1995). The implications of adopting a precautionary approach to fisheries management are summarised as follows (FAO, 1995):

‘The precautionary approach involves the application of prudent foresight. Taking account of the uncertainties in fisheries systems and the need to take action with incomplete knowledge, it requires inter-alia:

- *Consideration of the needs of future generations and avoidance of changes that are not potentially reversible*
- *Prior identification of undesirable outcomes and of measures that will avoid them or correct them promptly*
- *That any necessary corrective measures are initiated without delay, and that they should achieve their purpose promptly, on a time scale not exceeding two or three decades;*
- *That where the likely impact of resource use is uncertain, priority should be given to conserving the productive capacity of the resource*
- *That harvesting and processing capacity should be commensurate with estimated sustainable levels of resource, and that increases in capacity should be further contained when resource productivity is highly uncertain*
- *All fishing activities must have prior management authorisation and be subject to periodic review*
- *An established legal and institutional framework for fishery management within which management plans implement the above points are instituted for each fishery*
- *Appropriate placement of the burden of proof by adhering to the requirements above.’*

The Australian and State Governments formed an agreement in 1992 to implement a precautionary approach to all facets of policy development and decision-making concerning the environment. This agreement, known as the Intergovernmental Agreement on the Environment, is embodied in the resultant *National Environment Protection Council Act 1994*. Section 3.5.1 (precautionary principle) of the Intergovernmental Agreement on the Environment states that:

‘Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

- *Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment*
- *An assessment of the risk-weighted consequences of various options.’*

This Management Plan seeks to promote a precautionary approach to the management of the South Australian Marine Scalefish Fishery. For the purposes of this Management Plan, the precautionary principle has the same meaning as in Section 3.5.1 of the Intergovernmental Agreement on the Environment.

2.4.3 Australian Government Environment Legislation

The Australian Government *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) establishes reporting requirements against the ‘*Guidelines for the Ecologically Sustainable Management of Fisheries.*’ All State and Australian Government fisheries must undergo a comprehensive independent ecological assessment process, which is subject to public consultation, prior to fishery products being considered for export approval under Parts 13 and 13A of the EPBC Act.

The two key principles of the EPBC Act ‘*Guidelines for the Ecologically Sustainable Management of Fisheries*’ are as follows:

- A fishery must be conducted in a manner that does not lead to overfishing, 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
- Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.

PIRSA Fisheries has prepared a submission for the Australian Government Department for the Environment and Heritage to allow them to independently assess the management framework in place for the South Australian Marine Scalefish Fishery against the EPBC Act ‘*Guidelines for the Ecologically Sustainable Management of Fisheries.*’

2.4.4 National Policy on Fisheries By-catch

The Ministerial Council on Forestry, Fisheries and Aquaculture endorsed the National Policy on Fisheries By-catch in 1999 to ensure a unified national response to the problem of by-catch across all Australian fisheries. The overall goal of the policy is to ensure that the direct and indirect fishery impacts on ecosystems are taken into account in the development and implementation of fisheries management regimes. An overarching objective of the policy is to ensure that by-catch species and populations are maintained at sustainable levels. Supporting this are the following sub-objectives (DAFF, 1999):

- To reduce by-catch
- To improve protection for vulnerable/threatened species
- To minimise adverse impacts of fishing on the aquatic environment.

The National Policy on Fisheries By-catch defines by-catch at its broadest level, to include all material, living and non-living, other than targeted species which is caught while fishing. For practical purposes, the National Policy defines by-catch to include discards (that part of the catch returned to the water) and also that part of the catch that is not landed but is killed as a result of interactions with fishing gear. By-product is defined as non-targeted catch that is commercially valuable and therefore retained by fishers. For the purposes of this Management Plan, by-catch and by-product have the same meaning as the definitions set out in the National Policy on Fisheries By-catch.

As some commercial fishing operations in the Marine Scalefish Fishery may not target a particular species (e.g. for haul netting operations, ‘000’ is occasionally recorded in logbooks to denote that no particular species was targeted), by-catch is further divided into retained by-catch (or by-product) and discarded by-catch.

The reasons for discarding vary, and include (but are not necessarily limited to):

- Undersized fish/catch (i.e. all species managed by minimum legal lengths)
- Legal-sized fish that are legislatively required to be returned to water (i.e. all species managed by catch limits – commercial trip, and recreational bag and boat limits, and snapper inadvertently taken by nets or during closed season)
- Protected species (e.g. blue groper in Spencer Gulf, Gulf St Vincent and Investigator Strait for all fisheries, and all commercially caught blue groper in State waters not to be sold; white shark)
- ‘Catch-and-release’ fish by recreational fishers (e.g. sport species including Australian salmon, mulloway, yellowtail kingfish, snapper)
- Unwanted catch of by-product species (e.g. fish regarded by commercial and recreational fishers to have low value and/or poor eating qualities).

3 A DESCRIPTION OF THE FISHERY

3.1 Introduction

The Marine Scalefish Fishery operates in all coastal waters of South Australia including gulfs, bays and estuaries (excluding Coorong estuary), from the Western Australian border (129°E longitude) to the Victorian border (141°E longitude).

The Marine Scalefish Fishery includes most marine species of fish, molluscs, crustaceans, annelids and sharks, but excludes rock lobster, prawns, abalone, blue crabs and freshwater fish species, all of which are managed separately.

The term ‘scalefish’ is somewhat of a misnomer when applied to a few of the species in this commercial sector (e.g. crabs, squid, sharks). Although the majority of production is still comprised of traditional scalefish species, in particular King George whiting, snapper, southern sea garfish and Australian salmon, these other species, especially southern calamary, sharks, ocean jackets, sand crabs and cockles, also provide an important contribution to the value of the fishery.

There are more than 50 species of ‘scalefish’ taken by commercial fishers in South Australia (Appendix A). Of these, less than ten are taken consistently. King George whiting is the State’s most important fish from a commercial and recreational point of view.

3.2 Historic Context

Fishing for marine scalefish in South Australia preceded the establishment of the colony of South Australia. Aboriginal communities fished the coastal waters for at least 6,000 years before European settlement (Nance & Speight, 1986). The types of fishing gear used included: nets made from animal and vegetable fibres by the Kaurna community during summer months along the Adelaide coastline (Ellis, 1976) and Encounter Bay (Whitelock, 1985); fish spears, fish traps and snares by southern Eyre Peninsula communities (Mountford, 1939; Berndt, 1985); and the gathering of inter-tidal mud cockles and gastropods (turbo shells) (Cann et al., 1991).

Fishing by European first settlers for marine scalefish commenced almost simultaneously with their arrival as a means of providing food for the new colony. In fact, fish became the State’s first export when The South Australian Company shipped three barrels of salted fish to Tasmania in 1836. The South Australian Company was established earlier that year to exploit whales, seals and other fisheries in the gulfs and seas around the colony. However, whaling declined quickly and by 1841 many of these experienced sailors turned to other employment, including fishing.

Using nets, the first fishers operated from settlements along the eastern coast of the Gulf St Vincent. Most of the early cutter fishers in South Australia originated from England and Scotland and used a handline with two hooks, while a few Scandinavians that settled preferred tarred twine nets. During the 1870s and 1880s, a large number of Greek and Italian fishers arrived bringing with them ring nets and seine nets. The main problem was not catching enough fish, but preventing them from decomposing in the heat.

After the turn of the century, there were approximately 500 people engaged in commercial scalefish fishing in South Australia. When licensing was introduced in 1904, 476 applied for and received licences. The Depression in the 1930s had a marked effect on employment; 1463 licences were issued in 1934 and, as a consequence, fish stocks soon became over exploited. To compound the situation, there were only three permanent inspectors assigned to patrolling the entire coastline of the State.

There were three important changes that enabled fishers to catch and carry more fish to market before it decomposed. These were the introduction of engines, the use of ice, and the development of fish canneries. The first petrol engine was fitted to a cutter in 1909 and they gradually came into general use until the mid 1930s when motors began to influence the general design of boats. This enabled scalefish fishers to build bigger and faster vessels with greater range and to incorporate mechanisation into the catching process. To the line fisher, increased speed meant less time getting to the fishing spot and more time spent fishing.

The first ice boxes were introduced in the late 1920s and the trend continued during the next 30 years until it became the normal means of carrying fish in boats of any size. As fishers began travelling further afield, iceboxes replaced wells, carrying capacity was improved and the catch did not have to be landed each day.

The first fish cannery operated on Kangaroo Island during the 1890s, concentrating on whiting (Wallace-Carter, 1987). During the mid-1900s, a number of canneries operated out of Port Lincoln and several West Coast towns, with the purpose of preserving catches of Australian salmon and Australian herring (tommy ruffs). The Port Lincoln cannery operated at least to the early 1960s; however, canning of State-managed marine scalefish species began to decline at this time, in favour of the Australian Government-managed southern bluefin tuna. Another method of preserving large catches was by smoking marine scalefish. This began with mullet in the 1890s on Kangaroo Island (Wallace-Carter, 1987). Smoking fish has continued over the years at a low level for a number of marine scalefish, including Australian salmon, Australian herring, snook and snapper.

There is now less than half the number of licensed fishers in the Marine Scalefish Fishery as there were in the 1930s, but with the development of modern fishing technology and improved catching methods, commercial fishers have increasingly become more efficient.

The sustainable management of the State's fishery resources, as common property resources, is of interest to all South Australians. The large number and range of species that can be harvested under this fishery ensures a high level of public interest in its management. Another significant sector in terms of size is the non-fishing consumers, who may have no interest in fishing but wish to consume marine scalefish species obtained through commercial sales.

Many South Australians who do not fish are the purchasers and consumers of marine scalefish products. Some of the listed marine scalefish species, such as King George whiting and snapper, have icon status amongst the fishing and non-fishing South Australian public, and their management attracts a corresponding high level of public scrutiny.

The management of marine scalefish species is also of interest to non-consumptive stakeholders such as scuba divers and conservationists. The community is thus considered to be a significant stakeholder within this fishery. There are several other user groups that utilise the marine scalefish resource that also need to be recognised as legitimate stakeholders within this Plan. These include charter fishing

operators, who are extractive users. The charter fishing sector is currently managed pursuant to the rules and regulations appropriate to general recreational fishing, i.e. the recreational boat and bag limits that apply to the catch of each fish species. A specific management plan and a scheme of management for this sector have recently been developed by PIRSA Fisheries.

A flow-on effect of fishing-related recreation and tourism activities is the increasing interest in management of the Marine Scalefish Fishery by regional tourism representatives and local government. Such interests seek to have fish resources managed in such a way that protects the resource for the benefit of tourists, peak recreational seasons and local community activities.

3.3 The Commercial Fishery

The commercial Marine Scalefish Fishery is a limited entry fishery currently managed through input controls. Access to the commercial Marine Scalefish Fishery is limited to holders of a licence pursuant to the *Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991*. These regulations preclude the Director of Fisheries from granting any additional fishing licences in the fishery.

As of 26 July 2005, 371 fishers held a licence to operate only within the Marine Scalefish Fishery. Of these, 351 held ‘M’ class licences and 20 held restricted or ‘B’ class licences (Table 3.1).

Table 3.1 Licence holders of South Australian fisheries able to access marine scalefish species.

Fishery Licence Type	No. Licence Holders
Marine Scalefish Fishery Licences	
Marine Scalefish Fishery	351
Restricted Marine Scalefish Fishery	20
Others with Access to Marine Scalefish Species	
Northern Zone Rock Lobster Fishery	68*
Southern Zone Rock Lobster Fishery	181†
Lakes and Coorong Fishery	37
Miscellaneous Fishery	8‡
Total	665

* Of these 68 licence holders, 65 have full access to marine scalefish species, 2 have access for bait only, and 1 has no access (incidental catch only).

† Of these 181 licence holders, 154 have full access to marine scalefish species, 12 have access for bait only, and 15 have no access (incidental catch only).

‡ As of 12 April 2005.

It should be noted that there is continuing adjustment to the number of Marine Scalefish Fishery licences (Table 3.1) due to licence amalgamation and other programs in place to restructure the fishery.

The heterogeneous mixture of participants, fishing devices and licence conditions, make the task of managing this fishery in accordance with the requirements of the *Fisheries Act 1982* more difficult than most other fisheries. The large number of licence holders, the great variety of species being targeted, and variations and permutations of licence endorsements compound the complexity of the current management arrangements. In addition, licence holders in other fisheries have access to species prescribed in the Marine Scalefish Fishery for commercial purposes (i.e. rock lobster and Lakes and Coorong fisheries).

The South Australian Fishing Industry Council (SAFIC) is the peak body that represents the commercial fishing sector and is supported by the Marine Scalefish Industry Working Group.

3.3.1 Other Commercial Fishery Licences with Access to Marine Scalefish Species

As of 26 July 2005, there were 294 licences in other fisheries that also had access to Marine Scalefish Fishery species for commercial purposes (Table 3.1).

Rock Lobster Fisheries

Almost all licence holders in the northern zone and southern zone rock lobster fisheries have some level of access to the Marine Scalefish Fishery. The main marine scalefish species taken by northern zone rock lobster fishers include ocean leatherjacket, Australian salmon, blue morwong, snapper, parrot fish (wrasse) and various shark species, while the species taken by southern zone rock lobster fishers include octopus, southern rock cod, Australian salmon, yellow-eye mullet, conger eel and various shark species. Australian salmon and yellow-eye mullet are primarily taken for bait purposes.

Rock lobster fishers are restricted in their use of gear to take marine scalefish. The targeting of marine scalefish by rock lobster fishers using nets is not permitted whilst they are pot fishing for lobster. When their quota is reached, rock lobster fishers are permitted to target marine scalefish provided they have access to marine scalefish species – three categories apply (none, i.e. incidental catch in pots only; for bait only; and for purposes of trade or business). If targeting scalefish during the rock lobster closed season, the licence holder is not restricted in the number of days they can fish when on board their boat. However, a registered master (other than the licence holder) is restricted to a maximum of 28 days fishing during the rock lobster closed season.

Lakes and Coorong Fishery

There are 37 Lakes and Coorong licence holders who have restricted access to some of the permitted species in the Marine Scalefish Fishery. These fishers may operate in coastal waters between the seaward extension of the Goolwa Beach Road and the jetty at Kingston, out to three nautical miles from low water mark.

The species that are targeted by Lakes and Coorong fishers in coastal waters include mulloway (*Argyrosomus japonicus*), black bream (*Acanthopagrus butcheri*), yellow-eye mullet (*Aldrichetta forsteri*), greenback flounder (*Rhombosolea tapirina*), Goolwa cockles (Suborder Teledonta), sharks and rays.

The main gear type used commercially to take mulloway in marine waters is a swinger net, which is used in the surf zone. Cockle nets and cockle rakes are used to take Goolwa cockles from the intertidal zone of the Coorong ocean beach.

Miscellaneous Fisheries

There is one licensed Australian salmon fisher, and seven commercial fishers with a miscellaneous fishery licence to harvest the marine scalefish species: beachworms, bloodworms and tubeworms.

