
Management Plan for the South Australian Abalone Fishery

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FOREWORD

Management Plan for the South Australian Abalone Fishery

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

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

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

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

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

I am pleased to support this revised management plan for the South Australian abalone fishery that has been prepared by the Abalone Fishery Management Committee in association with Primary Industries and Resources South Australia and the South Australian Research and Development Institute, in accordance with the *Fisheries Act 1982*.

The purpose of this management plan is to ensure that the fishery continues to be managed on a sustainable basis while allowing for continued development of the abalone industry. The management plan provides management objectives and strategies for the next five years and is subject to annual review and amendments as considered necessary.

This management plan will be comprehensively reviewed in 2009.



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

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1 SCOPE OF THE MANAGEMENT PLAN

Sustainable management of marine resources in South Australia is the responsibility of Primary Industries and Resources South Australia (PIRSA) under the *Fisheries Act 1982*. The principal objectives to be pursued in the administration of the Act (section 20) are:

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

This management plan sets out the specific objectives of the abalone fisheries. It also provides a statement of the policy and strategies to be employed to achieve these objectives. The exploitation of all species of abalone (Genus *Haliotis*) will be guided by this management plan.

Regulations that relate to the management of the abalone fishery in South Australia are located in the *Scheme of Management (Abalone Fisheries) Regulations 1991* and the *Fisheries (General) Regulations 2000*.

This management plan will apply for a **five**-year period from the date of approval and will be subject to annual review and amendments as considered necessary by the Abalone Fishery Management Committee, the Director of Fisheries or the Minister for Agriculture, Food and Fisheries. In addition, six months before the end of the five-year period this plan will be comprehensively reviewed.

This management plan is a dynamic document reflecting current understanding of the abalone fishery, and as such, may change over time.

It is important to note that a review of the *Fisheries Act 1982* is presently being undertaken. This review is expected to be completed by the end of 2004 and may result in changes to the principal objectives of the Act. This management plan will be reviewed to ensure that it is consistent with the new Act.

2 DEFINITION OF THE SOUTH AUSTRALIAN ABALONE FISHERY

Pursuant to section 46 of the *Fisheries Act 1982* the Government may make regulations for the conservation, enhancement and management of the living resources of the waters to which the Act applies and, the regulation of fishing and the protection of certain fish. These regulations may (among other things):

- declare that any prescribed class of fishing activities constitutes a fishery;
- prescribe a scheme of management for a fishery...

The scheme of management relating to the abalone fishery is known as the *Scheme of Management (Abalone Fisheries) Regulations 1991*.

In those regulations, three abalone fisheries are formally constituted. These fisheries are defined as the taking of abalone in the waters of the Western Zone Abalone Fishery, the Central Zone Abalone Fishery and the Southern Zone Abalone Fishery respectively.

Certain terms are defined in the scheme of management -

"**abalone**" means abalone (*Haliotis* spp.) of all species:

"**abalone fishery**" means:

- (a) the Western Zone Abalone Fishery;
- (b) the Central Zone Abalone Fishery; or
- (c) the Southern Zone Abalone Fishery,

constituted by the regulations:

"**Western Zone**" means the coastal waters west of the meridian of longitude 136°30'E.

"**region A**" means the waters in the Western Zone south and east of a line drawn due south through Point Brown position latitude 32°32.6'S, longitude 133°50.8'E;

"**region B**" means the waters in the Western Zone north and west of a line drawn due south through Point Brown position latitude 32°32.6'S, longitude 133°50.8'E;

"**Central Zone**" means the coastal waters between the meridians of longitude 136°30'E and 139°E but does not include the waters of the Coorong or any other waters inside the Murray Mouth:

"Southern Zone" means the coastal waters east of the meridian of longitude 139°E, but does not include the waters of the Coorong or any other waters inside the Murray Mouth:

Refer to Figure 1, for a further description of the fishing zones.

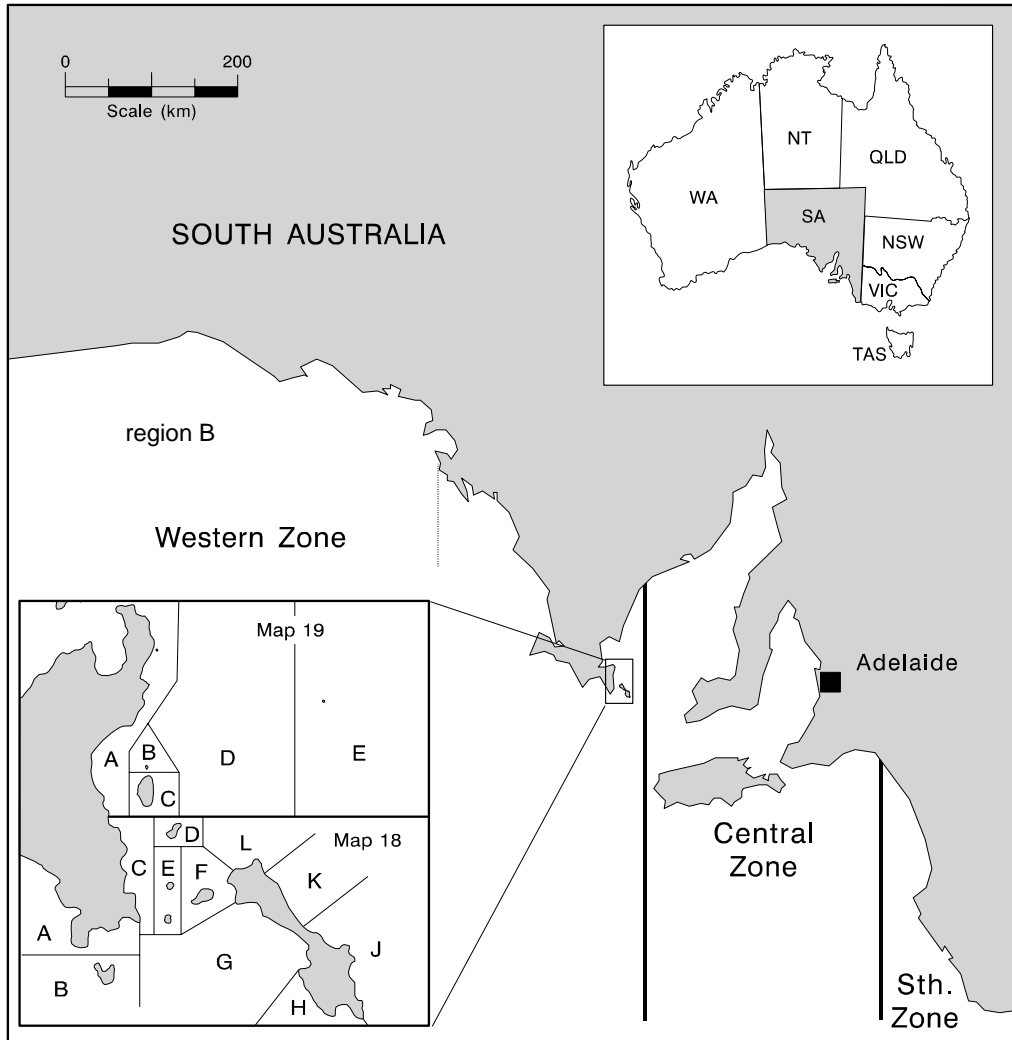


Figure 1: The three management zones for the South Australian abalone fishery together with an example from the Western Zone showing the fine scale at which catch and effort data from the fishery are collected. [Region B in the Western Zone means those waters north and west of a line drawn due south of Pt. Brown (Lat. 32°32.6'S, Long. 133° 50.8'E)]

3 OVERVIEW OF THE FISHERY

3.1 Commercial fishing

In South Australia, two species of abalone (greenlip abalone, *Haliotis laevis*, and blacklip abalone, *Haliotis rubra*) are harvested on a commercial basis. One species, *Haliotis roei*, is the subject of a comprehensive research program.

The other two species present in South Australian waters, *H. cyclobates* and *H. scalaris*, are smaller and less abundant than *H. roei* and are not exploited at this time.

The life history and biology of South Australian abalone is well known and Shepherd (1973, 1975, 1986, 1988, 1990), Mayfield *et al* (2001, 2002a,b,c) and Mayfield & Ward (2003) provide comprehensive summaries.

The South Australian commercial abalone fishery began in 1964. The history of the fishery is well documented (Mayfield *et al* 2001; Shepherd & Rodda 2001; Zacharin 1997), and significant fishery milestones are provided in **Appendix I**. By 1971, the number of licences exceeded 100. This was reduced through a policy of non-transferability. At the same time the fishery was divided into the three management zones still used today. Thirty licences remained in 1976 when five additional licences were issued.

There are currently 23 licences in the Western Zone and 6 licences in each of the Central Zone and Southern Zones.

In 1980, licences became transferable and several transfers occurred as the fishery expanded due to the improvement in price and export markets. Significant increases in catch and fishing effort between 1974 and 1984 lead to concerns that the resource may be over-exploited. In 1985, quotas were introduced in the Western Zone to restrict the catch. Quotas were subsequently introduced into the Southern and Central Zones during 1988 and 1989 respectively. A summary of the total allowable commercial catches (TACCs) set for the fishery since the imposition of quotas in 1985 is provided in **Appendix II**.