3.3.2 Marine Scalefish Fishery Licences with Access to Other Fisheries

Pilchard Fishery

There are 14 marine scalefish fishers with licence conditions to use purse seine nets to harvest a specified pilchard quota. They may also take other small pelagic species such as anchovies, sprats and maray. Marine scalefish fishers with a pilchard quota operate under a Marine Scalefish Fishery licence and are managed in accordance with the Pilchard Fishery Management Plan under the auspices of the Pilchard Fishery Working Group through the *Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991*.

Blue Crab Fishery

There are 14 marine scalefish licence holders who have access to the blue crab fishery within the South Australian gulfs. The fishery for blue crabs in West Coast waters is managed by the MSFMC and is addressed through the MSF Management Plan. Within the remaining waters of the State where blue crabs are distributed (i.e. gulf waters), the fishery for this species is managed in accordance with the Blue Crab Fishery Management Plan, under the jurisdiction of the Blue Crab Fishery Management Committee through the *Fisheries (Scheme of Management – Blue Crab Fishery) Regulations 1998*.

3.3.3 Management History of the Commercial Fishery

The commercial fishery has undergone many changes in the last 30 years that has seen the fishery restructured and limited through gear changes, licensing, area closures and species size limits. A summary of the management history of the commercial fishery is provided in Table 3.2.

Table 3.2 Management history of the marine scalefish commercial fishery (1970-2005).

Date	Management Measure
Early 1970s	Minimum legal lengths in place prior to 1970s for most primary marine scalefish (MSF) species; State-wide ban on netting in water greater than 5 m water depth
1977	Freeze on issue of new commercial licences; conversion call – B class licence holders able to convert to A class licences if they met certain criteria
1977-1982	Show cause provision - licence holders required to demonstrate a minimum level of involvement to qualify for licence renewal
1979-1980	Remote employee conversion call – some employees of MSF licence holders given opportunity to apply for licences
1980	Netting arrangements: <ul style="list-style-type: none"> • Limit on total net length to 600 m for A class licence holders and 400 m for B class licence holders • Net could not be joined with another net, with the exception of a drain-off shot • Net endorsements made non-transferable • Freeze on issue of additional permits for use of nets • B class licence holders no longer entitled to use nets other than bait nets • Restrictions on use of nets by northern zone rock lobster licence holders
1980	Restricted B class MSF licences became non-transferable; owner-operator policy announced; family transferability introduced for A class net and line licences
1982	Licences became transferable (any endorsement for the use of nets could not be retained with the transfer except in the case of family transfer)
1983	Inshore Fisheries Advisory Committee established; further Aquatic Reserves and restricted netting areas introduced
1987	New management controls introduced for snapper
1992	New management controls introduced for snapper, King George whiting and southern calamary
1993	Ban on net fishing for snapper; introduction of a separately managed fishery for blue crabs in Spencer Gulf and Gulf St Vincent
1994	Licence amalgamation scheme introduced
1995	King George whiting minimum legal length increased from 28 to 30 cm
1995-1996	Net review conducted and further netting restrictions introduced
1997	Jurisdiction transferred to Australian Government for some species under Offshore Constitutional Settlement (OCS) agreement
1998	First cuttlefish closure of Spencer Gulf spawning aggregation area implemented
1999	Split snapper closures implemented in August and November
2000	OCS jurisdiction for shark transferred to the Australian Government (AFMA)
2001	Changes to legal minimum lengths and recreational bag and boat limits for several MSF species as recommended in the South Australian Recreational Fishing Management Strategy including snook and southern sea garfish
2002	Coffin Bay sand crab pot fishery approved by Minister; scallop dredges prohibited
2003	November closure for snapper introduced; adoption of an Environmental Management Strategy for commercial fishery
2004	Change in legal minimum length to 31 cm for King George whiting taken east of 136°E longitude; amendments to the licence amalgamation scheme from 26 to 24 points
2005	Voluntary net buyback scheme announced by the State Government – to reduce fishing effort using nets (gill nets <15 cm mesh and hauling nets). This buyback culminated in the removal of 24 licences and 61 net endorsements, and new areas closed to net fishing.

3.3.4 Current Management Arrangements

All fishing gear, excluding rods, lines and hand lines, must be registered on a Marine Scalefish Fishery licence before they can be used to take fish for trade or business. Current policy does not allow for additional fishing devices to be endorsed on a licence other than those listed in Table 3.3. However, the Licence Amalgamation Scheme within the Marine Scalefish Fishery allows for a licence holder to purchase an additional licence and amalgamate some of the gear endorsed on both licences.

There are a number of licence conditions applicable to the Marine Scalefish Fishery that describe the use of gear and the area(s) in which it may be set. The licence conditions are printed by code on the front of the licence with conditions printed on the reverse. The conditions listed on a Marine Scalefish Fishery licence are imposed pursuant to the provisions of Section 37 of the *Fisheries Act 1982*.

Table 3.3 The total number of devices and licences for each type of commercial gear endorsed in the Marine Scalefish Fishery (marine scalefish licence holders only) as of 26 July 2005.

Gear Type	Total No. of Devices	No. of Licences
Bait fork	37	17
Bait net	37	36
Bait pump	31	17
Bait spade	40	18
Brailing net	90	83
Cockle net	83	40
Cockle rake	319	148
Crab net	270	11
Crab rake	328	117
Dab net	793	310
Drop line	2781	134
Drop net	697	56
Fish spear	142	68
Fish trap	3094	179
Gill net (<15 cm)	187	48
Hauling net	146	53
Hoop net	2074	208
Large mesh net	157	37
Longline	2271	316
Mussel dredge	27	21
Oceanjacket trap	80	4
Octopus trap	27276	44
Pilchard net	19	14
Purse seine net	3	3
Razorfish tongs	428	244
Sand crab pot	400	4
Squid jigging machine	18	3

3.4 The Recreational Fishery

The South Australian recreational fishing sector has recently been surveyed as a part of the 2000/01 National Recreational and Indigenous Fishing Survey (Henry & Lyle, 2003). This survey estimated that about 328,000 people (over the age of 5 yrs), 24% of the South Australian population over the age of 5, and 29% of all South Australian households contained at least one person who participated in some form of recreational fishing in this State. Both participation levels were greater than the national average (20 and 24%, respectively). Of these recreational fishers, 2.3% belonged to fishing clubs, and they owned 38,713 recreational fishing vessels, worth an estimated \$243 million (Henry & Lyle, 2003).

In terms of the relative harvest and effort levels, the Marine Scalefish Fishery dominates the recreational fishery in this State. In 2000/01, the species managed within the Marine Scalefish Fishery comprised 66% of the total annual recreational harvest (numbers) and approximately 69% of the total annual recreational effort (fishing events) (Jones & Doonan, 2005).

The South Australian Recreational Fishing Advisory Council (SARFAC) is the peak body that represents the recreational fishing sector and is supported by a series of regionally based Recreational Fishing Committees.

3.4.1 Management History of the Recreational Fishing Sector

Recreational fishing effort has been controlled by a range of gear limitations, species size, bag and boat limits, and closed areas, including aquatic reserves (Table 3.4).

Table 3.4 Management history of the recreational fishing sector (1980-2004).

Date	Management Measure
Prior to 1980	Minimum legal lengths for primary marine scalefish (MSF) species; bag limit of 30 King George whiting per person
1980	Recreational nets limited to one net with a length of 75 m and minimum mesh size of 5 cm, except for South East waters where two nets can be used
1985	Freeze on recreational net licences
1987	Bag limit for snapper introduced
1994	New bag limits for King George whiting (30 to 20), snapper and southern calamary
1994-1996	Boat-based recreational angling survey conducted in South Australian gulfs and West Coast waters
1995	King George whiting minimum legal length increased from 28 to 30 cm; prohibition on use of recreational mesh nets in all State waters, except for the Lakes and Coorong and Lake George
1996	Review of recreational fishing announced and regional Recreational Fisheries Committees (RFCs) formed to provide input
1997	Network of nine RFCs established to cover the regions of the State
1998	First cuttlefish closure of Spencer Gulf spawning aggregation area implemented
1999	Split snapper closures implemented in August and November
2001	'Management strategy for the sustainable development of recreational fishing in SA,' a five-year plan released by the Government; changes to legal minimum lengths and recreational bag and boat limits for several MSF species as recommended in the South Australian Recreational Fishing Management Strategy
2003	Code of Conduct for Recreational Anglers in South Australia; Five-year Research & Development Strategy 2003/08
2004	Changes to bag and boat limits for King George whiting in all State waters to 12 and 36 (from 20 and 60), respectively; change in legal minimum length to 31 cm for King George whiting taken east of 136°E longitude

3.4.2 Current Management Arrangements

The recreational fishing sector is currently managed through a range of input and output controls designed to ensure total catch remains within sustainable limits and is shared equitably between recreational fishers. These controls include gear restrictions, bag and boat species limits, size limits, seasonal and spatial closures.

A variety of fishing methods and fishing gear are permitted under the *Fisheries (General) Regulations 2000* for recreational fishing. They differ depending on the location of fishing and the types of species being targeted. Restrictions apply to the operation of gear in terms of number, dimension and construction to restrict the catch and prevent overfishing. The majority of recreational fishers use rods and hand lines; however, other devices used include hand nets, lift nets, crab and cockle rakes, razorfish tongs, fish spears, bait pumps forks and spades. Rock lobster pots and restricted use of fish nets are also permitted; however, these devices have to be registered.

3.5 Other Stakeholder Groups

3.5.1 Charter Boat Fishery

A separate scheme of management for recreational fishing under a charter operation in South Australia was recently finalised by PIRSA Fisheries and is currently in operation.

A number of regulations under the *Harbours & Navigation Act 1993* (administered by the Department of Transport and Urban Planning, Marine Safety Section) and the *Fisheries Act 1982* (administered by PIRSA Fisheries) apply to charter boat fishing.

3.5.2 Indigenous Communities

At present, the *Fisheries Act 1982* makes no statement regarding Aboriginal cultural fishing. All non-licensed fishers are recognised as recreational fishers under the *Fisheries Act 1982*.

However, in a broader context, access to South Australia's fisheries resources by indigenous communities is being considered as part of the current review of the *Fisheries Act 1982*. It is anticipated that the new legislation will specifically recognise traditional or customary fishing. Furthermore, the State is currently engaged in negotiations with native title claimant representative bodies and the commercial fishing industry in relation to resolving native title claims through negotiated agreements. Both the Act review process and the agreement negotiation process will inform the means by which access to fisheries resources by Aboriginal communities is defined and implemented in the Marine Scalefish Fishery.

3.5.3 Community

The community is a stakeholder group as a consumer of fish, a passive user of the fisheries resources through interaction activities such as diving, or as a holder of aesthetic values that wishes to protect the resources into perpetuity for their intrinsic worth.

3.6 Marine Scalefish Species and Associated Fisheries Habitat

The species targeted by either commercial and recreational fishers include primary species such as King George whiting, snapper, southern sea garfish, southern calamary, and secondary species such as Australian salmon, Australian herring (tommy ruff), mulloway, snook, yellowfin whiting, parrot fish, yellow-eye mullet, oceanjackets, mud cockles, sand crabs and sharks. Fish prescribed for the Marine Scalefish Fishery are detailed in Appendix A.

According to the commercial Marine Scalefish Fishery catch and effort records, there are at least 68 species reportedly taken during fishing operations. However, there may be other species caught but not reported (i.e. as released species or those reported as 'mixed species'). For the recreational fishing sector, McGlennon and Kinloch (1997) recorded up to 80 species caught during the South Australian recreational boat creel survey conducted between 1994 and 1996. The NRIFS in 2000/01 reported on 46 species groups (e.g. all species of whiting other than King George whiting, and all species of wrasse combined, etc.) specific to the Marine Scalefish Fishery that were harvested by recreational boat and shore based fishers (Jones & Doonan, 2005).

Given the large number of species taken within the Marine Scalefish Fishery, most of the known habitats of South Australian marine waters are utilised. In addition, a number of species are known to occupy more than one of the habitats/ecosystems for part of their life history (Bryars, 2003). The types of habitats, together with the accompanying main species and their methods of capture include:

1. Inter-tidal low and high-energy coastal areas:
 - Hand gathering and raking for mud and surf cockles
 - Digging for tube, beach and blood worms (although these are mainly taken by miscellaneous fishery licence holders, the species are accessible to marine scalefish fishers).
2. Gulf waters and sheltered embayments of the West Coast of South Australia and Kangaroo Island, ranging from bottom habitats of bare sand to dense seagrass beds:
 - Netting (haul and gill) for juvenile salmon, yellow-eye mullet, Australian herring, snook, yellowfin whiting, King George whiting, southern sea garfish and southern calamary
 - Dab netting for southern sea garfish
 - Handline fishing for King George whiting
 - Jig fishing for southern calamary and cuttlefish
 - Trolling for snook and Australian salmon
 - Lift netting for sand and blue crabs
 - Unbaited and baited trapping of octopus
 - Hand gathering or using tongs to harvest razorfish
 - Longlining for whaler sharks and snapper.
3. Natural and artificial reefs of the gulfs, West Coast waters and Investigator Strait:
 - Handline, longline fishing for snapper
 - Handline fishing for adult King George whiting, sweep and parrot fish
 - Jig fishing for cuttlefish.
4. High energy beach areas:
 - ‘Salmon’ and beach seine netting and rod-and-line fishing for Australian salmon and rod-and-line fishing for mulloway.
5. Offshore deepwater areas:
 - Baited trap fishing for ocean leatherjackets (>60 m depth)
 - Large mesh netting and longlining for sharks and by-catch species (gummy, school and whaler sharks) (up to 150 m)
 - Trap fishing for sand crabs (0-30 m).

Knowledge of the geographic distribution of the stocks of marine scalefish is fundamental to the management of each species. For example, it is essential to know whether the fishery in one area of the State influences a geographically adjacent fishery for the species, either in the same or adjacent State. As the inshore Marine Scalefish Fishery is, at times, based on local fish populations adjacent to coastal communities where the level of recreational fishing or tourism is often significant, it is also important to know the effects of high localised fishing effort in these areas. The relative risk of localised depletion of a particular species needs to be considered when managing different fisheries.

However, the above type of information on stock structure only gives a semi-quantitative indication of the status of the primary species. Full stock assessments are presently being carried out on a number of primary target species, with the long-term aim of providing estimates of sustainable catch. In order to assist in these determinations, key biological performance indicators have been identified to quantify the biological status of the fishery for each target species. Assessments of the effect of the

fishery on critical habitat and the ecosystem associated with the primary marine scalefish species is fully discussed in Chapter 5 of this Plan.

3.7 Consultation and Co-management

Section 46 of the *Fisheries Act 1982* establishes a set of regulation-making powers to formalise a co-management process for fisheries management in South Australia. The *Fisheries (Management Committees) Regulations 1995* outline a set of co-management principles and establish a number of Fisheries Management Committees (FMCs) for key fisheries or groups of fisheries, including the Marine Scalefish FMC (MSFMC). FMCs are designed to assist the Minister for Agriculture, Food and Fisheries, the Director of Fisheries and fishery managers in the administration of the *Fisheries Act 1982*, consistent with the objectives of the Act and the designated Management Plans for each fishery. The *Fisheries (Management Committees) Regulations 1995* prescribe the advisory role and function of all FMCs. The Act also provides a capacity for the Minister or the Director of Fisheries to delegate decision-making functions to an FMC.