Each licence is allocated an individual transferable quota (ITQ) that is an equal proportion of the total allowable commercial catch (TACC) for blacklip and greenlip abalone for that zone of the fishery. Quota is transferable between licence holders within each zone during a fishing period, but may not be permanently transferred.

A minimum legal length of 130 millimetres (shell length) for both blacklip and greenlip abalone was introduced in 1971. These minimum legal lengths were amended in 1984 based upon improved information on the biology of greenlip and blacklip abalone, and the exploitation dynamics of the fishery. The minimum

legal lengths were again reviewed for the Southern Zone in 1988. The current minimum legal lengths are provided in Table 7, Table 10 and Table 13.

In 1993, regulations requiring the licence holder to operate the licence were abolished with revised regulations permitting the issue of licences to persons, partnerships or companies.

Today, abalone divers operate from single or twin hulled boats of up to 12 metres in length. Diving is conducted in neoprene wetsuits with surface air supplied by hookah hoses from compressors. Many divers use self-propelled “shark cages” that provide protection and enable divers to fish large areas with minimal effort. Abalone are harvested by hand using a chisel-shaped metal blade called an “abalone iron.”

Most South Australian abalone is exported to Hong Kong, Taiwan and Singapore (refer to **Table 1**). Lesser amounts are exported to Japan, mainland China, the USA and Europe. The majority of the product is canned in South Australia (62 percent). This generates export earnings of A\$58 million and approximately 350 jobs (directly and indirectly) for South Australia (ABARE – 2000/01).

Table 1: SA Abalone Exports by Type/Country/Value for the period 2000/01

	Frozen/Chilled		Canned	
	tonnes	\$ ('000's)	tonnes	\$ ('000's)
Europe	0.15	5.00	4.41	461
Hong Kong	97.5	13 453	182	17 247
Singapore	16.4	1612	45	4338
Japan	13.6	1478	28	2946
Taiwan	22.0	2019	42	4259
USA/Canada	13.8	1765	31	3317
China	45.3	5123		
Total	208.8	25 455	332.82	32 568

The divers formed the Abalone Divers Association in 1969 in response to the concerns for the fishery and the need for a representative approach. After incorporation was introduced and companies started owning abalone licences, the Association broadened its views to encompass all abalone industry participants and was renamed the Abalone Industry Association of South Australia Inc. (AIASA) in 1987. AIASA aims to promote and safeguard the industry and maintains close links with other State industry organisations. AIASA actively pursues research and development (R&D) in many areas and aspects of the fishery from a supply chain perspective. Projects undertaken by the AIASA include the development of a Dive Code, a Code of Conduct and an Environmental Management System. Further information is available by contacting AIASA directly.

Aside from the commercial fishery, greenlip and blacklip abalone are also harvested by recreational fishers and other users. There is also significant illegal activity. Some abalone are taken for use as broodstock by the growing aquaculture industry.

3.2 Recreational fishing

Abalone is primarily taken by the recreational sector for consumptive use. Public access to the recreational fishery is not seasonal and therefore access is unrestricted, with no licence requirement. Individuals are subject to a daily bag limit of five (5) and a boat limit of 10 abalone. The same minimum legal lengths apply for the recreational as for the commercial fishery (with the exception of blacklip abalone in the Southern Zone where the recreational size limit is set at 130 millimetres, 5 millimetres above the commercial size limit). Abalone taken by recreational fishers may not be sold or bartered.

General controls including size limits, carrying of a measuring device and replacing undersize fish from where they are harvested also apply to recreational divers.

Survey studies suggest the majority of recreational effort is expended in the Central Zone (50 percent) with 30 and 20 percent of total effort expended in the Western and Southern Zones respectively (see **Table 2**).

Over 50 percent of recreationally caught abalone are landed in the Western Zone, 35 percent in the Central Zone and 15 percent in the Southern Zone.

Proportionally, the recreational share, when compared to the commercial sector, suggests that participation rate is low. There are no data sets that fully enable an estimate of the value of the recreational fishery for abalone in South Australia.

Table 2: Estimates of the number of abalone, whole weight and proportion of the commercial catch landed annually by the recreational sector.

Zone	Estimated catch (numbers)	Estimated catch (tonnes whole weight)	% of Commercial TACC
Western Zone	15 286	8.82	1.76%
Central Zone	10 749	4.02	2.17%
Southern Zone	4415	1.61	1.07%

3.3 Indigenous fishing

At present, the *Fisheries Act 1982* makes no statement regarding Indigenous fishing, traditional laws and practices or native title issues. Indigenous people are required to abide by the restrictions that apply to recreational abalone fishing. A formal consultative process has been established by the Government to progress the aspirations of indigenous people and to ensure that they are incorporated in the review of the *Fisheries Act 1982*.

As there are presently no specific management arrangements applying to Indigenous fishers, all references made in this management plan regarding recreational fishing include indigenous fishing.

3.4 Illegal fishing

Abalone is a high-value product that can be accessed readily and transported easily and has therefore become an attractive commodity for illegal operators. Although limits have been set on the take of abalone by the commercial and recreational sectors, the ongoing demand for the product, together with the potentially high financial rewards made from the sale of illegal abalone, undoubtedly provides an incentive for continued illegal harvesting.

It is difficult to quantify the amount of abalone illegally harvested. However, intelligence from state fisheries and law enforcement agencies across Australia suggests that the problem is significant.

Estimates by PIRSA Fishwatch of the illegal abalone harvest are obtained by the following three methods, each of equal importance:

1. The amount of abalone seized and used in prosecution briefs.
2. Information received and reported by field officers.
3. Anecdotal information gathered by Fisheries Compliance Officers.
4. Information from other state and interstate government agencies.

The lack of information on the illegal harvest of abalone prevents the estimation of the total catch in each zone in each year. However, as estimates improve, it is intended that the annual setting of the TACC and limits on recreational catch will consider the total harvest (legal and illegal) from the resource.

3.5 Collection of broodstock and abalone aquaculture

Culture of abalone commenced in South Australia in the early 1990s. Difficulties with husbandry of greenlip abalone during the warm summer months has led to assessment of the suitability of other species (eg *H. rubra*, *H. roei* and *H. cyclobates*) for culture.

In 2003, there were 20 shore-based and 5 offshore abalone farms in South Australia.

The collection of abalone broodstock is currently critical to the success of abalone farming in South Australia for several reasons including:

- The inability to obtain broodstock from other sources;
- The reduced risk and management costs of maintaining parent stock for lengthy periods; and

-
- The maintenance of genetic diversity amongst farmed abalone.

The taking of fish “*for the purpose of trade or business*” is an activity controlled by the *Fisheries Act 1982*. Harvest of abalone for broodstock is currently managed through the provision of exemptions granted under section 59 of the Act.

It is important that collection of broodstock is properly managed and does not impact on the sustainability of the resource. To assist in this process, PIRSA is currently developing a series of discussion papers including “*Broodstock Collection for Aquaculture Purposes*” which will provide a new policy for abalone broodstock collection and use.

Both wild capture and farmed abalone are susceptible to a variety of diseases, which pose varying levels of risk and consequence if these animals are to be held in hatcheries as broodstock. Management of disease takes into account whether the disease is notifiable, pathogenicity of the disease, implications for trade, food safety, animal welfare and protection of wild stocks and the environment.

4 MANAGEMENT OF THE FISHERY

The commercial abalone fishery is managed under the *Fisheries Act 1982*, *Fisheries General Regulations 2000*, *Scheme of Management (Abalone) Regulations 1991* and specific licence conditions. A summary of the current management arrangements is provided in Sections 6, 7 and 8 for the Western, Central and Southern Zones respectively.

Each zone is managed by a regime of input and output controls including limited entry, minimum legal sizes and annual total allowable commercial catches (TACCs) with individually allocated transferable quotas (ITQs).

A separate TACC is set for blacklip and greenlip abalone in the three management zones each year, except for Region B in the Western Zone, where a single quota is set for both species providing licence holders with a harvest choice. Separate TACCs are also set for four small ‘fishdown’ areas in the Southern Zone.

All zones are required, through licence conditions, to submit a report by telephone to PIRSA Fishwatch prior to undertaking any fishing activity (See **Appendix III, IV**).

Information provided includes:

- The name of the person making the call and the relevant licence number;
- The name of the registered master who will be conducting the permitted activity on that day;
- The date on which fishing will take place;
- The launching site to be used that day.

To ensure compliance with quota allocation, a Catch and Disposal Record (CDR) form must be completed and forwarded (Refer **Appendix III, IV**) to PIRSA Fishwatch to monitor the fishing of quota by each licence holder. In addition, a fishery logbook must be completed for each day’s fishing and lodged with SARDI by the 15th day of the subsequent month.

4.1 The co-management model

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

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

To provide for better decision-making by Government in managing the marine resources, specific fishery management committees (FMCs) have been established to advise the Minister for Agriculture, Food and Fisheries.

Subject to the Act, a committee is responsible for the management of its fisheries. A committee may:

- (a) *make recommendations to the Minister on any of the following matters:*
 - (i) *any matter which may be provided for by a scheme of management under section 46 of the Act;*
 - (ii) *any other matter that may be the subject of regulations under the Act;*
 - (iii) *proposals to make, vary or revoke regulations under the Act, or to make amendments to the Act;*
 - (iv) *the application of money in the Fisheries Research and Development Fund;*
 - (v) *any matter related to the administration of the Act;*
 - (vi) *any matter that the Minister refers to the committee for advice or on which the committee believes it should advise the Minister;*
- (b) *make recommendations to the Director on any of the following matters:*
 - (i) *the granting of authorities under the Act and the conditions to be included in such authorities;*
 - (ii) *any matter related to the administration of the Act;*
 - (iii) *any matter that the Director refers to the committee for advice or on which the committee believes it should advise the Director.*

The Abalone Fishery Management Committee (AFMC) is comprised of a fisheries manager from PIRSA, a research scientist from SARDI, a representative from the South Australian Fishing Industry Council (SAFIC) and the South Australian Recreational Fishing Advisory Council (SARFAC), four representatives from the commercial abalone sector and convened by an independent chairperson. Appointment of members and the terms of reference of

the management committees are provided for under the *Fisheries (Management Committees) Regulations 1995*.

The AFMC is required under the *Fisheries (Management Committees) Regulations 1995* to provide the Minister for Agriculture, Food and Fisheries on or before 30 November each year a report on the operations of the committee during the preceding financial year. These documents include a report on any target or limit reference points that were reached during the reporting period and any actions that resulted. Both the performance of the committee and the fishery are measured against stated objectives.

4.2 Consultative process for developing a management plan

The *Fisheries Act 1982* and the *Fisheries (Management Committee) Regulations 1995* provide for the establishment of fishery management committees (FMCs) that relate to specific fisheries, and provide a framework for consultation and advice with fishery stakeholders in South Australia. Further to the formal procedures prescribed in the regulations, the following steps are employed:

- Development or review of a management plan by a sub-committee of the relevant FMC;
- Review of the proposed plan by the relevant FMC;
- Submission of a draft plan to the Minister seeking approval for public release of the document;
- A public comment period of at least 30 days;
- Provision of the draft plan to stakeholder groups (all relevant licence holders, fish processors, recreational and commercial representative bodies, local councils and community, conservation, and indigenous groups, as well as government agencies);
- Publicising to the wider community release of the plan;
- A summary report submitted to the FMC and subsequently the Minister on issues raised during the public comment period;
- Finalisation of the plan by the FMC and submission to the Minister for final approval; and
- Distribution of the plan (including posting on relevant website).

4.3 Review of the management plan

This management plan is a dynamic document that reflects current understanding of the abalone fishery and as such may change over time. No major departure from the stated management arrangements, performance indicators or trigger points will occur unless the AFMC is otherwise directed by the Minister during the life of this management plan.

This management plan will undergo a major review six months before the end of the five- year period of this plan.

4.4 Process for determining the TACC

In 1997, PIRSA introduced a formal stock assessment process that involved the preparation of annual fishery assessment reports by SARDI. The reports synthesise and assess the information available for resource assessment, assess the status of the resource and the uncertainty with that assessment and identify the future research needs for the fishery. These reports constitute the primary source of information used in setting the Total Allowable Commercial Catch (TACC). Other information is provided by the AIASA who consult with its members and provides the committee with a summary of their views. Following consideration of the fishery assessment report, industry views and, in particular, the fishery management objectives, strategies and reference points as set out in the management plan, PIRSA and the AFMC provide their recommendations to the Director of Fisheries and Minister for Agriculture, Food and Fisheries.

4.5 Cost recovery

In 1995, the Government introduced a process to recover the full attributed costs of the management of commercial fisheries from licence holders.

The Government funds recreational, community and environmental obligations associated with the management of fisheries.

The Abalone Fishery Management Committee (AFMC) plays an important role in the cost recovery process. The AFMC recommends a package of programs and services to the Minister each year for the abalone fishery, which are considered necessary for the effective, efficient and sustainable management of the fishery.

Holders of commercial licences pay an annual licence fee that covers the costs associated with research, management, compliance and administration of the fishery. Licence fees are set by regulation.

4.6 Management objectives, strategies and trigger points

The priority for management of the abalone fishery is to ensure that annual harvest levels are sustainable in the long term so that future generations may benefit from exploitation of the resource. Commensurate with this goal and the directives of the *Fisheries Act 1982* specific biological, ecological, social and economic objectives for the entire fishery (Section 5) are used to ensure appropriate management with four broad aims:

1. Maintain abalone populations (at an appropriate spatial scale) at sustainable levels and provide for adequate levels of recruitment.
2. Protect biological diversity and maintain ecological processes and life-support systems relating to the abalone fisheries in South Australia.
3. Maintain and provide for reasonable access to abalone resources for commercial, recreational, and broader community users.
4. Provide an efficient and cost-effective management framework, which facilitates economic efficiency in the harvest of abalone resources in South Australia.

Differences among the three fishing zones require specific reference points for each species in each zone or sub-zone. These specific reference points are detailed in sections 6 (Western Zone), 7 (Central Zone) and 8 (Southern Zone). Trigger points are agreed quantitative measures used to assess performance of the fishery against the performance indicators, which, once triggered initiate a management response.

4.7 Management responses

Performance indicators and trigger points have been developed for the South Australian abalone fishery. In the event that a reference point is triggered, PIRSA Fisheries will undertake the following action:

1. Notify the Minister for Agriculture, Food and Fisheries and participants in the fishery as appropriate;
2. Undertake an examination of the causes and implications of the reference point being triggered;
3. Consult with the abalone industry in association with the Abalone Fishery Management Committee on the need for alternative management strategies or actions;
4. Conduct a review of the effect of the reference point being triggered; and

5. Provide a report to the Minister for Agriculture, Food and Fisheries and industry, within three months of the initial notification.

The Abalone Fishery Management Committee will consider the information currently available for the fishery, as well as any other data it believes to be relevant. On the basis of this information, the AFMC will recommend one of the following actions to the Minister:

- No action be taken but the situation be reviewed following another fishing season.
- Immediate investigation be undertaken to further assess the reasons for triggering of the reference points prior to recommendations being presented.
- Amendments to the TACC and/or legal minimum length or changes to other management arrangements as deemed necessary with stated recovery objectives with the minimum delay but not exceeding five years.

5 BIOLOGICAL, ENVIRONMENTAL, ECONOMIC AND SOCIAL OBJECTIVES FOR THE SOUTH AUSTRALIAN ABALONE FISHERY

Table 3: Biological objectives for the South Australian Abalone Fishery

Objective	Strategy	Performance Indicator	Spatial Scale	Trigger Point	Statistical test and significance level	Management Response	
Control, measure and regulate all catches/extractions from the resource	Collect and collate fishery-dependent information	Commercial logbooks	-	<100% received	-	Apply appropriate regulations	
		Catch and effort database	-	<100% of logbooks received & entered in the database	-		Report to Director of Fisheries for appropriate action
		Stock assessment report	Fishing Zone	Annual report not produced to AFMC	-		
		Recreational catch	Fishing Zone	Annual report not produced to AFMC	-		
		Illegal catch	Fishing Zone	Annual report not produced to AFMC	-		
	Collect and collate fishery-independent information	Recreational catch	Fishing Zone	25% increase in catch	-	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Illegal catch (number of prosecutions)	Fishing Zone	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend			
		Annual report on harvest discard not provided for TACC setting	Fishing Zone				
Monitor and control disease	Identification of disease areas	Monitoring of catch reporting by divers	Fishing Zone	Identification of unknown disease or fish kills >25% inter-annual change (weight) from individual catches >10% inter-annual change (weight) from each zone Identification of <i>Perkinsus</i> outside map codes 16, 17, 18, 19 and 20	-		

Further specific biological objectives have been defined for the Western, Central and Southern Zones and are detailed in Sections 6, 7 and 8 respectively.

Table 4: Environmental objectives for the South Australian Abalone Fishery

Objectives	Strategies	Performance Indicator	Trigger Point	Management Response
To minimise the environmental impacts of abalone fishing and promote conservation measures.	Monitor harvesting techniques that minimise the impact of abalone fishing on the marine environment	Annual survey of harvesting techniques	Abalone are harvested by means other than the use of abalone irons	Investigation into the impact of alternative harvest method – Report to AFMC
	Work closely with government agencies and the community on proposed planning for MPA's	Appropriate levels of information available to consider the establishment of MPAs	Insufficient information is available to consider the establishment of MPAs	Report to Director of Fisheries
	Research the interactions between abalone and other species	Development of research proposal for funding	No proposal submitted	Review research priorities

Table 5: Economic objectives for the South Australian Abalone Fishery

Objectives	Strategies	Performance Indicator	Trigger Point	Management Response
To maintain the abalone fishery at a level that provides for fair and reasonable economic benefits to licence holders	Collate and evaluate economic data on the fishery	Gross Value of Product (GVP)	GVP 5-year trends are negative	Report to Director of Fisheries
	Encourage regional investment	Return on capital		
To recover an economic return sufficient to cover costs	Set licence fees at a level sufficient to recover all costs	Cost of management programs against GVP	Management costs against GVP > 10%	
To provide for economic efficiency and flexibility in management arrangements	Allocate a share of annual TACCs to licence holders as ITQs			
Develop harvest strategies that minimise costs	Promote world best practice in the harvesting, processing and management of the resource	Operating cost trends	Top 3 (labour, licence fees, maintenance & repairs) operating costs increase inter-annually to greater than 10%	
		Return on capital		
		Total Effort (days)	Total effort changes by >25% inter-annually	
Optimise yield from the fishery	Set MLL to optimise yield consistent with sustainability	YPR	YPR not maximised	
	Identify stunted stocks			