The MSFMC provides the principle forum for stakeholder consideration of fisheries management and research issues relevant to the marine scalefish resource of South Australia. Membership of the MSFMC consists of a Government fisheries manager, a Government scientist, and commercial and recreational fishing representatives appointed by the Minister (Membership of the MSFMC is shown in Table C.1). An independent Chairperson is appointed by the Minister to facilitate meetings. A committee support officer provides secretarial support to the committees. The Minister appoints non-Government members of the committee after calling for applications from relevant parties and interest groups and undergoing a transparent selection process involving relevant stakeholder representation. Appointment of members and the terms of reference of the FMCs are provided for under the *Fisheries (Management Committees) Regulations 1995*.

The MSFMC is required to produce an annual report to the Minister on its operations of the Committee during the preceding financial year. The annual report also includes a summary of limit reference points that may have been triggered during the reporting period and any actions that resulted. The operating costs of the MSFMC are currently funded through a combination of fees paid by commercial fishery licence holders and Government funds. The MSFMC meets six times per year. Pending agreement from the Chairperson, observers are welcome to attend FMC meetings. The MSFMC is also required to hold a public meeting each year to publicly report on its yearly activities and to provide an opportunity for members of the broader community to discuss relevant issues with FMC members.

The *Fisheries (Management Committees) Regulations 1995* assign responsibility for the preparation of Management Plans to individual FMCs. The necessary tasks required to complete Management Plans are undertaken by PIRSA Fisheries. Key stakeholder and community input to the development of management arrangements and strategic research and monitoring priorities for the Marine Scalefish Fishery are facilitated through the MSFMC process and during public consultation on draft Management Plans. In addition, a Research Working Group of the MSFMC has been established to provide for more coordinated input from key stakeholder groups to the development and review of strategic research priorities, research projects and stock assessment reports.

The Act requires the Minister or a delegate to consult with licence holders who may be affected by a change to licence conditions, in particular if the change will result in the removal of a species or gear entitlement from a commercial fishing licence. No formal requirements currently exist in the Act to consult with the broader community concerning fisheries management decision-making. However, as a matter of policy PIRSA Fisheries endeavours to consult with affected stakeholders and/or the broader community when significant management changes or developments are being considered. For example, all Fisheries Management Plans undergo a public consultation process. Formal community

consultation and accountability provisions are being considered as part of the Fisheries Act review process.

A public consultation period is currently underway for the draft Fisheries Management Bill, which may result in changes to the operation and structure of current FMCs. In the interim, the MSFMC has the responsibility, under regulations, to prepare a management plan for the fishery that is reviewed every year. It is envisaged that new fisheries legislation will mandate fishery management plans and appropriate consultation processes for their development, implementation and review.

All new fishing regulations or amendments to the current Act are subject to the disallowance provisions set out under the *Subordinate Legislation Act 1978* and, as such, can be disallowed by either house of parliament. New regulations or amendments to the Act are also scrutinised by the parliamentary legislative review committee.

4 THE MANAGEMENT PLAN FOR THE MARINE SCALEFISH FISHERY

4.1 Introduction

The following section outlines the Management Plan for the Marine Scalefish Fishery, which aims to provide a strategic framework to guide annual decision making on the harvest for all sectors of the fishery. In a practical sense, the Management Plan describes the linkages between management goals and objectives, strategies, performance indicators, limit reference points and agreed management actions to be undertaken when limit reference points are triggered.

The priority for management of the Marine Scalefish Fishery is to meet the requirements of ESD by ensuring that annual harvest levels are sustainable so current and future generations may benefit from marine scalefish resources. As the fishery is multi-species and multi-gear, the achievement of ESD for this fishery must account for the requirement to meet the various biological, ecological, social and economic objectives of the *Fisheries Act 1982* (Section 20) and relevant Australian Government legislation.

The management strategy for the Marine Scalefish Fishery has two major components to meet this challenge:

- A general management strategy for the entire fishery
- A specific management strategy for each of the primary target species.

For both components of this strategy, the identification and integration of recreation and commercial activities are paramount.

The Management Plan for the Marine Scalefish Fishery is based on the following processes:

- Key goals relating to management, sustainability of fish stocks, impacts of fishing operations on the ecosystem, resource sharing among stakeholder groups, and governance of the fishery
- A set of agreed objectives that are understood by stakeholders, are measurable and relate to the goals of the Management Plan
- A set of cost-effective management performance indicators aligned with the objectives
- Assessment and evaluation of each objective through limit reference points
- Monitoring of the performance of the fishery

- Assessment and evaluation of each primary species through the use of biological reference points
- Agreed management responses or decision rules to outcomes of assessment and evaluation.

Details of management goals and objectives, strategies, performance indicators, monitoring programs/schedules and limit reference points are provided in Table 4.1 to Table 4.4.

4.2 Management Goals and Objectives

The *Fisheries Act 1982* provides an overarching framework to ensure long-term sustainability of South Australia's marine, estuarine and freshwater fisheries resources. The following management goals and objectives provide a focus for the long-term sustainable management of the Marine Scalefish Fishery and are complementary to the objectives outlined in the Act.

Consistent with the objectives of the Act, a key goal of this Management Plan is to ensure that an appropriate balance exists between the need to ensure the long-term sustainability of marine scalefish resources and the optimum utilisation and equitable distribution of these resources between all stakeholder groups and future generations. For this reason, the stock sustainability and environmental management objectives set out in this Management Plan provide the baseline against which all other objectives will be pursued. Economic and social objectives will be pursued to the extent possible where stock sustainability imperatives have been demonstrably achieved.

The following management goals aim to address key challenges facing the fishery and take into account key policy drivers set out in section 2.4, such as the principles of ESD, the precautionary approach, and '*Guidelines for the Ecologically Sustainable Management of Fisheries.*' A series of objectives have been established to ensure management goals are actively pursued.

The Marine Scalefish Fishery will be managed in accordance with principles of ESD to achieve the long-term sustainability of marine scalefish resources and their habitats, provide for an efficient, viable and diversified commercial fishery, and provide for equitable access to the marine resources by the recreational fishing sector, indigenous communities and other stakeholders.

4.2.1 Goal 1

Sustainable harvest of marine scalefish fish stocks.

- Manage total catch and effort in all sectors that take marine scalefish species to ensure the fishery is sustainable*
- Ensure that appropriate biological performance and fishery status indicators are measured.*

Achieving this goal is the major challenge in the Marine Scalefish Fishery. Scientific advice on the fishery shows that the level of catch and fishing effort is considered to be at the upper levels that the fishery can sustain. However, at current exploitation rates, species such as King George whiting and southern sea garfish are considered 'overfished' and other species such as snapper and Australian salmon are at risk of being overfished. The level of commercial fishing effort and recreational angling needs to be continually monitored.

4.2.2 Goal 2

Minimise adverse impacts of all fishing operations on the ecosystem upon which the Marine Scalefish Fishery depends.

- Minimise impacts of all fishing operations on fisheries habitat*
- Maintain low-level impacts of fishing operations on discarded by-catch.*

An ecosystem management approach to the Marine Scalefish Fishery is an integral strategy in the protection of fisheries habitats and the conservation of species impacted by operations of the fishery. This approach includes reduction of discarded by-catch and the protection of threatened species and ecological communities.

4.2.3 Goal 3

Optimal utilisation of Marine Scalefish Fishery resources within the constraints of sustainability imperatives.

- a. Improve economic efficiencies and financial returns to the commercial fishery*
- b. Provide for fair and equitable access and opportunities for recreational fishing*
- c. Maintain a flow of social and economic benefit from the fishery to the broader community*
- d. Support Government policies in providing opportunities for indigenous communities to access fish stocks for traditional purposes.*

The marine scalefish commercial fishery operates in areas close to urban and tourism development. The recreational sector takes a significant proportion of the total harvest of the primary species. The social interactions that occur between the commercial marine scalefish fishing operations and other stakeholders, such as recreational fishers, tourism operators (particularly charter fishing) and indigenous communities, are important issues. Resource sharing and reallocation needs to be carefully managed to ensure fair and reasonable access to marine scalefish resources and improved social and economic benefits to local communities.

4.2.4 Goal 4

Good governance of the Marine Scalefish Fishery.

- a. Develop and implement cost-effective management of the fishery*
- b. Support co-management of the fishery*
- c. Provide an effective compliance program for the fishery*
- d. Increase knowledge of the Marine Scalefish Fishery.*

The cost-effective management of the Marine Scalefish Fishery relates to the provision of effective stakeholder participation in the management of the fishery. To facilitate this approach, the Government has established a co-management committee, the MSFMC, with stakeholder membership that provides advice to the Minister for Agriculture, Food and Fisheries and Director of Fisheries on the management strategy for the fishery. The co-management model is supported by management services providing information and facilitation related to scientific research, committee support, policy and management planning, industry extension and compliance services. Cost recovery is the basis for funding these services.

4.3 Management Strategies

The management strategies outlined in Table 4.1 to Table 4.4 reflect the multi-species, multi-gear nature of the fishery and have been designed to ensure that management objectives are effectively pursued. Collectively, these strategies are aimed at management of the whole fishery; however, a number of strategies have been directed specifically at either the commercial or recreational sector, or at individual primary species or group of species.

An important element of the Marine Scalefish Fishery commercial harvest strategy is the flexibility that commercial fishers have to transfer effort between species and ecosystem components, within and between years. This strategy is fundamental to the management of the commercial sector as it allows

commercial fishers to respond to natural changes in environmental conditions, which drive the abundance and availability of fish within and between seasons. This strategy reduces the risk of commercial overfishing of an individual species during most conditions. This strategy also provides scope for fishers to adjust fishing practices in response to changes in market conditions. Strictly speaking, recreational fishers also have the flexibility to shift target species and areas, according to seasonal availability of species.

The range of strategies outlined in Table 4.1 to Table 4.4 provides the necessary scope and flexibility required to manage the fishery and its impacts on fish stocks and the broader ecosystem, within a natural system that is characterised by high variability in environmental conditions and fish stock abundances.

4.4 Performance Indicators

The extent to which this Management Plan is achieving the range of established management objectives will be assessed using a combination of performance indicators, designed to measure the performance of the fishery, the status of individual primary species and the overall condition of the environment. Due to the contrasting life-history strategies for the marine scalefish species, not all of the performance indicators established in the Management Plan will be suitable for assessing every species or the fishing impacts associated with the fishery.

Performance indicator values will be estimated using conventional stock assessment methods, models and more empirically-based practical methods, which are outlined in the Management Plan. These methods will be refined during the life of the Management Plan as advances in knowledge are made. Where there is another fishery that has an impact on fish stocks managed under this Management Plan, e.g. Australian Government-managed shark fishery, and Australian salmon and Australian herring from Western Australia, that impact will be taken into account when estimating fishery performance. Additional indicators of fishery performance may be developed over time as advances in knowledge are made and as stock assessment methods are refined.

4.5 Limit Reference Points

A limit reference point specifies the level at which a performance indicator suggests there is an uncertain situation within the fishery and that a review may be required depending on the nature of the problem. Limit reference points are precautionary and are set relative to known levels of variation of catch and effort, changes to management, recording systems, environmental changes, and the behaviour of fishers.

A series of general and biological limit reference points have been established for key performance indicators of Goal 1 to enable managers to determine, through annual monitoring, whether the performance of the fishery is acceptable (i.e. sustainable) or not. These limit reference points have been designed to guide management decision-making processes by defining how performance indicators should be interpreted. General limit reference points relate to catch and effort data for primary and secondary species that are collected every financial year from the commercial fishery (and recreational fishery when possible). Biological limit reference points relate to measures of egg production, exploitation rate, fishable biomass, abundance of pre-recruits and age structure, which are estimated for a primary species when a stock assessment is conducted for that species.

Given the multi-species nature of the Marine Scalefish Fishery, many species (particularly secondary and tertiary species) will not have a stock assessment as the base for determining limit reference points. As a result, these species will have limit reference points based on catch and effort data only. As stock assessment reports become available and more biological reference points can be used, monitoring of these secondary species may be improved.

Catch and effort based limit reference points are chosen to determine both short-term and longer-term trends. Short-term trends need to be identified through an indicator that measures significant change from the previous year, and longer-term trends can be identified through comparison with a reference period such as the preceding five-year period.

4.6 Monitoring Programs

Given the complexity of the Marine Scalefish Fishery, some management strategies relate to achieving multiple objectives. An annual review of the performance of the MSFMC, individual species, and the fishery as a whole will be undertaken. The basis of this review will be the production of an annual species status report (produced by SARDI for PIRSA Fisheries) that provides a comprehensive analysis for each primary and secondary species, a report against the key performance indicators of the Management Plan, and an annual report of the MSFMC that includes their operational plans.

Performance indicators are the basis on which the goals and objectives of the Management Plan can be evaluated. Performance indicators are designed to be practical and measurable and, as such, a number of monitoring and research programs are needed to gather the information needed to measure these indicators. The monitoring programs/schedules required for performance indicators to be adequately assessed, along with whom that responsibility is assigned to, are provided in Table 4.1 to Table 4.4.

4.7 Reporting on the Performance of the Management Plan

A report on the performance of the Management Plan will be undertaken by the MSFMC each year. The report assesses each performance indicator to detect whether limit reference points have been triggered and what action was or needed to be taken. These annual reports will advise the Minister for Agriculture, Food and Fisheries on the effectiveness of the Management Plan.

4.8 Management Responses

Should any limit reference point be triggered, the following response will occur:

1. Immediately notify the Minister for Agriculture, Food and Fisheries, and the Director of Fisheries of the limit reference point(s) being triggered
2. Undertake an examination of the causes and implications of a limit reference point being triggered
3. Where a limit reference point relates to an individual species, consider the importance of the species based on its combined value to the commercial, recreational and community sectors, and the broad biological group to which it belongs based on the age of recruitment into the fishery (see Management Response Matrix, Table D.1)
4. Consult with the marine scalefish industry and key stakeholders on the need for alternative management strategies or actions, which may include:
 - Limitations on total effort levels
 - The type and amount of fishing gear that may be used
 - Modifications to fishing gear (e.g. mesh size, configuration of gear)
 - Temporal or spatial closures
 - Moratoria on the take of individual species
 - Size limits for individual species
 - Recreational bag and boat limits and possession limits

- Limits on the total catch of an individual species (output controls)
 - Limitations on the number of participants
 - Processes that influence environmental performance
5. Determine appropriate action in consultation with stakeholders
 6. 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 a limit reference point being triggered
 7. Apply appropriate management actions
 8. Communicate any policy or management changes to stakeholders
 9. Advise Commonwealth DEH of any material change to the Marine Scalefish Fishery's management arrangements that could affect the criteria on which the EPBC decisions are based, within 3 months of that change being made.

4.9 Data Collection and Analysis

The primary source of data used for stock assessment is fishery-dependent. The collection of fishery-dependent data is facilitated by a commercial logbook program, which requires all commercial fishers to compulsorily record daily information on catch and effort levels and other details on daily fishing operations. This information is entered into a database, which is managed by SARDI Aquatic Sciences. Information collected through the logbook program is periodically reviewed to ensure data collection meets management and research needs. The common units of effort currently used to measure CPUE in the fishery are either boat days (e.g. snapper) or man days (e.g. King George whiting, southern sea garfish). These broad units of effort will be refined and standardised during the life of the Management Plan to improve CPUE estimates.

Because of the inherent limitations associated with fishery-dependent data sets, it is recognised that the information required to generate accurate estimates of some fishery performance indicators may require additional fishery-independent data. It is also recognised that it may be necessary for fishery-dependent data sets to be periodically validated by independent means to ensure accuracy of the data collected. The strategic research plan in Appendix D establishes a process to prioritise fishery-independent research for the Marine Scalefish Fishery.

All data available on recreational catch and effort levels will be taken into account when assessing the performance of the fishery through stock assessment. In the absence of other survey data, the data provided by the 2000/01 National Recreational and Indigenous Fishing Survey (Henry and Lyle, 2003) will be used as the main source of information on catch and effort levels in the recreational sector. Development of cost-effective methods to continue the collection of accurate recreational catch and effort data is identified as a priority in the strategic research plan.

Table 4.1 Goal 1 of the Management Plan for the Marine Scalefish Fishery.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
<p>Goal 1: Sustainable harvest of marine scalefish fish stocks</p> <p>a. Manage total catch and effort in all sectors that take marine scalefish species to ensure the fishery is sustainable.</p>	<ol style="list-style-type: none"> 1. Reduce the number of commercial Marine Scalefish Fishery licences through licence amalgamation and other means of restructure. 2. Regulate the fishing methods that may be used in the commercial and recreational sectors. 3. Rationalise the number of devices for each gear type endorsed and/or used on commercial licences. 4. Regulate the amount of fishing gear that may be used in the recreational sectors. 5. Apply spatial and temporal restrictions to commercial and recreational fishing where identified to protect fish species during critical stages of their life cycle. 6. Regulate the size at which fish may be captured using minimum and/or maximum size limits. 7. Develop an ongoing recreational catch and effort monitoring program. 8. Regulate the quantity of each species that may be taken by the recreational sector using bag, boat and possession limits. 9. Collaborate with all commercial and recreational fisheries (State and Australian Government) regarding extent of access and fishing effort in the Marine Scalefish Fishery. 10. Maintain a capacity for commercial fishers to transfer fishing effort between species. 	<ol style="list-style-type: none"> 1. The number of commercial fishing licences operating in the fishery. 2. Total commercial catch for primary and secondary species. 3. Total commercial fishing effort (boat days). 4. Commercial catch per unit effort (CPUE) for primary and secondary species. 5. Estimate of recreational catch and CPUE of primary and secondary species. 6. Number of devices for each gear type endorsed and/or used on commercial licences. 	<ol style="list-style-type: none"> 1. PIRSA reports on number of commercial licences (annual). 2. SARDI reports on commercial catch and effort data (annual). 3. PIRSA to provide status reports on primary and secondary species (annual, December). 4. PIRSA/SARDI reports on recreational statistics (periodic). 5. PIRSA to review existing regulations for commercial and recreational sectors, and commercial licence conditions (when necessary). 	<ol style="list-style-type: none"> 1. Rate of licence reduction is less than 5% from previous year. 2. The upper limit of total annual commercial effort of 41,000 boat days is exceeded. 3. The total annual commercial catch is 25% less or greater than previous year's catch for any of the primary and secondary species. 4. The total annual commercial catch is 10% less or greater than the average catch of the previous five years for any of the primary and secondary species. 5. The total annual target commercial effort is 20% less or greater than the average target effort of the previous five years for any of the primary and secondary species. 6. The ratio of non-target-to-target commercial effort is 10% less or greater than the previous year's ratio for any of the primary and secondary species. 7. The annual average commercial CPUE is 10% less or greater than the average CPUE of the previous five years for any of the primary and secondary species. 8. The combined annual commercial and recreational catch is 25% less or greater than previous year's catch for any of the primary and secondary species (subject to the availability of recreational statistics).

Table 4.1 Continued.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
Goal 1: Sustainable harvest of marine scalefish fish stocks				
b. Ensure that appropriate biological performance and fishery status indicators are measured.	<p>11. Review and refine general limit reference points based on further information on individual species.</p> <ol style="list-style-type: none"> 1. Establish methods for measuring effective fishing effort. 2. Obtain sound biological information for primary species. 3. Complete and further refine stock assessment models for primary species. 4. Review and update the strategic research and monitoring plan. 5. Periodically review and update the information collected through commercial fishing logbooks. 6. Develop and maintain a fishery-dependent catch sampling/measuring program for relevant fishing sectors on primary species. 7. Develop a cost-effective fishery-independent monitoring program. 8. Develop a cost-effective recreational catch and effort monitoring program. 9. Review and refine biological limit reference points based on further information on individual species. 	<ol style="list-style-type: none"> 1. Egg production, fishable biomass, harvest fraction of fishable biomass, abundance of pre-recruits, and age structure of primary species. 	<ol style="list-style-type: none"> 1. Timely completion by SARDI of stock assessment models for primary species (scheduled). 2. MSFMC reviews and updates the strategic research and monitoring plan based on outcomes of PIRSA status reports (annual). 	<ol style="list-style-type: none"> 9. Catch, effort and CPUE levels for primary species by recreational fishers are higher than previous estimates. 1. Egg production is 20-35% of pristine population for any species. 2. Fishable biomass is 10% less or greater than the average biomass of the previous five years for any species. 3. Exploitation rate (harvest fraction of the fishable biomass) exceeds the international standard for any species. 4. Abundance of pre-recruits is 10% less or greater than the average abundance of the previous five years for any species. 5. Significant change of age structure over the previous five years for any species.

Table 4.2 Goal 2 of the Management Plan for the Marine Scalefish Fishery.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
<p>Goal 2: Minimise adverse impacts of all fishing operations on the ecosystem upon which the Marine Scalefish Fishery depends</p> <p>a. Minimise impacts of all fishing operations on fisheries habitat.</p>	<ol style="list-style-type: none"> 1. Develop Ecological Management Systems (EMS) for commercial and recreational sectors. 2. Assist with the adoption of Codes of Practice for commercial and recreational sectors. 3. Work towards the development of an ecosystem-based management regime on inshore South Australian fisheries. 4. Management of the fishery incorporates coastal zone management principles. 5. Measure the impacts of fishing operations on fisheries habitat. 6. Promote harvesting techniques that minimise adverse impacts of fishing on the habitat. 7. Conserve habitats inhabited by marine scalefish species. 8. Investigate the impact that changes in habitat may have on marine scalefish resources in relation to management of the fishery. 	<ol style="list-style-type: none"> 1. Acceptance of EMS and Codes of Practice by commercial and recreational sectors. 2. Progress of milestones in determining the trophic structure of the food web of the inshore ecosystem. 3. Number and extent of Marine Protected Areas (MPA)/Aquatic Reserves in each Marine Bioregion. 4. Use of fishing operations known to minimise impacts on habitat. 5. Effectiveness of closures for protection of critical habitat (e.g. aquatic reserves in nursery areas). 	<ol style="list-style-type: none"> 1. Update/review of EMS and Codes of Practice by commercial and recreational sectors (ongoing). 2. Extension and adoption of EMS and Codes of Practice (commercial and recreational sectors). 3. SARDI to report on progress of ecosystem-based model. 4. PIRSA/DEH to report on progress of MPAs/Aquatic Reserves (periodic). 5. Risk assessment of fishing operations by independent observers/SARDI (periodic). 6. Fishery-independent research (SARDI) (periodic). 	<ol style="list-style-type: none"> 1. Delayed adoption of EMS and Codes of Practice by commercial and recreational sectors. 2. A lack of progress of milestones on the development of an ecosystem-based model. 3. Increased awareness of issues that require restriction of fishing operations in some areas. 4. An increasing trend in level of impact of fishing operations conducted over critical habitat where known. 5. Closures for protection of habitat have little or no effect on marine scalefish species that depend on the associated habitat.
<p>b. Maintain low-level impacts of fishing operations on discarded by-catch (undersized, legal sized fish that are legislatively required to be returned to water, protected, unwanted, 'catch and release' by recreational fishers, not by-product). (See section 2.4.4 for Marine Scalefish Fishery definition of by-catch.)</p>	<ol style="list-style-type: none"> 1. Legislate for commercial fishers to record composition of discarded by-catch in logbooks. 2. Include information on discarded and retained by-catch in recreational fishing surveys. 3. Quantify the impact of fishing operations on discarded by-catch through targeted research. 4. Develop management strategies that minimise discarded by-catch. 	<ol style="list-style-type: none"> 1. Acceptance by commercial and recreational fishers to report discard by-catch (in addition to retained by-catch) in logbooks or surveys. 2. Levels and fate of discarded by-catch in commercial and recreational sectors. 3. The proportion of discarded and retained by-catch of the total catch. 	<ol style="list-style-type: none"> 1. SARDI/industry to monitor fate of discarded by-catch for commercial and recreational sectors (periodic). 2. Commercial sector to develop and implement a by-catch action plan for the commercial sector. 3. Recreational sector to review Code of Conduct for Recreational anglers and Guide for the Survival of Released Fish (periodic). 	<ol style="list-style-type: none"> 1. Increase in perceived level of impact of fishing operations on discarded by-catch. 2. The level of mortality of undersized fish (and other discarded by-catch) of a particular species is considered to adversely affect the population dynamics of that species. 3. An increasing trend in discard rates in the commercial or recreational sectors over a three-year period.

Table 4.3 Goal 3 of the Management Plan for the Marine Scalefish Fishery.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
Goal 3: Optimal utilisation of Marine Scalefish Fishery resources within the constraints of sustainability imperatives				
a. Improve economic efficiencies and financial returns to the commercial fishery.	<ol style="list-style-type: none"> 1. Ensure reliable economic performance indicators are measured annually. 2. Encourage the development of improved harvest, post-harvest, and marketing as value adding strategies. 3. Develop arrangements that allow commercial operators to maximise operational flexibility and economic efficiency. 4. Consider economic and financial impacts when implementing management arrangements. 	<ol style="list-style-type: none"> 1. GVP, average prices. 2. Average Financial returns, eg, Gross Income, Total expenses 3. Cash Operating Surplus, Return on Investment. 4. Average licence value. 	<ol style="list-style-type: none"> 1. Economic Performance Indicator report (annual). 	<ol style="list-style-type: none"> 1. A decreasing trend in annual return on investment over a three-year period.
b. Provide for fair and equitable access and opportunities for recreational fishing.	<ol style="list-style-type: none"> 1. Regulate the quantity of each species that may be taken by each recreational fisher using bag, boat and possession limits. 2. Develop a method for measuring quality of recreational fishing. 3. Develop and implement a method for resolving allocation and resource sharing disputes. 4. Develop and implement a program to periodically monitor participation and catch trends in the recreational sector. 	<ol style="list-style-type: none"> 1. Recreational participation. 2. Fishing success rates. 3. Index of fishing quality. 4. Recreational catch data. 	<ol style="list-style-type: none"> 1. Recreational fishing surveys (periodic). 2. PIRSA/SARDI reports on recreational statistics (periodic). 	<ol style="list-style-type: none"> 1. Decreasing (or increasing) trends of performance indicators.

Table 4.3 Continued.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
<p>Goal 3: Optimal utilisation of Marine Scalefish Fishery resources within the constraints of sustainability imperatives</p> <p>c. Maintain a flow of social and economic benefit from the fishery to the broader community.</p>	<ol style="list-style-type: none"> 1. Improve measurement of the social and economic benefit of commercial fishing on regional communities and the State. 2. Develop social and economic indicators of recreational fishing on regional communities and the State. 3. Consider the social and economic implications before implementing fisheries management strategies. 4. Support quality assurance programs for wild-caught seafood. 	<ol style="list-style-type: none"> 1. Economic and social benefits from commercial fishing towards employment, household income, and flow-on benefits. 	<ol style="list-style-type: none"> 1. Economic Performance Indicator report (annual). 2. Social assessment of commercial fishing (periodic). 	
<p>d. Support Government policies in providing opportunities for indigenous communities to access fish stocks for traditional purposes.</p>	<ol style="list-style-type: none"> 1. Provide mechanisms by which access to indigenous communities can be facilitated. 2. Incorporate catch and effort data for the indigenous fishing sector into stock assessments and status reports. 			

Table 4.4 Goal 4 of the Management Plan for the Marine Scalefish Fishery.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
<p>Goal 4: Good governance of the Marine Scalefish Fishery</p> <p>a. Develop and implement cost-effective management of the fishery.</p>	<ol style="list-style-type: none"> 1. Develop and implement arrangements that are effective at achieving management objectives, while minimising costs. 2. Identify the attributed costs of management for each of the commercial and recreational sectors, and the community. 3. Recover costs of managing the commercial sector through licence fees, with costs directly attributed to licence holders in relation to benefits derived 4. Explore methods for all non-commercial stakeholder groups to share the costs of managing the fishery. 5. Explore means for attracting additional funding for management of the fishery. 	<ol style="list-style-type: none"> 1. Total real costs of management, research and compliance for the fishery. 2. Total real costs of management, research and compliance in the fishery, attributed to the commercial industry, relative to GVP, each licence holder and per weight of fish. 3. Total real costs for core research of primary and secondary species based on PIRSA status reports as outlined in Goal 1 Objective a. 	<ol style="list-style-type: none"> 1. Finance Working Group to determine total real costs through the cost-recovery process (annual). 2. Economic Performance Indicator report (annual). 	<ol style="list-style-type: none"> 1. Insufficient funding for core research identified as essential. 2. Costs for service programs increase above annual CPI.
<p>b. Support co-management of the fishery.</p>	<ol style="list-style-type: none"> 1. Provide mechanisms for and promote stakeholder involvement in the management of the fishery, through established co-management processes. 2. Ensure that social and cultural issues are given appropriate consideration when developing new management strategies. 3. Provide the mechanisms for improving public awareness on the management of the fishery. 	<ol style="list-style-type: none"> 1. MSFMC membership reflects the stakeholder interests within the fishery. 2. Number of public meetings and their respective attendances. 	<ol style="list-style-type: none"> 1. Annual report of the MSFMC. 2. Public meetings (scheduled). 3. Newsletters by FMC Extension Officer. 	<ol style="list-style-type: none"> 1. High level of disenchantment of stakeholders through correspondence to the Minister or PIRSA, feedback to the Extension Officer, or through public meetings.

Table 4.4 Continued.