Table 6: Social objectives for the South Australian Abalone Fishery

Objectives	Strategies	Performance Indicator	Trigger Point	Management Response
To maintain and provide for reasonable access to abalone resources for recreational fishers	Monitor catch and participation by recreational fishers	Recreational catch	25% increase over 3 years	Review bag/boat limits and/or resource sharing arrangements
To provide for adequate compliance resources	Monitor and review compliance needs	Annual Risk Assessment		Report to Director of Fisheries
	Maintain a Code of Practice to promote best practice	Code of Practice monitored	Code of Practice not being complied with	Code of Practice reviewed
	Regular compliance checks	Number of prosecutions each year	Number of prosecutions greater than the 3-year average	Report to Director of Fisheries
		Errors in Catch and Disposal Record (CDR) forms	> 5% errors detected in CDR forms	
Improve access, for the community, to information on the abalone fishery	Inform and educate the community about the management of abalone resources in South Australia	Management Plan for the abalone fishery		Report to Director of Fisheries
		Participation in Education and Community Awareness programs	No participation in programs	
		Status and use of website – inclusion of appropriate information on website	No use of website	
		Annual public meeting of the AFMC	No meeting held	
	Support for the Fishcare Volunteer Program	Members in all regions of South Australia	Not representative in all regions	

6 WESTERN ZONE ABALONE FISHERY

The **Western Zone** of the South Australian Abalone Fishery includes all coastal waters of South Australia between the South Australia/Western Australia border and the meridian of longitude 136°30'E. The Zone is further sub-divided into Region A and Region B as described below:

“**Region A**” means the waters in the Western Zone south and east of a line drawn due south through Point Brown position latitude 32°32.6'S, longitude 133°50.8'E;

“**Region B**” means the waters in the Western Zone north and west of a line drawn due south through Point Brown position latitude 32°32.6'S, longitude 133°50.8'E;

The fishing season extends from 1 January to 31 December of the same year and the fishery is subject to the following management arrangements.

Table 7: Current management arrangements for the Western Zone abalone fishery

MANAGEMENT STRATEGY	Western Zone b – blacklip; g - greenlip
Licensing year	1 July – 30 June
Limited entry (no. of licence holders)	✓(23)
Main species	Greenlip abalone (<i>H. laevigata</i>) Blacklip abalone (<i>H. rubra</i>)
Minimum legal length and meat weight (measured at widest part of shell) (commercial)	13 cm or 113 grams (b and all other species) 14.5 cm or 140 grams (g)
Minimum legal length and meat weight (recreational)	14.5 cm or 140 grams (g) 13 cm or 113 grams (all other species)
Bag limit (recreational)	Combined limit of five per person per day
Boat limit (recreational)	Combined limit of 10 per boat (two or more persons)
Recreational licence	Not required
Corporate ownership	✓
Max. no. of boats permitted	2
Max. no. of boats to be used at one time	1
Max. no. of masters permitted	3
Max. no. of masters to be used at one time	1
Licence Transferability	✓
Quota scheme	✓
Quota year	1 January – 31 December
Individual quota amounts (2004)	Measured as meat weight 3,000 kilograms (g) 4,250 kilograms (b) 600 kilograms (g/b) (Region B)
Total quota amounts for the Western Zone (2004)	Measured as meat weight 69,000 kilograms (g) 92,000 kilograms (b) 13,800 kilograms (g/b) (Region B)
Quota transferability (within a quota year and between licence holders)	✓
Other species permitted	<i>H. roei</i> , <i>H. scalaris</i> , <i>H. cyclobates</i>
Method of capture	By hand

6.1 Biology and feasibility fishing for Roe's abalone (*H. roei*)

In 1998, the then Minister for Primary Industries invited the Abalone Fishery Management Committee (AFMC) to investigate the extent of *H. roei* stocks in the Western Zone of the abalone fishery.

A three-year research program was subsequently developed by PIRSA, SARDI and the AIASA and agreed to by the AFMC, Director of Fisheries and Minister. The research program, conducted by SARDI, commenced on 1 November 2000 and concluded in December 2003, and was funded by the AIASA.

The objectives of the *H. roei* program were to:

- 1) Determine basic population parameters of *H. roei* relevant to developing harvest strategies for a fishery. Such parameters include size/age at maturity, growth rate, natural mortality rates and recruitment,
- 2) Determine the response of populations to different levels of fishing, and
- 3) Conduct feasibility fishing to acquire information on the distribution, abundance and population structure of *H. roei* in the Western Zone.

To facilitate this research, commercial fishers and processors in the Western Zone of the fishery were provided limited access to *H. roei* stocks through the issue of Ministerial exemption notices permitting:-

- 1) Licence holders to participate in the research program through the controlled capture of fish above a size limit of 75mm in defined feasibility fishing areas;
- 2) Specific fish processors to receive and be in possession of the research fish harvested; and
- 3) Specific licence holders (at the direction of SARDI scientists) to harvest fish above a size limit of 60mm in defined fishdown areas subject to the terms and conditions of the notice.

The AFMC carefully monitored the progress of the program with quarterly and annual reports being provided by SARDI. During 2004 the AFMC will assess the results of the program and recommend future management arrangements for this species.

6.2 Perkinsus

Perkinsus species have historically been considered the cause of extensive mortalities in commercially important molluscs (Ray & Chandler 1955), including greenlip and blacklip abalone in South Australia. Perhaps the first recorded “die-back” of abalone occurred during 1986, when divers found substantial reductions in greenlip (*Haliotis laevigata*) abalone populations on the western shores of Gulf St Vincent (Lester 1986). Areas from which no ‘die-backs’ had been reported were free of *Perkinsus* infection.

Aside from the potential for causing wide-spread mortalities, the sale of *Perkinsus*-infected abalone is likely to have a negative impact on abalone markets.

All abalone taken from Area 1 of the Western Zone are to be landed in the shell to assist with managing *Perkinsus*. In addition to this requirement, fishers are encouraged to not fish in areas where *Perkinsus* is known to occur, particularly during summer. Infected abalone must be landed and reported to PIRSA Fishwatch.

6.3 Biological objectives for the Western Zone

Table 8 and Table 9 detail the specific biological objectives for the Western Zone abalone fishery.

Table 8: Biological objectives – Western Zone (greenlip abalone)

Objective	Strategy	PERFORMANCE INDICATOR	Spatial Scale	Trigger Point	Statistical Test and Significance Level	Management Response
Control, measure and regulate all catches/extractions from the resource	Set TACC using best available information	Commercial catch	Fishing Zone	< 90% of TACC harvested	-	AFMC to follow due process as outlined in Section 4.7 of the Management Plan
		Commercial effort	Fishing Zone	Statistically significant 5-year trend	ANOVA of Regression; $\alpha=0.05$	
		Mean daily catch (kg)	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season. (Region B): all fishing areas of Region B combined	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Spatial distribution of catch	(Region A): the five most important fishing areas (by catch)	Change in order of contribution to TACC		
		Mean daily effort (hours)	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season. (Region B): all fishing areas of Region B combined	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		CPUE	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season. (Region B): all fishing areas of Region B combined			
		Mean Size	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season. (Region B): all fishing areas of Region B combined	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.01$ 2) ANOVA of Regression; $\alpha=0.01$	
		Diver assessment of stock status	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season. (Region B): all fishing areas of Region B combined	Reported change in stock status	-	
		Illegal Catch	Fishing Zone		-	
		Recreational Catch	Fishing Zone		-	
		Abundance of legal-sized abalone	Western Zone (Region A): The Gap, Hotspot, Ward Island, Flinders Island, Pearson Island and Point Avoid.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Abundance of sub legal-sized abalone				
Maintain sufficient egg and sperm production to provide for adequate levels of recruitment	Harvest at appropriate Minimum Legal Length	% Egg production relative to estimated pristine (un-fished) egg production	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season. (Region B): all of Region B.	< 50% of unfished level	-	
	Maintain abalone population densities	Abundance of abalone > L ₅₀	Western Zone (Region A): The Gap, Hotspot, Ward Island, Flinders Island, Pearson Island and Point Avoid.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	

Table 9: Biological objectives – Western Zone (blacklip abalone)

Objective	Strategy	Performance Indicator	Spatial Scale	Trigger Point	Statistical Test and Significance Level	Management Response
Control, measure and regulate all catches/extractions from the resource	Set TACC using best available information	Commercial catch	Fishing Zone	< 90% of TACC harvested	-	AFMC to follow due process as outlined in Section 4.7 of the Management Plan
		Commercial effort	Fishing Zone	Statistically significant 5-year trend	ANOVA of Regression; $\alpha= 0.05$	
		Mean daily catch (kg)	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing year. (Region B): all fishing areas of Region B combined	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	
		Spatial distribution of catch	(Region A): the five most important fishing areas (by catch)	Change in order of contribution to TACC		
		Mean daily effort (hours)	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing year. (Region B): all fishing areas of Region B combined	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	
		CPUE	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing year. (Region B): all fishing areas of Region B combined			
		Mean Size	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing year. (Region B): all fishing areas of Region B combined	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.01$ 2) ANOVA of Regression; $\alpha= 0.01$	
		Diver assessment of stock status	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing year. (Region B): all fishing areas of Region B combined	Reported change in stock status	-	
		Illegal Catch	Fishing Zone		-	
		Recreational Catch	Fishing Zone		-	
		Abundance of legal-sized abalone	Western Zone (Region A): Pt Labatt, Talia, Ward Island, Sheringa, Reef Head	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	
		Abundance of sub legal-sized abalone				
Maintain sufficient egg and sperm production to provide for adequate levels of recruitment	Harvest at appropriate Minimum Legal Length	% Egg production relative to estimated pristine (un-fished) egg production	(Region A): all fishing areas from which >5% of the TACC was harvested during the previous fishing season.	< 50% of unfished level	-	
	Maintain abalone population densities	Abundance of abalone > L ₅₀	Western Zone (Region A): Pt Labatt, Talia, Ward Island, Sheringa, Reef Head	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	

7 CENTRAL ZONE ABALONE FISHERY

The **Central Zone** of the South Australian Abalone Fishery includes the coastal waters between the meridians of longitude 136°30'E and 139°E but does not include the waters of the Coorong or any other waters inside the Murray Mouth.