Management Objectives	Management Strategies	Performance Indicators	Monitoring Program/Schedule	Limit Reference Points
<p>Goal 4: Good governance of the Marine Scalefish Fishery</p> <p>c. Provide an effective compliance program for the fishery.</p>	<ol style="list-style-type: none"> 1. Risk assessment of compliance issues. 2. Implement a cost-effective compliance and monitoring program to address identified risks. 3. Develop and implement methods to quantify illegal catch levels. 4. Support stakeholder stewardship through FishWatch education program. 5. To measure the level of public awareness of fishing regulations. 	<ol style="list-style-type: none"> 1. Number of high-rated risks. 2. Number of compliance checks undertaken by FishWatch. 3. Number of reports of illegal activity, relative to the number of compliance actions (e.g. expiations, formal briefs, cautions, etc.). 4. The percentage of the sample that is aware of the fishing regulations. 	<ol style="list-style-type: none"> 1. PIRSA/MSFMC to conduct annual compliance risk assessment. 2. PIRSA to conduct annual review of FishWatch education program. 3. Annual report of the MSFMC. 4. PIRSA report on public awareness statistics (periodic). 	<ol style="list-style-type: none"> 1. Increasing trend in the level of illegal activity, relative to the number of compliance actions, detected in the fishery over a three-year period. 2. A decrease in the level of awareness of fishing regulations.
<p>d. Increase knowledge of the Marine Scalefish Fishery.</p>	<ol style="list-style-type: none"> 1. Ongoing funding for a research program that addresses management priorities (incorporating biological, ecological, social, and economic information). 2. Ongoing funding for recreational fishery research. 3. Stock assessments and status reports meet requirements of fisheries management. 4. Work towards ecosystem-based management of inshore South Australian fisheries. 5. Review and refine the commercial logbook system. 	<ol style="list-style-type: none"> 1. Funding available to meet research, monitoring and information needs. 2. Improvements in ecosystem and social research. 	<ol style="list-style-type: none"> 1. Annual review of research program by MSFMC, which is subject to funding through cost recovery. 2. Annual SAPDI stock assessment reports available according to research program. 3. Annual collation of logbook data by SARDI to determine annual estimates for catch and effort to be used for producing status reports on primary and secondary species. 	<ol style="list-style-type: none"> 1. Inadequate information to measure biological limit reference points for primary species. 2. Delayed availability of stock assessments and status reports for primary and secondary species. 3. Lack of proposals on ecosystem and social research.

5 MANAGEMENT OF ECOSYSTEMS AND CRITICAL HABITAT

5.1 Introduction

The conservation of the ecosystems and critical habitats associated with the Marine Scalefish Fishery is Goal 2 of the Management Plan and directly relates to the third core objective of the National Strategy for ESD: *‘To protect biological diversity and maintain essential ecological processes within life-support systems’* (Commonwealth of Australia, 1992) (see section 2.4.1). As such, the performance indicators and limit reference points associated with Goal 2 are related to measuring the ecological risks of fishery impacts on the ecosystems and critical habitats.

The performance indicators and limit reference points chosen relate to the following management objectives for Goal 2:

- a. *Minimise impacts of all fishing operations on fisheries habitat*
- b. *Maintain low-level impacts of fishing operations on discarded by-catch.*

In contrast to many of the measurable sustainability performance indicators for the primary target species outlined in Goal 1, we are only just beginning to obtain an understanding of the relative importance of the performance indicators for Goal 2. Therefore, collaborative research and monitoring of ecological risk is essential for assessing the performance indicators.

This chapter summarises the existing information on the primary target species in the Marine Scalefish Fishery, and provides the background for the setting of the limit reference points for the performance indicators within the objectives of Goal 2. A detailed review is provided in the *‘Ecological Assessment of the South Australian Marine Scalefish Fishery’* (Jones & Noell, 2005).

5.2 Impacts of Fishing Operations on Ecosystem Structure

All assessments on the primary species have assumed that there is no interaction between other species within the ecosystem that they occupy. Existing information on the diets of these species indicate that:

- King George whiting and southern calamary are lower order carnivores (Anon., 1994; Triantafillos, 2002)
- Southern sea garfish are omnivores, i.e. demonstrate herbivorous and lower order carnivorous behaviour (Noell, 2004)
- Snapper are higher order carnivores (Jones, 1987).

Consequences to the structure of the ecosystem if one or more of these primary species is not fished in a sustainable way can be categorised into one of a range of impact levels, ranging from ‘negligible’ to ‘catastrophic’ (Table 5.1). A limit reference point has been set at a moderate level of impact; however, without further detailed research on the ecosystems of South Australian waters, particularly those mainly associated with the Marine Scalefish Fishery in the South Australian gulfs, this limit reference point can not be appropriately assessed.

Table 5.1 Subjective classification of levels of impacts that fishing operations have on the structure of the ecosystem (Fletcher et al., 2002).

Impact Level	Consequence on Ecosystem Structure
Negligible	Interactions may occur, but there is unlikely any change outside the background variation.
Minor	Captured species do not play a significant role in the structure of the ecosystem.
Moderate	Changes in the ecosystem are apparent without major changes in function (e.g. no loss of trophic levels).
Severe	Ecosystem structure altered considerably and some function or local component missing, declining or increasing outside of historic range.
Major	A major change to ecosystem structure, with certain species major targets for capture.
Catastrophic	Total collapse of ecosystem processes.

5.3 Impacts of Fishing Operations on Fisheries Habitat

The critical habitats for a large number of the primary and secondary marine scalefish species have been reported elsewhere (Scott et al., 2000; McArthur et al., 2003; Bryars, 2003). Table 5.2 provides a summary of the critical habitats for the different life history stages of the primary marine scalefish species.

Table 5.2 Critical habitat types associated with different life stages of the primary species in the Marine Scalefish Fishery.

Life Stage	King George Whiting (Jackson & Jones, 2000; McGarvey et al., 2003)	Snapper (Fowler, 2002; Jones & Luscombe, 1993)	Southern Sea Garfish (Noell, 2004)	Southern Calamary (Triantafillos, 2002)
Early juveniles (0+ age group), i.e. nursery areas	Sheltered bays, tidal creeks, with seagrass patches.	Fine mud substrate, deeper gulf waters.	Sheltered bays, tidal creeks, seagrass beds of both gulfs.	Bare sand substrate in deeper waters of both gulfs.
Sub-adults	Seagrass beds (patchy to dense).	Natural and artificial reefs.	Not applicable	Not applicable
Adults, i.e. spawning or feeding areas	Offshore low profile reefs, sponge/bare sand.	Natural and artificial reefs, inshore mud substrate.	Seagrass and algal beds.	Seagrass and algal beds, low profile reefs.

The potential impacts of the fishing operations (e.g. gear, vessels) on these critical habitats include:

- Damage to seagrass beds and algal communities by net fishing
- Deployment of illegal artificial reefs
- Anchoring and mooring over seagrass
- Propeller scarring in shallow waters
- Damage to natural reefs from anchors.

Similar to the levels of impact of fishing operations on the structure of the ecosystem, the consequences of impacts on critical fisheries habitats can be categorised by a number of levels (Table 5.3). Each level is determined by the proportion of the area of critical habitat that is directly impacted by the fishery. For the Marine Scalefish Fishery, a limit reference point is provisionally assigned at the moderate level (i.e. >20 % of fragile habitat). Quantification of affected area of habitat is required to assess against this limit reference point.

Table 5.3 Classification of levels of impacts that fishing operations have on critical fisheries habitats (Fletcher et al., 2002).

Impact Level	Area of Habitat Affected
Negligible	<1%
Minor	1-5%
Moderate	5-20% (fragile habitat); 5-50% (non-fragile habitat)
Severe	20-70%
Major	70-90%
Catastrophic	>90%

5.4 Levels and Survival of Discarded By-catch

Discarded by-catch may consist of:

- Undersized fish/catch
- Legal-sized fish that are legislatively required to be returned to water, e.g. when recreational bag/boat limits or commercial quotas are exceeded, or fish that are caught during closed seasons or in closed areas
- ‘Catch-and-release’ fish by recreational fishers
- Protected species
- Unwanted catch.

Most of these possibilities for classification of discarded by-catch may apply to the four primary species in the Marine Scalefish Fishery (King George whiting, snapper, southern sea garfish and southern calamary) (with the exception that these species are not protected, nor are they likely to be unwanted). Information on the discarded by-catch of these species is derived from a number of sources, including the voluntary information reported by commercial fishers in logbooks, research surveys of net fishing activities (Jones, 1982; Kumar et al., 1995; Jones & Hill, 1996; O’Sullivan & Jones, 2003), and the National Recreational and Indigenous Fishing Survey (Henry & Lyle, 2003). Results of these surveys provide sufficient information to set a limit reference point of >10% mortality rate of total catch (by weight) for each of the primary species only. Methods are currently being developed in both the hauling net and line fisheries to maximise survival of discarded by-catch of all species after encountering fishing gear.

Although no information is currently available on the proportion of discarded by-catch of all species taken in hauling nets, a study on the by-catch and subsequent fate in the Victorian inshore net fishery, which is of similar nature to that of the South Australian Marine Scalefish Fishery (Knuckey et al., 2002), reported an average release rate of 60-70% (numbers and weight) with a subsequent average mortality of released species of 20%. Information on the release and mortality rates available for the primary target species of the Marine Scalefish Fishery is provided in Table 5.4.

The levels of by-catch vary considerably between fisheries, gear types and species within fisheries and regions within fisheries. Barratt et al. (2000) reviewed 144 Australian managed fisheries and categorised them into those having *very low* by-catch (1 – 9% of total catch, by weight), *low* by-catch (10 – 24%), *moderate* (25 – 49%) or *high* by-catch (>50%). Limit reference points should be set on by-catch that will not only ensure sustainability of target, by-product and discarded by-catch species, but also minimise socially unacceptable practices of discarding dead and/or dying animals (Fletcher et al., 2002). Also, limit reference points should include, where available, the overall release rate, as well as the mortality of the released catch.

Table 5.4 Information on the release and mortality rates available for the primary target species of the Marine Scalefish Fishery. Values are presented as the percentage of the total catch (numbers). LML = legal minimum length.

Primary Species	Commercial Hauling Net (Targeting Southern Sea Garfish)	Commercial Hauling Net (Targeting King George Whiting)	Commercial Line (Targeting King George Whiting, Snapper, Southern Calamary) or Dab Net (Southern Sea Garfish)	
				Recreational Line*
King George whiting	30.2% release rate (undersized), 15% mortality rate (Kumar et al., 1995).	Up to 5 % release rate (undersized) at LML 28 cm, up to 7 % at LML 30 cm (Jones & Hill, 1996). 4% mortality rate in Vic. hauling net fishery (Knuckey et al., 2002).	Unknown	33% release rate, 3% mortality rate (Kumar et al., 1995).
Snapper	Unknown	Unknown	Unknown	76 % release rate, mortality rate unknown but believed to be higher in deeper waters (McLeay et al, 2002).
Southern sea garfish	Unknown release rate, mortality rate believed to be high (100% in Vic. hauling net fishery, Knuckey et al., 2002)	Not applicable	Unknown release and mortality rates for commercial dab net fishery.	11% release rate (Henry & Lyle, 2003); mortality rate unknown but believed to be very high.
Southern calamary	Unknown	Unknown	Unknown	2.4% release rate, unknown mortality rate.

* Release rates for primary species taken by recreational line include undersized fish, bag and boat limits exceeded, and for snapper, 'catch-and-release' fish.

In accordance with the *Fisheries Act 1982*, all protected species must be returned to the water if inadvertently caught in the fishery. Protected species that are occasionally encountered or inadvertently captured during fishing operations for primary species of the Marine Scalefish Fishery are listed in Table 5.5. Species are categorised as protected or threatened because they are either rare, or vulnerable to human or anthropogenic effects (e.g. pollution, fishing, habitat alteration). Because of the considerable concern about their sustainability, the potentially adverse impact of the Marine Scalefish Fishery on these protected species is such that a moderate level limit reference point is set for management action (i.e. when impact is considered to be at the maximum acceptable level).

Table 5.5 Protected species that are occasionally encountered or inadvertently captured during fishing operations for primary species of the Marine Scalefish Fishery.

Species	Target Species (and Gear Type)
Great white shark	Snapper (long line, handline)
Blue groper (protected in Spencer Gulf and Gulf St Vincent, and not permitted to be landed by commercial fishery in State waters)	Snapper, shark (longline, dropline, handline) King George whiting (line fishing in Investigator Strait)
Marine mammals (seals, dolphins)	King George whiting, southern sea garfish (line, net)
Seabirds (cormorants, pelicans)	King George whiting, southern sea garfish (line, net)

6 COMPLIANCE

6.1 Strategic Aim and Mission of PIRSA Fisheries Compliance

In line with the Australian Fisheries National Compliance Strategy 2005-2010, the strategic aim of PIRSA Fisheries Compliance is *'to hold non-compliance at an acceptable level, which can be maintained at a reasonable cost for enforcement services whilst not compromising the integrity and sustainability of the resource'* (National Fisheries Compliance Committee, 2004).

Two goals are identified in achieving this strategic aim:

1. Maximising voluntary compliance whereby fishers are encouraged to voluntarily adopt and support fisheries laws for moral and ethical reasons
2. Effective deterrence whereby the penalties resulting from illegal activity outweigh benefits gained from that activity.

Critical aspects to achieving these aims are:

- Integrity and quality of PIRSA Fisheries Compliance services
- Stakeholder support for the strategic aim
- Collaborative approaches, i.e. working together with all stakeholders
- Co-management of the fisheries with all stakeholders
- Risk management to maximise effectiveness
- Fairness and equity in delivery of PIRSA Fisheries Compliance services
- Efficient and effective service delivery by PIRSA Fisheries Compliance.

6.2 Risk Management Model

PIRSA Fisheries Compliance ensures compliance with the management requirements of the Marine Scalefish Fishery by undertaking random checks at points of landing, during transit to the processors, and at processing premises.

The PIRSA Fisheries Compliance program includes associated areas of risk that are annually assessed by the compliance program and details of the risk mitigation tool-kit for the Marine Scalefish Fishery (Table 6.1) specifies the risk priorities and mitigating strategies agreed by the MSFMC for 2004/05, and thereby identifies the foci of compliance activity. Other risks will be addressed outside of the planned program, as circumstances require. Also, risks may change during the course of the year on the basis of information received by PIRSA Fisheries Compliance. Activity and outcome information will be collected in relation to the risks and activities outlined in Table 6.1, and reported to the MSFMC on a quarterly basis. The MSFMC and PIRSA Fisheries Compliance will audit the risk profile on an annual basis.

Table 6.1 Risk mitigation tool-kit for the Marine Scalefish Fishery for 2004/2005. Note: ranking for consequences and likelihood are on a scale of 1-5 (i.e. 5 is highest priority; 1 is lowest); overall rating is the product of consequence and likelihood rankings.

Fishery Sector	Risks (What Can Happen)	Consequence	Likelihood	Rating	Mitigating Strategies (Possible Actions)
a. Commercial	1. Collusion between commercial/recreational fishers (e.g. multiple boats working with a single licence holder, particularly in relation to squid, snapper and King George whiting)	3	4	12	1. Conduct covert operations/investigations 2. Conduct intelligence-driven operations 3. Follow-up and investigate possible illegal activity 4. Conduct risk assessment in relation to the charter fishery
	2. Fishing during closed season (snapper)	3	4	12	1. Conduct random at-sea patrols 2. Conduct intelligence-driven operations 3. Follow-up and investigate possible illegal activity
	3. Take over limit (gummy/school shark)	3	3	9	1. Conduct random at-sea patrols 2. Conduct landing inspections 3. Conduct intelligence-driven operations 4. Follow-up and investigate possible illegal activity
	4. Fishing in closed areas (particularly around Price, Port Pirie and Aldinga)	3	3	9	1. Conduct random at-sea patrols 2. Conduct intelligence-driven operations 3. Follow-up and investigate possible illegal activity 4. Aerial surveillance
	5. Take snapper by net	3	3	9	1. Conduct random at-sea patrols 2. Conduct landing inspections 3. Conduct intelligence-driven operations 4. Follow-up and investigate possible illegal activity
	6. Take undersized fish	2	4	8	1. Conduct random at-sea patrols 2. Conduct landing inspections 3. Conduct intelligence-driven operations 4. Follow-up and investigate possible illegal activity
	7. Take protected/non-permitted species	2	4	8	1. Conduct random at-sea patrols 2. Conduct landing inspections 3. Conduct intelligence-driven operations 4. Follow-up and investigate possible illegal activity
b. Non-commercial	1. Illegal sales	3	5	15	1. Provide awareness talks to schools and groups 2. Conduct covert operations/investigations 3. Conduct overt operations/investigations 4. Conduct covert operations on unregistered and registered processing sectors 5. FishWatch to target priorities 6. Conduct intelligence-driven operations 7. Follow-up and investigate possible illegal activity

Table 6.1 Continued.

Fishery Sector	Risks (What Can Happen)	Consequence	Likelihood	Rating	Mitigating Strategies (Possible Actions)
	2. Take over bag limit	3	4	12	<ol style="list-style-type: none"> 1. Conduct awareness campaign by actively talking to fishers about size and bag limits 2. Liaise with FishCare volunteers 3. Provide awareness talks to schools and groups 4. Conduct covert operations/investigations 5. Conduct overt operations/investigations 6. Use FishWatch to target priorities 7. Follow-up and investigate possible illegal activity
	3. Take undersized fish	2	5	10	<ol style="list-style-type: none"> 1. Conduct awareness campaign by actively talking to fishers about size and bag limits 2. Provide awareness talks to schools and groups 3. Liaise with FishCare volunteers 4. Conduct covert operations/investigations 5. Conduct overt operations/investigations 6. Use FishWatch to target priorities 7. Follow-up and investigate possible illegal activity
	4. Fish during closed season (razorfish, cockles, snapper)	3	3	9	<ol style="list-style-type: none"> 1. Conduct awareness campaign by actively talking to fishers about closed seasons 2. Liaise with FishCare volunteers 3. Conduct random at-sea patrols 4. Conduct intelligence-driven operations 5. Follow-up and investigate possible illegal activity
c. Processor	1. Non-commercial purchase/sales	3	5	15	<ol style="list-style-type: none"> 1. Conduct awareness campaign for unregistered & registered fish processors 2. Liaise & strengthen networks with local fishers, groups and relevant agencies 3. Conduct intelligence-driven operations on unregistered & registered fish processor premises 4. Conduct processor audits 5. Conduct random processor checks 6. Follow-up and investigate possible illegal activity
	2. Unregistered processor	3	5	15	<ol style="list-style-type: none"> 1. Conduct awareness campaign by actively talking to fishers and processors about rules 2. Liaise & strengthen networks with local fishers, groups and relevant agencies 3. Conduct overt & covert operations in unregistered fish processor premises 4. Conduct intelligence-driven operations 5. Follow-up and investigate possible illegal activity

Table 6.1 Continued.

Fishery Sector	Risks (What Can Happen)	Consequence	Likelihood	Rating	Mitigating Strategies (Possible Actions)
	3. Fail to keep correct records	3	4	12	<ol style="list-style-type: none"> 1. Conduct random processor checks 2. Conduct processor audits 3. Conduct scheduled follow-up processor checks 4. Follow-up and investigate possible illegal activity
d. Other	1. Habitat destruction	4	4	16	<ol style="list-style-type: none"> 1. Respond to reports of habitat destruction 2. Raise fisher awareness about habitat issues 3. FishCare volunteer patrols 4. Liaison and networking with relevant agencies 5. Follow-up and investigate possible illegal activity
	2. Lack of effective compliance (resources and local plans)	4	4	16	<ol style="list-style-type: none"> 1. Liaise with local fishers and groups to gather intelligence and encourage reporting of offences 2. Conduct covert operations/investigations 3. Conduct highly visible patrols 4. Conduct intelligence-driven operations 5. Liaise with FishCare volunteers 6. Liaison and networking with relevant agencies
	3. Pest/disease incursion	4	3	12	<ol style="list-style-type: none"> 1. Actively contribute to development of incident response plan and training 2. Respond as directed to incidents/outbreaks 3. Liaison and networking with relevant agencies 4. Investigate opportunities to improve border controls
	4. Commonwealth fishers fishing in State waters	3	4	12	<ol style="list-style-type: none"> 1. Conduct at-sea patrols 2. Aerial surveillance

7 RESEARCH AND DEVELOPMENT

7.1 Introduction

The success of the Management Plan and, consequently, the sustainability of the Marine Scalefish Fishery are both highly dependent on the provision of accurate fishery, biological, economic and social information. The strategy for prioritisation of the research in this complex fishery is described below.

7.2 Research Objectives

The following research objectives were developed by the Research Working Group of the MSFMC and ratified by the MSFMC:

- To undertake biological research on primary and secondary species, with special reference to key parts of their life history and their associated habitat and oceanographic dependencies
- To undertake ongoing stock assessment on primary and secondary species, incorporating general fishery and biological reference points for monitoring by the MSFMC
- To identify key economic reference points for monitoring by the MSFMC
- To undertake fish community studies, with special reference to trophic dynamics of primary species and relationships between fish communities and habitat
- To undertake or support studies that quantify the impacts or potential impacts of the activities of other sectors (fishing and non-fishing) on the Marine Scalefish Fishery.

7.3 Research Themes and Prioritisation of Issues

The research and development needs of the Marine Scalefish Fishery are identified and summarised as research themes, with prioritisation of issues within each theme, in Table 7.1.

7.4 Prioritisation of Research and Stock Assessment Reporting

Prioritisation of 30 species for research and stock status reporting was decided upon by the MSFMC in July, 2003, and was based on the following combined values of the commercial, recreational and community sectors, respectively, of the Marine Scalefish Fishery:

- Commercial harvest weight and value from 2001/02 wild fisheries production figures (Knight et al., 2002)
- Recreational harvest numbers from the 2000/01 National Recreational & Indigenous Fishing Survey (Henry & Lyle, 2003)
- Community values through a consensus view from community representatives of the Research Working Group of the MSFMC and the broader community.

Based on this method of prioritisation, the four primary species in order of priority are:

1. King George whiting
2. Southern calamary
3. Snapper
4. Southern sea garfish.

Table 7.1 Research themes and prioritisation of issues in the Marine Scalefish Fishery. Note: priority ranking is on a scale of 1-5 (i.e. 5 is highest priority; 1 is lowest); projects assigned with a priority ranking of 1 or 2 are not included in the table.

Group	Issue	Priority
a. Natural Resource Management	1. Development and maintenance of fishery monitoring systems to ensure adequate information is available for effective assessment and management of resource for all fishing sectors, including commercial, recreational and charter fishing.	5
	2. Development of management decision-making framework based on a risk assessment of research results.	5
	3. Policy research to assist in the enhancement of access security.	4
	4. Development of electronic logbooks to improve timeliness of data used in assessment and management of fishery.	3
b. Stock Assessment	1. Maintenance and enhancement of stock assessments.	5
	2. Development of fishery models used to evaluate reference points and biological performance indicators for the fishery.	5
	3. Provide regular and timely stock assessments, or stock status reports where a full stock assessment is not funded in any given funding year.	5
	4. Regular prioritisation of species for stock assessment.	4
c. Biological Research	1. Collect key biological data for priority species.	5
	2. Identify appropriate species-specific biological performance indicators for stock assessment purposes.	5
	3. Establish and refine fisheries models to assess biological performance indicators.	4
	4. Stock discrimination research (e.g. through genetic, tagging and otolith microchemistry) to define spatial distributions of populations for management purposes.	4
	5. Validate stock assessment models with fishery-independent biological performance indicators.	3
d. Ecosystem Sustainability	1. Support development of the ESD requirements of the fishery through the Environmental Management Plan.	5
	2. Determine relative importance of fisheries habitats that support fish communities.	4
	3. Determine the impact (direct and indirect) of other industries on fish stocks or fisheries habitat.	4
	4. Assessment of the impact of marine scalefish fishing operations on the ecosystem (including fate of discarded by-catch and gear on fisheries habitat).	4
	5. Research into environmental indicators such as fisheries habitat distribution, inter-species interactions (e.g. trophic dynamics) and climatic effects (e.g. oceanographic influences on recruitment).	4
	6. Monitor impacts of introduced marine pests, algal blooms and disease.	3
e. Compliance	1. Effectiveness of various enforcement techniques.	4
	2. Quantification of the effects of illegal fishing on catch and sustainability of fish stocks.	4
f. Socio-economics	1. Studies that support resource sharing and allocation decisions among different sectors.	4
	2. Assessment of the economics of all sectors of the industry for management decision-making.	4
g. Training and Development	1. Identify training needs in management processes to increase knowledge of relevant biological and management issues.	4
h. Funding	1. Identify opportunities for additional research funding from various sources to support and enhance research in the fishery.	5

For each of these species, the general fishery and biological performance indicators were ranked in order of priority for research as of July 2004 (Table 7.2).

The order of priority for the remaining 25 species is as follows:

5. Australian herring (tommy ruffs)
6. Australian salmon
7. Snook and mullet
8. Sand crabs, ocean leatherjacket, wrasses and State-managed sharks
9. Yellowfin whiting, mud cockles, cuttlefish, leatherjackets and black bream
10. Razorfish, blue groper, mullet, trevally, red mullet, rays and annelid worms
11. Striped trumpeter, weedy whiting, sweep, flathead and yellowtail kingfish.

Table 7.2 General fishery and biological performance indicators for the primary species of the Marine Scalefish Fishery ranked in order of research priority (ranking on a scale of 1-5, i.e. 5 is highest priority and 1 is lowest).

Species	Commercial Catch, Effort and CPUE	Recreational Catch, Effort and CPUE	Fishery-independent Pre-recruit Index	Population Age Structure	Fishable Biomass, Recruitment, Harvest Rate	Environmental Performance Indicators*
King George whiting	5	5	2	5	4	2
Snapper	5	5	5	5	4	3
Southern calamary	5	5	5	1	1	1
Southern sea garfish	5	5	1	3	4	2

* e.g. habitat, oceanography.

With the exception of Australian salmon and Australian herring, there is a lack of information on the basic biology and life history of these secondary species. Both Australian salmon and Australian herring are essentially shared stocks with Western Australia and Victoria and, therefore, research and management of these two species should be undertaken in collaboration with these States.

For most secondary species, biological performance indicators are not available. Reliance solely upon general fishery performance indicators, which are determined from commercial and recreational catch and effort (and hence CPUE), may not provide the level of certainty required to appropriately assess performance or sustainability of these species. Therefore, given the knowledge gaps regarding the biology of these species, the first research objective (see section 7.2) is a high priority.

Depending on the outcomes of the annual assessments of fishery and biological performance indicators for the primary and other species, the directions for research may change from year to year. However, it is still important for a five-year research plan for the primary species to be put in place. Any significant changes to the five-year plan will be dependent on:

- Urgency from management for the need for additional biological information for a particular species
- A significant change in the combined value of a species relative to other species
- The procurement of significant research funding for a particular fishery sector.

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9 APPENDICES

Appendix A Permitted species under Schedule 1 of the *Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991*

Scalefish

Anchovy (*Engraulis australis*)
Barracouta (*Thyrsites atun*)
Bluethroated wrasse (*Notolabrus tetricus*)
Bream (*Acanthopagrus butcheri*)
Cod (marine species) (Family Moridae)
Dory (Family Zeidae)
Flathead (Family Platycephalidae)
Flounder (Families Pleuronectidae, Bothidae)
Garfish (*Hyporhamphus melanochir*)
Horse mackerel (*Trachurus declivis*)
Leatherjacket (Family Aluteridae)
Ling (*Genypterus blacodes*)
Mackerel (*Scomber australasicus*)
Morwong (Family Cheilodactylidae)
Mullet (Family Mugilidae)
Mulloway (*Argyrosomus hololepidotus*)
Nannygai, Red snapper, Swallowtail (Family Berycidae)
Pilchard (*Sardinops neopilchardus*)
Red mullet (*Upeneichthys porosus*)
Salmon (*Arripis truttaceus*)
Snapper (*Chrysophrys auratus*)
Snook (*Sphyraena novaehollandiae*)
Sole (*Aserragodes haackeanus*)
Sweep (*Scorpius aequipinnis*)
Tommy ruff (*Arripis georgianus*)
Trevalla (*Hyperoglyphe antarctica*)
Trevally (*Usacaranx georgianus*)
Whiting (Family Sillaginidae)
Yellowtail kingfish (*Seriola grandis*)

Crustaceans

Crab, blue (*Portunus pelagicus*)
Crab, sand (*Ovalipes australiensis*)
Crab, rock (*Nectocarcinus integrifrons*)
Crab, velvet (*Nectocarcinus tuberculatus*)

Molluscs

Cockle (Suborder Teledonta)
Cuttlefish (*Sepia* spp.)
Mussels (*Mytilus* spp.)
Octopus (*Octopus* spp.)
Oyster (Family Ostidae)
Scallop (Family Pectinidae)
Squid
 calamary (*Sepioteuthis australis*)
 arrow (*Nototodarus gouldi*)

Annelids (Class Polychaeta)

Beachworm
Bloodworm
Tubeworm

Shark (Class Elasmobranchii)

All species other than white pointer shark (*Carcharodon carcharias*)

Skate

Rays

Appendix B Summary of Provisions in Fisheries (General) Regulations 2000 that Apply to the Marine Scalefish Fishery

Table B.1 *Fisheries (General) Regulations 2000* – Summary of provisions that apply to the Marine Scalefish Fishery as of 5 February 2005. (Note: this table is a summary document and should be used as a guide only. It has been prepared for the purposes of summarising the fisheries management arrangements that are in place under the regulations at the current time, and does not replace the regulations. Regulations may change from time to time. It is the responsibility of individuals to ensure that they are aware of the laws that apply and to comply with them.)

Regulation	Description	Applies to Commercial and/or Recreational?
4	Definitions.	
6	Protected fish.	
Sch 1 Clause 1	May only use a 'permitted device' or a rod and line or a hand line.	Both
Sch 1 Clause 2	May not use wire trace that is greater than 2 mm gauge in conjunction with fishing hooks size 12/0 or greater.	Both
Sch 1 Clause 4	Gear restrictions. Up to 10 hoop nets (lift nets) may be used if no other devices are used at the same time. However, a maximum of 3 may be used to take rock lobster. A maximum of 3 hoop nets (lift nets) may be used if other devices are being used, then a maximum of 1 hand net, 2 spear guns, 1 mussel dredge, 2 rock lobster pots and 3 hoop or drop nets (3 lift nets) may be used at the same time. Furthermore, out of hand nets, spear guns and mussel dredges, only 2 of these may be used at any one time. Out of rock lobster pots, hoop nets and drop nets (lift nets) only one may be used at any one time.	Recreational
Sch 1 Clause 5	Prohibition on use of fish nets in coastal waters. (Fish net means any net other than a hand net, dab net, shrimp net, hoop net, drop net, (lift net) or a prawn trawl net.)	Recreational
Sch 1 Clause 6	Prohibition on using a hauling net during the following periods: <ul style="list-style-type: none"> From 1 am on 23 December in any year to midnight on 1 January in the following year From 1 am on the Thursday before Good Friday to midnight Easter Monday From 1 am on Thursday to midnight Sunday for long weekends where the Friday is a holiday From 1 am Friday to midnight Monday for long weekends where the Monday is a holiday. 	Commercial
Sch 1 Clause 7	Prohibition on the use of long lines in coastal waters.	Recreational
Sch 1 Clause 8	Prohibition on leaving a long line unattended.	Commercial
Sch 1 Clause 11	Prohibition on fishing by bow and arrow.	Both
Sch 1 Clause 17	Prohibition on using more than 2 rods and lines.	Both
Sch 1 Clause 18	Prohibition on using more than 2 hand lines.	Both
Sch 1 Clause 19	Prohibition on using more than 1 of each at the same time.	Both

* Some provisions are expressed to apply to 'any person,' however, they effectively only apply to commercial operators in many cases because other prohibitions apply to exclude recreational activities. For example, some prohibitions on the use of mesh nets in coastal waters apply to 'any person,' but realistically they only apply to commercial operators who have mesh nets registered and endorsed on their licence. Recreational fishers are not permitted to use mesh nets in coastal waters anyway. Nevertheless, the table reflects the way the regulation is drafted i.e. that it applies to all.