Fishers in the Central Zone predominantly harvest greenlip abalone in a season that extends from 1 January to 31 December of the same year. Table 10 outlines the current management arrangements for the Central Zone Abalone Fishery.

Table 10: Current management arrangements for the Central Zone abalone fishery

Management strategy	Central Zone b – blacklip; g - greenlip
Licensing year	1 July – 30 June
Limited entry (no. of licence holders)	✓(6)
Main species	Greenlip abalone (<i>H. laevigata</i>) Blacklip abalone (<i>H. rubra</i>)
Minimum legal length and meat weight (measured at widest part of shell) (commercial)	13cm or 113 grams (all species)
Minimum legal length and meat weight (recreational)	13 cm or 113 grams (all species)
Bag limit (recreational)	Combined limit of five per person per day
Boat limit (recreational)	Combined limit of 10 per boat (two or more persons)
Recreational licence	Not required
Corporate ownership	✓
Max. no. of boats permitted	2
Max. no. of boats to be used at one time	1
Max. no. of masters permitted	3
Max. no. of masters to be used at one time	1
Licence Transferability	✓
Quota scheme	✓
Quota year	1 January – 31 December
Individual quota amounts (2004)	Measured as meat weight 7,950 kilograms (g) 2,350 kilograms (b)
Total quota amounts for the Central Zone (2004)	Measured as meat weight 47,700 kilograms (g) 14,100 kilograms (b)
Quota transferability (within a quota year and between licence holders)	✓
Other species permitted	<i>H.roei</i> , <i>H scalaris</i> , <i>H cyclobates</i>
Method of capture	By hand

7.1 Biological objectives for the Central Zone

Table 11 and Table 12 detail the specific biological objectives for the Central Zone abalone fishery.

Table 11: Biological objectives – Central Zone (greenlip abalone)

Objective	Strategy	Performance Indicator	Spatial Scale	Trigger Point	Statistical test and significance level	Management Response
Control, measure and regulate all catches/extractions from the resource	Set TACC using best available information	Commercial catch	Fishing Zone	< 90% of TACC harvested	-	AFMC to follow due process as outlined in Section 4.7 of the Management Plan
		Commercial effort	Fishing Zone	Statistically significant 5-year trend	ANOVA of Regression; $\alpha=0.05$	
		Mean daily catch (kg)	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Spatial distribution of catch	The four most important fishing areas (by catch)	Change in order of contribution to TACC	-	
		Mean daily effort (hours)	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		CPUE	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.			
		Mean Size	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.01$ 2) ANOVA of Regression; $\alpha=0.01$	
		Diver assessment of stock status	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	Reported change in stock status	-	
		Illegal Catch	Fishing Zone		-	
		Recreational Catch	Fishing Zone		-	
		Abundance of legal-sized abalone	Tiparra Reef	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
Abundance of sub legal-sized abalone						
Maintain sufficient egg and sperm production to provide for adequate levels of recruitment	Harvest at appropriate Minimum Legal Length	% Egg production relative to estimated pristine (un-fished) egg production	Tiparra Reef	< 50% of unfished level	-	
	Maintain abalone population densities	Abundance of abalone > L ₅₀	Tiparra Reef	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	

Table 12: Biological objectives – Central Zone (blacklip abalone)

Objective	Strategy	Performance Indicator	Spatial Scale	Trigger Point	Statistical Test and Significance Level	Management Response
Control, measure and regulate all catches/extractions from the resource	Set TACC using best available information	Commercial catch	Fishing Zone	< 90% of TACC harvested	-	AFMC to follow due process as outlined in Section 4.7 of the Management Plan
		Commercial effort	Fishing Zone	Statistically significant 5-year trend	ANOVA of Regression; $\alpha=0.05$	
		Mean daily catch (kg)	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Spatial distribution of catch	The four most important fishing areas (by catch)	Change in order of contribution to TACC		
		Mean daily effort (hours)	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		CPUE	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.			
		Mean Size	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.01$ 2) ANOVA of Regression; $\alpha=0.01$	
		Diver assessment of stock status	All fishing areas from which >10% of the TACC was harvested during the previous fishing year.	Reported change in stock status	-	
		Illegal Catch	Fishing Zone		-	
		Recreational Catch	Fishing Zone		-	
		Abundance of legal-sized abalone	Cape du Couedic, Cape Bouger, Cape Gantheaume	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Abundance of sub legal-sized abalone				
Maintain sufficient egg and sperm production to provide for adequate levels of recruitment	Harvest at appropriate Minimum Legal Length	% Egg production relative to estimated pristine (un-fished) egg production	The three most important fishing areas (by catch)	< 50% of unfished level	-	
	Maintain abalone population densities	Abundance of abalone > L ₅₀	Cape du Couedic, Cape Bouger, Cape Gantheaume	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	

8 SOUTHERN ZONE ABALONE FISHERY

The **Southern Zone** includes all coastal waters east of the meridian of longitude 139°E, but does not include the waters of the Coorong or any other waters inside the Murray Mouth.

Fishers in the Southern Zone predominantly harvest blacklip abalone in a season that extends from 1 September to 31 August. Table 13 outlines the current management arrangements for the Southern Zone abalone fishery.

Table 13: Current management arrangements for the Southern Zone abalone fishery

Management strategy	Southern Zone b – blacklip; g - greenlip
Licensing year	1 July – 30 June
Limited entry (no. of licence holders)	✓(6)
Main species	Greenlip abalone (<i>H. laevigata</i>) Blacklip abalone (<i>H. rubra</i>)
Minimum legal length and meat weight (measured at widest part of shell) (commercial)	12.5 cm or 106 grams (b) 13 cm or 113 grams (g and all other species) 11.0 cm in fishdown areas
Minimum legal length and meat weight (recreational)	13 cm or 113 grams (all species)
Bag limit (recreational)	Combined limit of five per person per day
Boat limit (recreational)	Combined limit of 10 per boat (two or more persons)
Recreational licence	Not required
Corporate ownership	✓
Max. no. of boats permitted	2
Max.no. of boats to be used at one time	1
Max. no. of masters permitted	3
Max. no. of masters to be used at one time	1
Licence Transferability	✓
Quota scheme	✓
Quota year	1 September – 31 August
Individual quota amounts (2003/04)	Measured as whole weight 16,000 kilograms (b) 500 kilograms (g) 8,500 kilograms (b) (fishdown)
Quota amounts for the Southern Zone (2003/04)	Measured as whole weight 96,000 kilograms (b) 3,000 kilograms (g) 51,000 kilograms (b) (fishdown)
Quota transferability (within a quota year and between licence holders)	✓
Other species permitted	<i>H.roei</i> , <i>H scalaris</i> , <i>H cyclobates</i>
Method of capture	By hand

8.1 Fishdowns in the Southern Zone

Since 1984 there has been periodic commercial harvesting of smaller abalone in the Southern Zone of the fishery, commonly known as fishdowns. These smaller blacklip abalone are considered (at this stage) to have either low growth rates or smaller maximum size and do not generally reach the minimum legal size of 125 millimetres. Whether this growth is a response to genetic, environmental or density dependent mechanisms has not been determined.

The Southern Zone licence holders developed and managed the fishdown areas between 1984 and 1988, without regulation, in response to their concerns about increasing fishing effort on the more productive abalone fishing areas. Since 1989 formal management arrangements regarding harvesting of fishdown areas were developed through the former Abalone Management Liaison Committee. Recent changes to the *Scheme of Management (Abalone Fisheries) Regulations 1991* provide for the taking of blacklip abalone above a minimum legal length of 110 millimetres in four designated fishdown areas.

8.2 Biological objectives for the Southern Zone

Table 14 and Table 15 detail the specific biological objectives for the Southern Zone abalone fishery.