Table B.1 Continued.

Regulation	Description	Applies to Commercial and/or Recreational?
Sch 1 Clause 20	Prohibition on using more than 1 teaser licence from a jetty, pier, wharf or breakwater. Prohibition on leaving a teaser line unattended.	Both
Sch 1 Clause 22	Prohibition on the use of an unregistered device.	Commercial
Sch 1 Clause 24	Marking requirements for fish nets.	Both
Sch 1 Clause 25	Marking requirements for drop lines.	Commercial
Sch 1 Clause 26	Marking requirements for trot lines.	Commercial
Sch 1 Clause 27	Maximum of 400 hooks on a set line or long line.	Commercial
Sch 1 Clause 28	Marking requirements for devices (other than hand held devices).	Commercial
Sch 1 Clause 30 and Schedule 2	Netting closures.	Both
Sch 1 Clause 31	Prohibition on using a fish net in Bay of Shoals. (Fish net means any net other than a hand net, dab net, dip net, shrimp net, hoop net, drop net, (lift net) or a prawn trawl net.)	Both
Sch 1 Clause 33	Maximum length of a hauling net that may be used in Venus Bay = 370 m.	Both
Sch 1 Clause 34	Spencer Gulf netting closures.	Both
Sch 1 Clause 35	Netting closure in Streaky Bay and Blanche Port. (The take of live bait for tuna poling by a licensed person is exempt from this prohibition.)	Both
Sch 1 Clause 37	Use of fish nets prohibited in waters deeper than 5m except for: <ul style="list-style-type: none"> • Large mesh nets • The taking of salmon by a licensed person • The taking of live bait for tuna poling • The taking of bait by Rock Lobster Fishery licence holders using a net with a mesh size less than 15 cm and a maximum length of 150 m. 	Both
Sch 1 Clause 38	Prohibition on the use of any device (except for rod and line, hand line or hand net) in specified areas around Baird Bay and Port MacDonnell.	Both
Sch 1 Clause 40	Allowable dimensions of a hauling net or seine net – maximum 600 m length, maximum 10m depth, minimum mesh size of 30 mm, maximum length or combined length of all ropes attached to it 100 m. Power hauling method excepted.	Both
Sch 1 Clause 41	Allowable dimensions of a commercial mesh net or gill net – maximum 600 m length, maximum 5 m depth, minimum mesh size 5 cm. A mesh net or gill net may not have a rope attached to it, except a floating rope. If it has a floating rope or ropes, the combined maximum length is 100 m (unless the net is used as a swinger net, which is not an endorsement on any MSF licence).	Commercial
Sch 1 Clause 42	Maximum length of a large mesh net = 600 m.	Both
Sch 1 Clause 43	Large mesh net may not be left in the water for more than 4 hours.	Both
Sch 1 Clause 44	No more than 5 large mesh nets may be used at any one time.	Both
Sch 1 Clause 45	Large mesh nets used in Spencer Gulf or Gulf St Vincent must be shot out in a straight line.	Both
Sch 1 Clause 46	Prohibition on the use of a net being towed behind a boat or by the hauling of a net other than by hand, in the following waters: <ul style="list-style-type: none"> • Spencer Gulf waters less than 40 m deep • Gulf St Vincent waters north of a line between Troubridge Point and Cape Jervis • All waters of the State less than 20 m deep. 	Both
Sch 1 Clause 49	The taking of prawns and the authorised use of the power hauling method of fishing are excepted from these prohibitions. A fish net may not be fixed, set or staked across any bay, inlet, river, creek or tidal water or the greater part of any bay, inlet, river creek or tidal water.	Both

Table B.1 Continued.

Regulation	Description	Applies to Commercial and/or Recreational?
Sch 1 Clause 50	Any stake, log, stone or other article (other than a fish net, which is dealt with by clause 49) may be fixed or placed across the mouth of any waters or the whole or part of any channel, creek, stream, river or tidal waters.	Both
Sch 1 Clause 51	Prohibition on taking using a purse seine net that exceeds 900 m in length, 13 m depth and has a mesh size of less than 50 mm.	Both
Sch 1 Clause 53	The allowable dimensions of a shrimp trap are – maximum 400 mm at its greatest dimension, maximum 200 mm height, minimum mesh size of the net forming part of the trap 5 mm and maximum diameter of the opening or entrance is 30 mm.	Both
Sch 1 Clause 54	Allowable dimensions and marking requirements of a fish trap – must be marked with a buoy that complies with regulations and is also marked with a black stripe 5 cm wide and visible above the water, maximum 2 m at its greatest dimension and each opening is either rectangular or funnel-shaped, Rectangular opening must not exceed 20 cm x 6 cm and must have a rigid frame of steel rod with a minimum diameter of 1.25 cm. Funnel-shaped openings, the inner opening of the funnel must be rectangular, and of the same dimensions as the rectangular opening above.	Commercial
Sch 1 Clause 55	Prohibition on the take of ocean leather jacket in waters deeper than 60 m by using a fish trap unless the fish trap has the following dimensions and markings – maximum volume 1 cubic metre (measured using outside dimensions), must be cylindrical, rectangular or square, maximum 2 openings each maximum length 30 cm and width 8 cm, each opening must be constructed of rigid steel rod minimum 0.8 cm diameter. Each trap must be marked with a buoy that complies with regulations and is marked with a black stripe 5 cm wide and visible above the water.	Commercial
Sch 1 Clause 60 and Schedule 6	Prohibition on taking undersize fish.	Both
Sch 1 Clause 61	Daily bag limit of 50 razor fish.	Commercial
Sch 1 Clause 62	Seasonal closure on taking razor fish during October, November, December, January and February in a specified area on the western side of Spencer Gulf.	Both
Sch 1 Clause 64	Closure on taking cockles (<i>Katejysia</i> spp.) within 50 m of specified area around Coffin Bay township and within 50 m of the shore of Goat Island.	Commercial
Sch 1 Clause 65	Prohibition on taking benthic marine organism in the area of a rocky reef and its waters, in waters between the high water mark and a depth of 2 m. Applies to waters adjacent to the State and waters adjacent to an island forming part of the State.	Both
Sch 1 Clause 66	Recreational bag and boat limits.	Recreational
Sch 1 Clause 67	Daily bag limit of 1 black cowrie.	Both
Sch 1 Clause 67A	Bag limit of 600 Goolwa cockles and 300 mud cockles.	Recreational
Sch 1 Clause 74	Maximum legal length of blue groper = 100 cm.	Both
Sch 1 Clause 77A	Daily boat limit for calamary and cuttlefish = 45 combined total. Daily bag limit = 15 combined total.	Recreational
Sch 1 Clause 77B	Daily boat limit for blue crab and sand crab = 120 combined total. Daily bag limit = 40 combined total.	Recreational
Sch 1 Clause 77C	Daily boat limit for school and gummy shark = 6 combined total. Daily bag limit = 2 combined total.	Recreational
Sch 1 Clause 78	Seasonal closure on taking blue crabs in Spencer Gulf during January and December.	Commercial
Sch 1 Clause 79	Seasonal closures on taking blue crabs in Gulf St Vincent during November and December and 1-15 January.	Commercial
Sch 1 Clause 80	Permanent closures on taking blue crabs in specified waters in Spencer Gulf.	Commercial
Sch 1 Clause 81	Prohibition on the commercial take of blue crab in any waters outside the waters of the Blue Crab Fishery.	Commercial
Sch 1 Clause 81A	Prohibition on the take of sand crabs using a sand crab pot in specified waters around Coffin Bay, Nepean Bay, Port Lincoln and Streaky Bay.	Commercial
Sch 1 Clause 109	Seasonal closure on the take of Goolwa cockles during June to October.	Both
Sch 1 Clause 113	Marking requirements for unattended hoop nets (lift nets).	Recreational
Sch 1 Clause 114	Marking requirements for unattended drop nets (lift nets).	Recreational

Table B.1 Continued.

Regulation	Description	Applies to Commercial and/or Recreational?
Sch 1 Clause 119	Allowable dimensions of a crab net for taking blue crabs – maximum diameter of opening hoop 150 cm, drop must not extend more than 30% of diameter and minimum mesh size 3 cm.	Commercial
Sch 1 Clause 120	Allowable dimensions of a crab net or hand net for taking any species of crabs – maximum diameter of opening hoop 107 cm and maximum drop 92 cm.	Recreational
Sch 1 Clause 122 and 122A	Prohibition on the use of a fish net, fish trap, hand fish spear, spear gun or longline near any of the specified artificial reefs.	Both
Sch 1 Clause 123	Prohibition on recreational fishing from a boat that is registered and endorsed on a commercial licence.	Commercial
Sch 1 Clause 126	Prohibition on the take of scallop using a scallop dredge.	Commercial
Sch 1 Clause 130	Allowable dimensions of a power hauling net – maximum length 600 m, maximum depth 10 m, maximum length of attached floating rope 100 m. Marking requirements are – must have attached to the bunt end a flag buoy that complies with regulations and has a yellow flag at least 30 cm x 30 cm and must be visible 1 m above water. If the hauling net is used at night, it must also have a flashing white light visible all around from at least 1 nautical mile.	Both
Sch 1 Clause 132	Prohibition on the use of a swinger net in all waters except between Goolwa Beach Rd and Kingston Jetty.	Commercial
Sch 1 Clause 134	Prohibition on the use of a fish trap.	Recreational

Appendix C Marine Scalefish Fishery Management Committee

Table C.1 Membership of the Marine Scalefish Fishery Management Committee.

Members/Representatives	Voting rights
Chairperson	Casting and deliberating
Committee Support Officer	Non-voting
Commercial (nets)	Voting
Commercial (line)	Voting
Commercial (general)	Voting
Recreational	Voting
Recreational	Voting
Community	Voting
SARFAC	Non-voting
SAFIC	Non-voting
SARDI Aquatic Sciences	Non-voting
PIRSA Fisheries Manager	Non-voting
Director, Fisheries Policy	<i>Ex officio</i>

Appendix D Strategic Research and Monitoring

A strategic approach to the management of the various species of the Marine Scalefish Fishery is based on a Management Response Matrix (Table D.1). This matrix relates the importance of a species (based on its combined value to the commercial, recreational and community sectors described in section 7.4) and the broad biological group to which it belongs, based on the age of recruitment into the fishery. The cell of the matrix that a species occupies determines the type of management action, if required, by the MSFMC in response to triggering a limit reference point linked to a performance indicator for that species.

Although many species are permitted to be taken in the Marine Scalefish Fishery, a small number have been prioritised as primary species. This group of species is the priority of this Management Plan and, therefore, the priority for research. However, other less important species, termed ‘secondary’ and ‘tertiary,’ still need to be managed appropriately as they make up a significant part of the supply to the seafood market and the catch in the recreational fishery. Effective future management of these species will be facilitated by scientific research when the need arises.

Table D.1 Management Response Matrix for marine scalefish species.

Age of Recruitment into Fishery (Years)*	Priority Classification†		
	Primary	Secondary	Tertiary
0-1	Southern calamary	Cuttlefish	Worms
1-3	Southern sea garfish	Australian salmon Australian herring Yellowfin whiting Snook Sand crab Ocean leatherjackets	Razorfish Yellowtail kingfish Yellow-eye mullet Sweep Red mullet Flathead
>3	Snapper King George whiting	Wrasses Mulloway Mud cockles Whaler sharks Black bream	Blue groper

* Age of recruitment into the fishery was regarded by the MSFMC Research Working Group as a key to differentiating management responses to changes to the key performance indicators.

† Type of response is related to classification of species and the type of limit reference point triggered.

Each cell of the matrix has an agreed set of decision rules for that group of species when the key performance indicators are triggered. The priority ranking determines whether or not the MSFMC will take any action. The age of recruitment into the fishery determines:

- The necessary time scale of the data needed for the biological performance indicators
- Immediate action by the MSFMC to establish a working group for a particular species
- The timeframe for the review and for the working group to report to the MSFMC
- The urgency for action.

Appendix E General Limit Reference Points for Individual Species

- The total annual commercial catch is 25% less or greater than the previous year's catch for any of the primary and secondary species
- The total annual commercial catch is 10% less or greater than the average catch of the previous five years for any of the primary and secondary species
- The total annual target commercial effort is 20% less or greater than the average target effort of the previous five years for any of the primary and secondary species
- The ratio of non-target-to-target commercial effort is 10% less or greater than the previous year's ratio for any of the primary and secondary species
- The annual average commercial CPUE is 10% less or greater than the average CPUE of the previous five years for any of the primary and secondary species
- The combined annual commercial and recreational catch is 25% less or greater than the previous year's catch for any of the primary and secondary species (subject to the availability of recreational statistics)
- Catch, effort and CPUE levels for any of the primary and secondary species by recreational fishers are higher than the previous estimates (subject to the availability of recreational statistics).

Appendix F Biological Limit Reference Points for Individual Species

The performance of the Marine Scalefish Fishery is based on the biological objectives of maintaining egg production, exploitation rate, fishable biomass and recruitment at sustainable levels. The biological limit reference points are as follows:

- Egg production is 20-35% of pristine population for any species
- Fishable biomass is 10% less or greater than the average biomass of the previous five years for any species
- Exploitation rate (harvest fraction of the fishable biomass) exceeds the international standard for any species
- Abundance of pre-recruits is 10% less or greater than the average abundance of the previous five years for any species
- Significant change of age structure over the previous five years for any species.

Appendix G Links between Research and Management

The MSFMC aims to ensure that research meets the strategic and day-to-day management priorities of the Marine Scalefish Fishery. These priorities relate to management goals of the fishery, primary,

secondary and tertiary species, and information requirements. Information requirements include catch and effort analyses, stock assessment reports and species status reports.

G.1 Catch and Effort Analyses

SARDI Aquatic Sciences is to provide the data on commercial and recreational (where possible) catch and effort summarised by fishing area (Figure G.1) and region for all primary, secondary and tertiary species in the Management Response Matrix (Table D.1), provided that funding is available. One of the responsibilities of the Research Working Group of the MSFMC is to analyse this catch and effort data, the report of which contributes towards the species status reports (see below).

G.2 Stock Assessment Reports

SARDI Aquatic Sciences is to provide stock assessment reports for selected species, based on the priorities of the research program and within the constraints of available research funds (reviewed on an annual basis). The following layout is typical of the contents of a stock assessment report:

1. Executive Summary
2. Introduction
 - Description of fishery
 - Management regulations
 - Population biology and life history
 - Previous stock assessments.
3. Analysis of Commercial Fishery Statistics
 - Catch, effort and CPUE trends (recent and historic)
 - State and regional overviews
 - Trend in number of licence holders that harvest the species (incl. selected licence holders)
 - Assessment of any recent change in management regulations.
4. Analysis of Recreational Fishery
 - Creel survey
 - National Indigenous and Recreational Fishing Survey (or similar).
5. Research (incl. fishery independent research)
 - Reproduction
 - Life history
 - Diet
 - Age and growth (incl. age structures of populations).
6. Assessment of Biological Performance Indicators
 - Data (for model input)
 - Stock assessment model (e.g. WhitEst, GarEst).
7. Management Strategy Evaluation
 - Simulation model (e.g. WhitSim)
 - Management considerations.
8. Future research

9. Discussion

10. References

G.3 Species Status Reports

SARDI Aquatic Sciences and the Research Working Group of the MSFMC will produce an annual species status report for the Marine Scalefish Fishery by the end of each calendar year, beginning 2005. The report will contain the following components for each of the primary species (for secondary and tertiary species, the report will mainly consist of catch and effort data analyses):

- Management background (incl. any recent change in management regulations)
- Stock structure, life history and other biological information
- Previous assessments and status
- Evaluation of performance indicators (general fishery and biological) against limit reference points
- Current assessment and status
- Implications for management
- Research needs.

These reports are to be used by the MSFMC to assess the performance of individual species and to determine management measures and research priorities for the following year.

Appendix H Glossary of Terms

Age structure A breakdown of the different age groups within an individual population, or population sample.

Allocation Distribution of the opportunity to access fisheries resources, within and between stakeholder groups.

Aquatic reserve An area of water, or land and water, established as an aquatic reserve by proclamation under the *Fisheries Act 1982* and managed for the protection of aquatic habitat.

Bag limit The maximum number of a species that can be legally retained by a person per day or per fishing trip, as specified.

Biodiversity The variability among living organisms from all sources (including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part) and includes diversity within species, between species and of ecosystems.

Biomass The total weight or volume of individuals in a fish stock.

Boat limit The maximum number of a species that can be legally retained on a boat per day or per fishing trip, as specified.

By-catch Includes all material, living and non-living, other than targeted species that is caught while fishing.

By-product The component of the by-catch that is non-targeted and retained because it has commercial value to the fisher.

Catch The total amount (weight or number) of a species captured from within a specified area over a given period of time. Includes any animals that are released or returned to the water.

Catch per unit of effort (CPUE) The weight or number of a species caught by a specified amount of effort. Typically, effort units are defined using a combination of the following factors: gear type; gear size; the amount of gear; the amount of time the gear is used; and the number of people operating the gear. CPUE is often used as an index of relative abundance in fisheries stock assessment. In modern assessments, CPUE is standardised to account for the diverse range of factors that can affect CPUE.

Closures Prohibition of fishing during particular times or seasons (temporal closures) or in particular areas (spatial closures), or a combination of both.

Co-management Arrangements between governments and stakeholder groups to allow joint responsibility for managing fisheries resources on a cooperative basis. Co-management arrangements can vary from consultative where co-managers have an advisory capacity, to informative where co-managers have decision-making powers.

Commercial fishing Fishing undertaken for the purposes of trade or business, where the catch is sold for financial gain.

Common property resource A resource that is determined to be owned by the community, or by the State on behalf of the community, and to which no individuals or user groups have exclusive access rights.

Critical habitats Habitats that are crucial in at least part of the life cycle of a species. Typically include nurseries such as estuaries, mangroves, seagrass beds, reefs and defined spawning areas.

Discards The component of the catch that is released or returned to the water after capture.

Ecologically related species Species that, while not associated with or dependent upon a harvested species, nevertheless are affected by the fishing operation.

Ecologically sustainable development Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

Ecologically viable stock Refers to the maintenance of the exploited population at high levels of abundance designed to maintain productivity, provide margins of safety for error and uncertainty and maintain yields over the long term in a way that conserves the stocks role and function in the ecosystem.

Economic efficiency The maximisation of the value of the net benefits derived from fishery resources.

Ecosystem A dynamic complex of plant, animal, fungal, and microorganism communities and the associated non-living environment interacting as an ecological unit.

Effective fishing effort Measures of fishing effort that have been standardised so that the measure is proportional to the fishing mortality rate that the gear(s) impose on the stock of fish (e.g. 'hooks per day of fishing'). Management measures to limit effective effort imply that the fishing mortality rate is to be limited.

Effort The amount of fishing taking place, usually described in terms of gear type and frequency or period during which the gear is in use (e.g. 'hook-sets,' 'trawl-hours,' 'searching hours').

Exploitation rate Applied to a fish stock, it is the fraction of the fishable biomass removed by fishing. An exploitation rate of 0.1 indicates that 10% of the available stock is being harvested within the time frame considered (per year, month, etc.). As a measure of fishing pressure, it is proportional to fishing mortality.

Fish stock The living resources in the community or population from which catches are taken in a fishery.

Fishery A term used to describe the collective enterprise of taking fish. Usually defined by a combination of the species caught (one or several), the gear and/or fishing methods used, and the area of operation.

Fishery-dependent data Information collected about a fishery or fish stock by the participants of a fishery, e.g. catch and effort information from fishery log sheets.

Fishery-independent data Information collected about a fishery or fish stock by researchers, independent of the fishery, e.g. scientific surveys, observer reports.

Fisheries Management Committee (FMC) A statutory advisory body established by the Minister to provide a stakeholder forum for consideration of management issues relevant to a specific fishery. Fisheries Management Committees are designed to allow for stakeholder input to fisheries management.

Fishing effort The amount of fishing gear of a specific type used on the fishing grounds over a given unit of time, e.g. Hours trawled per day, number of hooks set per day or number of hauls of a beach seine per day.

Fishing mortality The proportion of the fish available being removed by fishing in a small unit of time.

Fully exploited Describes a fish stock for which current catches and fishing pressure are close to optimum (the definition of which may vary between fisheries; for example, catches are close to maximum sustainable yield). Categorising a species as ‘fully fished’ suggests that increasing fishing pressure or catches above optimum (allowing for annual variability) may lead to overfishing.

Gear restriction A type of input control used as a management tool to restrict the amount and/or type of fishing gear that can be used by fishers in a particular fishery.

Habitat The place or type of site in which an organism naturally occurs.

Harvest The total number or weight of fish caught and retained from an area over a period of time.

Harvest strategy A plan, under input or output control, for working out how the allowable catch from a stock will be calculated each year (e.g. as a constant proportion of the estimated biomass).

Input controls Limitations on the amount of fishing effort; restrictions on the number, type, and size of fishing vessels or fishing gear, or on the fishing areas or fishing times in a fishery.

Limit reference point Indicates the limit beyond which the state of a fishery and/or a resource is not considered desirable or acceptable. Fishery development should be stopped before reaching the limit reference point (LRP). If a LRP is inadvertently triggered, management action should severely curtail or stop fishery development, as appropriate, and corrective action should be taken. Stock rehabilitation programs should use the LRP as a very minimum rebuilding target to be reached before the rebuilding measures are relaxed or the fishery is re-opened.

Limited entry Fishing effort is controlled by restricting the number of operators. It usually requires controlling the number and size of vessels, the transfer of fishing rights, and the replacement of vessels.

Logbook An official record of catch and effort data made by fishers.

Management objective A target that is actively sought and provides a direction for management action.

Management regime In this document, refers to the policies, plans, action plans, strategic research plans, and all documentation that relates to the operations and management of the fishery.

Marine park An area of water, or land and water, considered to be of national significance because of the aquatic flora or fauna of those waters or the aquatic habitat, and established as a marine park by proclamation under the *Fisheries Act 1982*.

Marine protected area An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, and managed through legal or other effective means.

Maximum sustainable yield The highest theoretical equilibrium yield that can be continuously taken (on average) from a stock under existing (average) environmental conditions without affecting significantly the reproduction process.

Minimum mesh size The smallest size of mesh permitted in nets and traps, imposed on the basis that smaller individuals will escape unharmed.

Mortality Rate of deaths (usually in terms of proportion of the stock dying annually) from various causes.

Nominal fishing effort ‘Nominal’ means quantities as they are reported, before any analyses or transformations. Refers to measures of fishing effort or vessel carrying capacity that have not been standardised.

Non-retained species Species taken as part of the catch that are discarded, usually because they have low market value or because regulations preclude them being retained.

Non-target species Species that are unintentionally taken by a fishery.

Offshore Constitutional Settlement (OCS) An agreement between the State(s) and the Australian Government whereby the State or the Australian Government (or in some cases, a Joint Authority) is given jurisdiction for a particular fishery occurring in both coastal waters and the Australian Fishing Zone. When no OCS agreement has been reached, the fishery remains under the jurisdiction of the State out to 3 nm, and the Australian Government from 3 to 200 nm.

Output controls Limitations on the weight of the catch (quota), or the allowable size, sex or reproductive condition of individuals in the catch.

Over-exploited (or overfished) A fish stock that is exploited beyond that limit which is believed to be sustainable in the long term and beyond which there is an undesirably high risk of stock depletion and collapse. The limit may be expressed, for example, in terms of a minimum biomass or a maximum fishing mortality, beyond which the resource would be considered to be over-exploited.

Overfishing Can be defined in two ways which can act independently or concurrently: (1) ‘recruitment overfishing,’ where fishing activities are causing a reduction in recruitment in succeeding years and cause the mortality of too many fish in total, too many pre-productive fish, or too many fish that have only spawned a few times; and (2) ‘growth overfishing,’ where fishing activities lead to a reduction in the size of the individuals of a species, as a consequence of which few specimens grow to the size for optimum yield.

Performance indicator A specific state, or variable, which can be monitored in a fishery to give a measure of the state of the fishery at any give time. In fisheries management, each performance indicator would be linked to one or more reference points and used to track the state of the fishery in relation to those reference points.

Population A group of individuals of the same species, forming a breeding unit and sharing a habitat.

Possession limit A possession limit under the *Fisheries Act 1982* is a prescribed number of fish for a species that represents what is considered a commercial quantity of that species. If a person has the prescribed amount of fish in their possession, then the onus of proof is reversed in any prosecution relating to taking those fish illegally.

Precautionary approach An approach that applies the precautionary principle.

Precautionary principle This principle asserts that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decision-making should be guided by: (1) careful evaluation to avoid, wherever practicable,

serious or irreversible damage to the environment; and (2) an assessment of the risk-weighted consequences of various options.

Precautionary recovery strategy Management and operational strategy designed to increase numbers within the stock that incorporates the precautionary approach and includes mechanisms to avoid or mitigate adverse ecosystem effects.

Productivity Relates to the birth, growth and death rates of a stock. A highly productive stock is characterised by high birth, growth, and mortality rates, and as a consequence, a high turnover and production-to-biomass ratio. Such stocks can usually sustain higher exploitation rates and, if depleted, could recover more rapidly than comparatively less productive stocks.

Quota A limit on the weight of fish that may be caught in a particular stock or area.

Recreational fishing Fishing where the catch is released or used for personal consumption and is not used for sale, trade or barter.

Recruitment The addition of new individuals to a stock.

Recruits The new age group (or cohort) of the population entering the exploited component of the stock for the first time or young fish growing into, or otherwise, entering that exploitable component.

Relative abundance An index of fish population abundance used to compare fish populations from year to year. This does not measure the actual numbers of fish, but shows changes in the population over time.

Retained The component of the catch that are kept and not discarded.

Seasonal closure The closure of a fishing ground for a defined period of time, often used as a tool by fisheries managers to protect a stock during a spawning season.

Selectivity The ability of a type of gear to target and catch a certain size or species of fish.

Size limits A minimum or maximum size limit determines the legal size at which a given species can be retained.

Size of maturity Length or weight of the fish at which 50% of the group, population or stock of a species have attained reproductive maturity.

Socio-economic Relating to both social and economic considerations.

Spatial Of or relating to space.

Species A group of organisms capable of interbreeding freely with each other but not with members of other species.

Stakeholder An individual or a group that has an interest in a resource and its use.

Stock In the strict sense, a distinct, reproductively isolated population. In practice, a group of individuals of a species occupying a defined spatial range independent of other groups of the same species, which can be regarded as an entity for management or assessment purposes.

Stock assessment A relatively detailed and comprehensive analysis of stock status (catch and effort, abundance, distribution, age structure, etc.) to support the management of the species/fishery.

Sustainable use The use of components of biological diversity in a way and at a rate that does not lead to their long term decline, thereby maintaining their potential to meet the needs and aspirations of present and future generations.

Target species The most highly sought component of the catch taken by fishers.

Temporal Of or relating to time.

Threatened A species or community that is vulnerable, endangered or presumed extinct.

Traditional fishing Fishing for the purposes of satisfying personal, domestic or non-commercial communal needs, including ceremonial, spiritual and educational needs and utilising fish and other natural marine and freshwater products according to relevant indigenous custom.

Uncertain A fish stock that may be underfished, fully fished or overfished, but for which there is inadequate or inappropriate information to make a reliable assessment of its status.

Under-exploited (or underfished) A fish stock that has the potential to sustain catches higher than those currently taken.

Vulnerable species Under endangered species protection legislation, a species that within 25 years will become endangered unless mitigating action is taken.

Yield The amount of biomass or the number of units that can be harvested currently in a fishery without compromising the ability of the population/ecosystem to regenerate itself.

Yield per recruit Analysis of how growth and natural mortality interact to determine the best size of animals for harvest; i.e. is it most beneficial economically for fish to be caught when they are young and plentiful, or when they are older and larger but reduced in number by natural causes?

Appendix I List of Acronyms

AFMA	Australian Fisheries Management Authority
BRP	Biological Reference Point
BPI	Biological Performance Indicator
CPUE	Catch per unit of effort
DAFF	Department of Agriculture, Fisheries and Forestry (Australian Government)
EMS	Environmental Management System
ESD	Ecologically Sustainable Development
FAO	Food and Agriculture Organisation
FMC	Fisheries Management Committee
FRDC	Fisheries Research and Development Corporation
GVP	Gross Value of Product
MPA	Marine Protected Area
MSF	Marine Scalefish Fishery
MSFMC	Marine Scalefish Fishery Management Committee
OCS	Offshore Constitutional Settlement
PIRSA	Primary Industries and Resources South Australia
SAFIC	South Australian Fishing Industry Council
SARDI	South Australian Research and Development Institute
SARFAC	South Australian Recreational Fishing Advisory Council

Appendix J Legislative Acts and Regulations

Environment Protection and Biodiversity Conservation Act 1999

Fisheries Act 1982

Fisheries (General) Regulations 2000

Fisheries (Management Committees) Regulations 1995

Fisheries (Scheme of Management – Marine Scalefish Fisheries) Regulations 1991

Harbours and Navigation Act 1993