Table 14: Biological objectives – Southern Zone (greenlip abalone)

Objective	Strategy	Performance Indicator	Spatial Scale	Trigger Point	Statistical Test and Significance Level	Management Response
Control, measure and regulate all catches/extractions from the resource	Set TACC using best available information	Commercial catch	Fishing Zone	< 90% of TACC harvested	-	AFMC to follow due process as outlined in Section 4.7 of the Management Plan
		Catch ratio: Mean Daily Catch _g /Mean Daily Catch _b	All fishing areas from which >15% of the TACC was harvested during the previous fishing season	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	
		Mean Size	All fishing areas from which >15% of the TACC was harvested during the previous fishing season	1) Statistically significant inter- annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.01$ 2) ANOVA of Regression; $\alpha= 0.01$	
		Abundance of greenlip abalone	Gerloffs Bay	1) Statistically significant inter- annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	
		Abundance Ratio: no. of greenlip/ no. of blacklip	Gerloffs Bay	1) Statistically significant inter- annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha= 0.05$ 2) ANOVA of Regression; $\alpha= 0.05$	
		Diver Assessment of stock status	All fishing areas from which >15% of the TACC was harvested during the previous fishing season	Reported change in stock status		
		Illegal Catch	Fishing Zone			
		Recreational Catch	Fishing Zone			

Table 15: Biological objectives – Southern Zone (blacklip abalone)

Objective	Strategy	Performance Indicator	Spatial Scale	Trigger Point	Statistical Test and Significance Level	Management Response
Control, measure and regulate all catches/extractions from the resource	Set TACC using best available information	Commercial catch	Fishing Zone	< 90% of TACC harvested	-	AFMC to follow due process as outlined in Section 4.7 of the Management Plan
		Commercial effort	Fishing Zone	Statistically significant 5-year trend	ANOVA of Regression; $\alpha=0.05$	
		Mean daily catch (kg)	All fishing areas from which >5% of the TACC was harvested during the previous fishing season and all fish-down areas.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Spatial distribution of catch	The four most important fishing areas (by catch)	Change in order of contribution to TACC		
		Mean daily effort (hours)	All fishing areas from which >5% of the TACC was harvested during the previous fishing season and all fish-down areas.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		CPUE	All fishing areas from which >5% of the TACC was harvested during the previous fishing season and all fish-down areas.			
		Mean Size	All fishing areas from which >5% of the TACC was harvested during the previous fishing season and all fish-down areas.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.01$ 2) ANOVA of Regression; $\alpha=0.01$	
		Diver assessment of stock status	All fishing areas from which >5% of the TACC was harvested during the previous fishing season and all fish-down areas.	Reported change in stock status	-	
		Illegal Catch	Fishing Zone		-	
		Recreational Catch	Fishing Zone		-	
		Abundance of legal-sized abalone	Ringwood Reef, Gerloffs Bay, Middle Point, Douglas Bay, Jones Bay and Cape Northumberland.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	
		Abundance of sub legal-sized abalone				
Maintain sufficient egg and sperm production to provide for adequate levels of recruitment	Harvest at appropriate Minimum Legal Length	% Egg production relative to estimated pristine (un-fished) egg production	The four most important fishing areas (by catch) and fish-down areas 3 and 4	< 50% of unfished level	-	
	Maintain abalone population densities	Abundance of abalone > L ₅₀	Ringwood Reef, Gerloffs Bay, Middle Point, Douglas Bay, Jones Bay and Cape Northumberland.	1) Statistically significant inter-annual change 2) Statistically significant 5-year trend	1) t-test; $\alpha=0.05$ 2) ANOVA of Regression; $\alpha=0.05$	

9 COMPLIANCE AND ENFORCEMENT

9.1 Mission of PIRSA Fishwatch

The mission of PIRSA Fishwatch is “*Achieving sustainable use and protection of fisheries resources by maximising voluntary compliance and creating effective deterrence against illegal activity.*”

Critical to achieving these aims are:

- Integrity and quality of Fishwatch services;
- Stakeholder support;
- Collaborative approaches – working together with all stakeholders;
- Co-management of the fisheries with all stakeholders;
- Risk management to maximise effectiveness;
- Fairness and equity in delivery of Fishwatch services; and
- Efficient and effective service delivery by Fishwatch.

9.2 Risk Management Model

The PIRSA Fishwatch compliance program includes monitoring the TACC for each species of abalone in the three management zones. Associated areas of risk are annually assessed by the compliance program and details of the Risk Mitigation Tool Kit for the abalone fishery for the 2003/04 fishing season is provided in **Appendix V**.

PIRSA Fishwatch ensures compliance with the management requirements of the abalone fishery by:

- Undertaking random checks at point of landing, during transit to the processors, and at processing premises; and
- Requiring prior reporting in each of three operating zones before commencing operations (**Refer Appendix III, IV**). Prior report information is provided to fisheries officers in the field via SMS message and includes:
 - Name of person operating licence
 - Licence number
 - Point of departure
 - Date and time of operations

-
- Type of activity – normal quota, research project or fish down (where undersized fish are permitted to be taken).

System integrity is enhanced in the Southern Zone with the use of sealed bins and numbered tags. Fishers are required, at the completion of the day's fishing activity and before landing, to place all abalone within bins and secure the lids with the consecutively number tags supplied by PIRSA Fishwatch. The total number of bins harvested on that fishing day, and the number of each of the tags placed on the bins, must be included in the catch and disposal (CDR) (Refer **Appendix III**).

System integrity improvements initiated by industry include a current trial of a counting and measuring device to be used on board the fishing vessel, and as the abalone are landed to the vessel. This provides an accurate count of all abalone prior to landing, removing potential human error in measuring the abalone.

Stock-take and audits of abalone processing businesses or single licence holders are conducted to verify that the amount of abalone recorded on the CDR does not exceed the amount sold to a given point in time.

10 RESEARCH AND STOCK ASSESSMENT

The South Australian Research and Development Institute (SARDI) is the primary research provider for the South Australian Government. This agency conducts the majority of the research and monitoring programs for the abalone fishery. These programs comprise the collection, synthesis, analysis and assessment of fishery-dependent and fishery-independent data.

The Abalone Fishery Management Committee (AFMC) recommends research needs and priorities for the management of the fishery. A five-year strategic research plan has been developed by the AFMC and is contained in **Appendix VI**.

10.1 Fishery-dependent data

Information on commercial catch and effort has been obtained from divers and licence holders throughout the course of the fishery. To ensure accurate data collection, a research logbook must be completed for each fishing day and submitted to SARDI monthly. This logbook provides information on the date of fishing, the fishing area, the amount of time spent fishing, whether or not an underwater vehicle was used, the diving depth and the total catch landed.

Only one change has been made to the data collection system over the last 30 years – in 1978, sub-zones and fishing blocks were replaced by spatially smaller fishing areas (of which there are 40) and map codes. The logbook data supplied by divers and licence holders are used annually to assess levels of catch, effort and catch-per-unit-effort in all three zones of the fishery.

10.2 Fishery-independent data

Fishery-independent research on abalone has predominantly been undertaken in South Australia by SARDI (and the former Department of Fisheries), although intermittent research by individuals at local and inter-state universities has played a supporting role. Historically the research has focused on surveys that monitor change in greenlip abalone abundance and population structure and the fisheries biology of greenlip and blacklip abalone.

Surveys to assess changes in greenlip abalone abundance and population structure were initiated at Tiparra Reef (Central Zone) in 1968 and expanded and amended over time to the current suite of sites (Table 16). Over 50% of the greenlip abalone TACC is harvested from the areas currently surveyed.

Surveys on blacklip abalone were initiated at Gerloffs Bay, Middle Point, Douglas Bay and Ringwood Reef in the Southern Zone during the 2002/03 fishing season.

As methodological changes since 1968 have been minimal, the long-term data sets at many of the sites provide valuable information on change in the abundance and size structure of abalone populations.

Understanding the fisheries biology of greenlip and blacklip abalone began in 1973 with an examination of the comparative ecology of the five sympatric species (Shepherd 1973). Reproduction of these five species was examined by 1974 (Shepherd & Laws 1974) and by the early 1980s, growth rates of the two commercially exploited species had been estimated (Shepherd & Hearn 1983). Since then, substantial information on reproduction (including recruitment and reseeded), juvenile and adult ecology, determination of growth rates and estimation of natural mortality has become available. Useful reviews on the fisheries biology of abalone in South Australia can be found in Mayfield *et al* (2001, 2002a, 2002b) and Mayfield and Ward (2002, 2003).

Table 16: Years during which fishery-independent surveys were conducted in parts of the Southern, Central and Western Zones of the South Australian Abalone Fishery.

Year	Southern Zone				Central Zone			Western Zone					Year	
	Gerloffs Bay	Middle Point	Douglas Bay	Ringwood Reef	Cape Jervis	West Island	Tiparra Reef	Avoid Bay	Hotspot	Ward Island	Thorny Passage	Flinders Island		Pearson Island
1968							■							1968
1969														1969
1970														1970
1971						■								1971
1972						■								1972
1973						■		■						1973
1974						■		■						1974
1975														1975
1976														1976
1977						■		■						1977
1978						■		■						1978
1979						■		■		■				1979
1980					■	■		■		■				1980
1981					■	■		■		■				1981
1982					■	■		■		■				1982
1983					■	■		■		■				1983
1984					■	■		■		■				1984
1985					■	■		■		■				1985
1986					■	■		■		■	■			1986
1987					■	■		■		■	■			1987
1988					■	■		■		■	■			1988
1989					■	■		■		■	■			1989
1990					■	■		■		■	■		■	1990
1991					■	■		■		■	■		■	1991
1992					■	■		■		■	■		■	1992
1993					■	■		■		■	■		■	1993
1994					■	■		■		■	■		■	1994
1995					■	■		■		■	■		■	1995
1996					■	■		■		■	■		■	1996
1997					■	■		■		■	■		■	1997
1998					■	■		■		■	■		■	1998
1999					■	■		■		■	■		■	1999
2000					■	■		■		■	■		■	2000
2001					■	■		■		■	■		■	2001
2002	■	■	■	■	■	■		■		■	■		■	2002
2003	■	■	■	■	■	■		■		■	■		■	2003

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APPENDIX I: MANAGEMENT MILESTONES FOR THE SA ABALONE FISHERY

Date	Milestone
1964	Fishery started
1971	Licences made non-transferable Fishery divided into three zones
	Minimum legal length set at 130mm for both species
1976	30 licences remained; 5 additional licences issued
1978	Sub-zones and fishing blocks replaced by map numbers and codes
1980	Licences became transferable
1984	Blacklip minimum legal length amended to 120mm in the Southern Zone Greenlip minimum legal length amended to 145mm in the Western Zone
1985	Western Zone divided into Regions A and B Quota introduced to Region A in the Western Zone
1988	Quota introduced to the Southern Zone Blacklip minimum legal length amended to 125mm in the Southern Zone/110 mm in fishdown areas
1989	Quota introduced to the Central Zone
1991	Quota introduced to Region B in the Western Zone
1993	Abolition of owner-operator regulations
1997	Management Plan implemented
2003	Management Plan reviewed Fishery assessed against Principles of Ecologically Sustainable Development Southern Zone fishdown management arrangements formalised through regulation amendments – minimum legal length for fishdown areas adjusted to 110mm and 12 000 kgs general area quota included in fishdown area quotas

APPENDIX II: TACCs FOR THE SA ABALONE FISHERY BETWEEN 1985 AND 2004

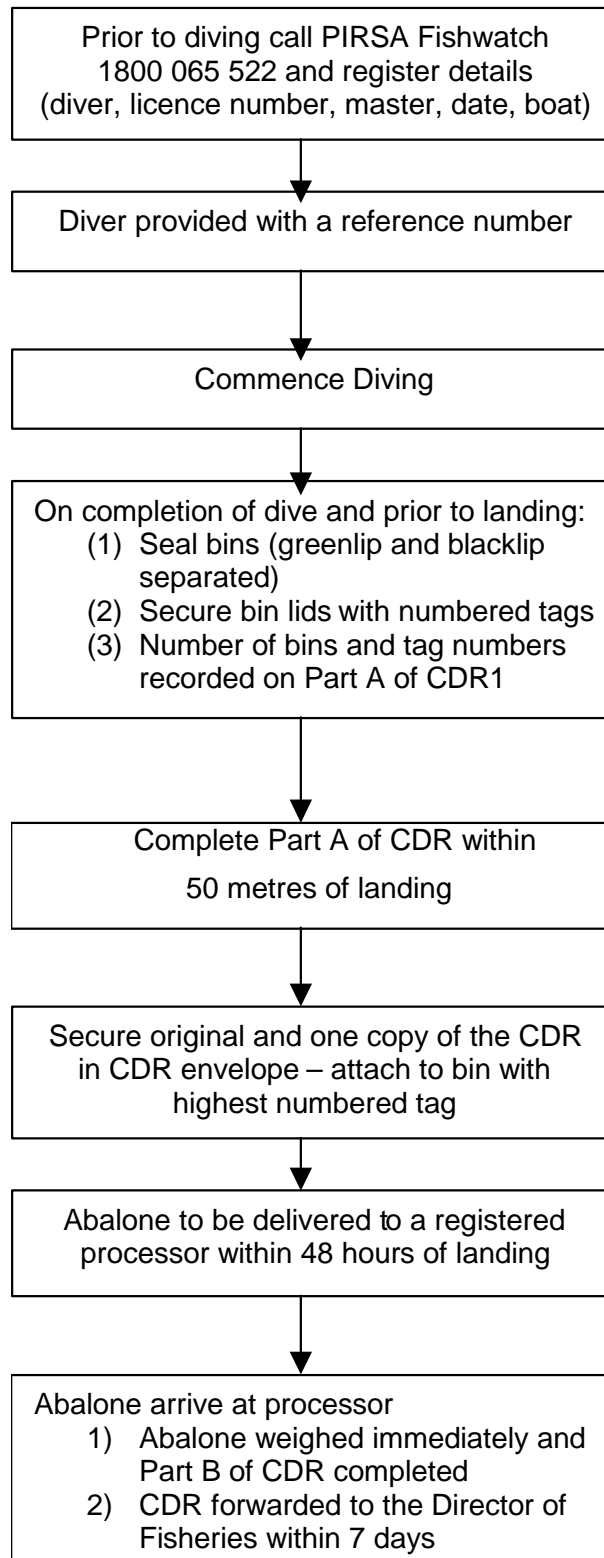
Summary of TACCs set for the SA abalone fishery for the period 1985-2004. Values given for the Western and Central Zones are in kg (meat weight). Values given for the Southern Zone are in kg (shell weight) and quotas listed for abalone 110-125mm shell length refers to quotas in 'fishdown' areas.

Western Zone – 23 licences			Central Zone	Southern Zone – 6 licences		
Year	Region A	Region B	6 licences	Fishing season	>125mm	110-125mm
1985/86	97 750 (g) 97 750 (b)	No Quota	No Quota	1985/86	No Quota	No Quota
1986/87	97 750 (g) 97 750 (b))	No Quota	No Quota	1986/87	No Quota	No Quota
1987/88	97 750 (g) 92 000 (b)	No Quota	No Quota	1987/88	No Quota	No Quota
1988	23 000 (g) 30 659 (b)	No Quota	No Quota	1988/89	3000 (g) 108 000 (b)	No Quota
1989	69 000 (g) 92 000 (b)	No Quota	No Quota	1989/90	3000 (g) 108 000 (b)	No Quota
1990	69 000 (g) 92 000 (b)	No Quota	47 400 (g) 13 800 (b)	1990/91	3000 (g) 108 000 (b)	No Quota
1991	69 000 (g) 92 000 (b)	9200 (g/b)	47 400 (g) 13 800 (b)	1991/92	3000 (g) 108 000 (b)	No Quota
1992	69 000 (g) 92 000 (b)	9200 (g/b)	47 400 (g) 13 800 (b)	1992/93	6000 (g) 108 000 (b)	No Quota
1993	69 000 (g) 92 000 (b)	11 500 (g/b)	47 400 (g) 13 800 (b)	1993/94	6000 (g) 108 000 (b)	No Quota
1994	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	1994/95	6000 (g) 108 000 (b)	36 000 (b)
1995	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	1995/96	6000 (g) 84 000 (b)	60 000 (b)
1996	69 000 (g) 86 020 (b)*	13 800 (g/b)	47 700 (g) 14 100 (b)	1996/97	6000 (g) 96 000 (b)	48 000 (b)
1997	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	1997/98	6000 (g) 108 000 (b)	36 000 (b)
1998	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	1998/99	6000 (g) 108 000 (b)	36 000 (b)
1999	69 000 (g) 92 000 (b)	13 800 (g/b) 10 350 (g)#	47 700 (g) 14 100 (b)	1999/00	6000 (g) 108 000 (b)	36 000 (b)
2000	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	2000/01	3000 (g) 108 000 (b)	39 000 (b)
2001	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	2001/02	3000 (g) 108 000 (b)	39 000 (b)
2002	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	2002/03	3000 (g) 108 000 (b)	39 000 (b)
2003	69 000 (g) 92 000 (b)	13 800 (g/b)	47 700 (g) 14 100 (b)	2003/04	3000 (g) 96 000 (b)	**Areas 1, 3 & 4 45 000 (b) Area 2 6000 (b)

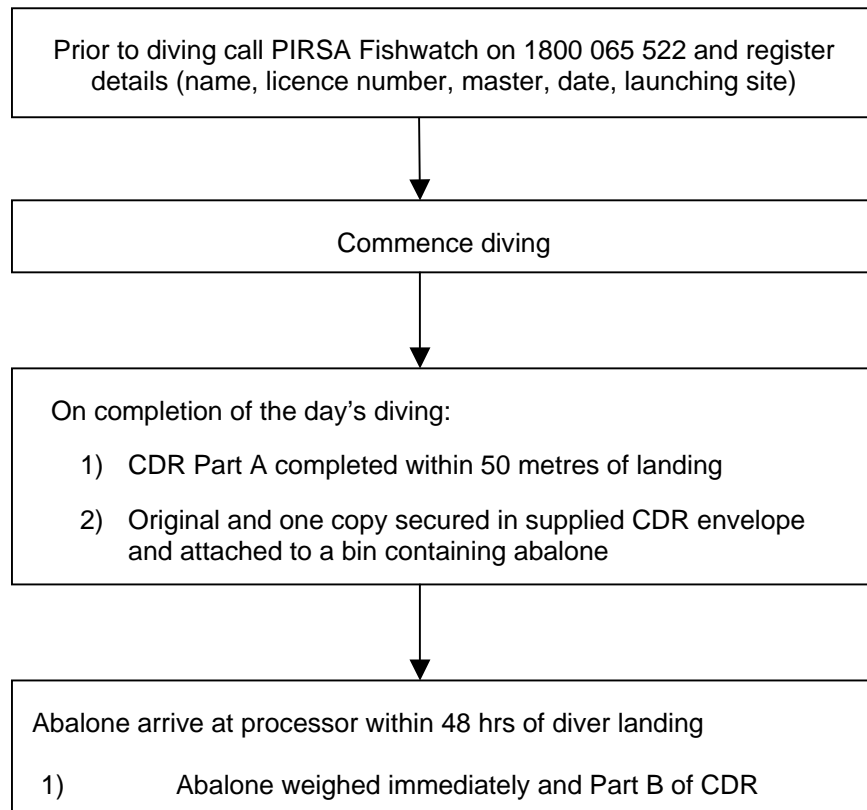
* and # refer to a reduction in quota due to *Perkinsus* infections in Thorny Passage and the 'fishdown' in Waterloo Bay respectively.

** fishdown area quotas introduced into regulation – minimum legal length for Areas 1, 2, 3 and 4 is 110mm.

APPENDIX III: COMPLIANCE PROTOCOLS SOUTHERN ZONE ABALONE FISHERY



APPENDIX IV: COMPLIANCE PROTOCOLS WESTERN AND CENTRAL ZONE ABALONE FISHERY



APPENDIX V: 2003/04 ABALONE FISHERY RISK MITIGATION TOOL KIT

The risk priorities contained within the table below will be the focus of compliance activity for the Abalone Fishery during 2003/2004. Other risks will be addressed outside of the planned program as circumstances require. Focus risks may change during the course of the year on the basis of information received by the Fisheries Group. (C = Consequence, L = Likelihood)

Fishery	What can happen (risks)	C	L	Rating	Possible actions (mitigating strategies)
Commercial	Fail to supply accurate log book data	2	5	10	Conduct education campaign - talking to fishers about reporting requirements Follow up late returns as advised by SARDI
	Quota evasion	3	3	9	Participate in development of electronic capture of catch & disposal data Conduct on-board inspections Conduct random roadside and processor checks Conduct targeted checks based on prior reporting Follow-up and investigate possible illegal activity
Non commercial	Illegal sales (Illegal fishing - non licensed sales)	3	5	15	Conduct random & targeted processor checks Conduct covert operations / investigations Conduct overt operations/ investigations Conduct random patrols Conduct intel driven operations Liaise with fishers to increase commitment to report offences Use Fishwatch to prioritise activities Liaise and network with inter and intrastate enforcement agencies Feedback Fishwatch call outcomes to callers Conduct education campaign Review need for abalone specific taskforce Follow-up and investigate possible illegal activity
	Organised illegal activity (Organised crime)	3	4	12	Conduct processor checks Conduct covert operations / investigations Conduct overt operations/ investigations Conduct random patrols Conduct Intel driven operations Liaise with fishers to increase commitment to report offences

Fishery	What can happen (risks)	C	L	Rating	Possible actions (mitigating strategies)
					Conduct patrols in remote areas Investigate opportunities to incorporate aerial surveillance activities with the tuna spotting program Use Fishwatch to prioritise activities Feedback Fishwatch call outcomes to callers Liaise and network with inter and intrastate enforcement agencies Review need for abalone specific taskforce Designate contact officers for abalone Fishery Follow-up and investigate possible illegal activity
	Take undersize	2	5	10	Liaise with FishCare volunteer patrols to educate fishers re size and bag limits Conduct covert operations / investigations Conduct overt operations/ investigations Conduct random patrols Conduct intel driven operations Liaise with fishers to increase commitment to report offences Use Fishwatch to prioritise activities Feedback Fishwatch call outcomes to callers Conduct education campaign - talking to fishers about size and bag limits Review need for abalone specific taskforce Follow-up and investigate possible illegal activity
	Take over bag limit (stock depletion - taking over bag limit)	2	5	10	Reef picking: Liaise with FishCare volunteer patrols to educate fishers re size and bag limits Conduct covert operations / investigations Conduct overt operations/ investigations Conduct random patrols Conduct Intel driven operations Liaise with fishers to increase commitment to report offences Use Fishwatch to prioritise activities Feedback Fishwatch call outcomes to callers Conduct education campaign - talking to fishers about size and bag limits Conduct inspections on local, unregistered fish processors Follow-up and investigate possible illegal activity Divers: Liaise with recreational divers to increase awareness of reporting offences

Fishery	What can happen (risks)	C	L	Rating	Possible actions (mitigating strategies)
					Review need for abalone specific taskforce
Processor	Fail to keep correct records (processor fail to keep records)	3	3	9	Conduct processor audits Conduct random checks on abalone transporters Follow-up and investigate possible illegal activity
	Quota evasion (collusion) (Collusion between fisher and processor to falsify catch records)	4	2	8	Conduct random roadside and processor checks Conduct targeted processor audits Conduct random checks on abalone transporters Conduct covert surveillance on processor premises Conduct Intel driven operations Follow-up and investigate possible illegal activity
Other	Pest / disease incursion (Spread of known diseases, introduction of pests, introduction of disease)	4	3		Conduct inspections of aquaculture sites Actively contribute to development of incident response plans & training Conduct awareness campaign actively talking to fishers about incident / response issues Follow-up and investigate possible illegal activity

APPENDIX VI: FIVE YEAR STRATEGIC RESEARCH PLAN FOR THE SA ABALONE FISHERY

In July 2001, the Abalone Fishery Management Committee identified seven broad research areas as important for the South Australian abalone fishery. They were related to resource management, stock assessment, biological research, ecosystem sustainability, compliance, marketing and industry training and development.

Resource Management

Research into the development and maintenance of fishery monitoring systems is needed to ensure that adequate information is available for the effective assessment and management of the resource. Policy research to assist in the enhancement of access security is also considered important. The ability to manage the fishery at finer scale remains a priority and is reflected below in the importance assigned to biological research needed to support this approach. The development of real-time reporting and electronic logbooks is also a priority and will assist the refinement of assessment and management systems.

Stock Assessment

The development of techniques for stock assessment is a priority, as is the development of a fishery model that could be used to evaluate reference points and biological indicators for the fishery. Determining the effects of “fishdowns” of stunted stocks across the fishery is important, as is the need for regular and meaningful stock surveys.

Biological Research

The major priority in this area is the need to draw together the existing scientific information for the fisheries, review the adequacy of the information and consolidate it into an information management system that will preserve its value for future researchers. At the gross regional level significant gaps exist in our biological knowledge of blacklip abalone. If assessment is to be conducted at a finer scale, then information is needed to describe the different populations and their basic biological characteristics. Genetic work may also be important in defining populations and explaining whether differences in growth are due to genetic or environmental influences.

Ecosystem Sustainability

The assessment of the ecological impact of abalone fishing and the potential for marine parks to permit ecologically benign activities is a high priority. The impact of other industries on the resources, either directly through genetic pollution or disease or indirectly through impact on habitat, is also important. Research relating to introduced marine pests, algal blooms and disease is also a priority. The mapping of habitat, inter-specific interactions and effects of climate are also considered important.

South Australia’s abalone fishery has not, to date, been severely damaged by disease. However, the problems caused by *Perkinsus* in the Western and Central Zones provide a warning that the fishery is not invulnerable. It is important that the risk of disease (for

example from aquaculture) is minimised, and that appropriate strategies are in place to deal with disease outbreaks if and when they do occur.

Compliance

The high value and ease of accessibility of abalone renders the fishery particularly vulnerable to theft. Compliance is therefore a vital component of the management of abalone fisheries. Research into the effectiveness of various enforcement techniques, and quantifying the effects of poaching on stocks and quota is a high priority.

Marketing

Environmental accreditation (such as ISO 14000, Marine Stewardship Council) is a high priority area for development. The need for the industry to have a higher or more accessible profile is considered important with the development of the website seen as a priority. The relatively limited number of jurisdictions involved in the greenlip abalone resources may permit the development of a more coherent and strategic marketing through a joint authority.

Sound assessments of the economics of the industry are needed to assist in good management decision-making.

Industry Training and Development

Management consistent with ESD principles encourages the inclusion of stakeholders in the decision making process. For industry to play an effective role, there is a need to invest in developing the leadership skills and capacity of future industry leaders.

A number of opportunities for development of the industry are identified and feasibility studies are encouraged to examine the productivity and extent of the resources of Roe's abalone, and the potential for enhancement of the fishery either directly through stock enhancement or indirectly by increasing habitat space or quality.

The development and adoption of seafood safety standards raises the need for extension services to ensure adoption by industry and adaptation to the industry's circumstances. Similarly, the development and adoption of dive standards has a direct impact on the industry. Finally, the need to be able to provide on-the-job training to new fishers is an ongoing priority.

Five-Year Strategic Research Plan for the South Australian Abalone Fishery

Group	Issue	Priority*
Resources management	Maintenance of adequate fishery monitoring information	1
	Enhancement of access security to abalone resources	2
	Reducing the spatial scale of management	2
	Development of real-time reporting	2
Stock Assessment	Development of improved techniques for assessment	1
	Development of fishery model and reference point evaluation	1
	Stock surveys	2
	Analysis of the effect of fishdowns	2
Biological Research	Collation and review of existing scientific information and the development of adequate information management systems	1
	Collection of adequate information for general assessment of blacklip	2
	Develop basis for fine-scale assessment with definition of metapopulation boundaries, stock recruitment relationships, growth, mortality, age, maturity.....	2
	Genetic structure of populations and investigation of the genetic and environmental influences on differences in growth	3
Ecosystem sustainability	Assessment of the impact of different marine reserve on productivity and ecosystem protection	1
	Assessment of the effects of other industries on the abalone fishery	2
	Development of ecological community level assessment and the development of environmental indicators	2
	Impact of algal blooms and development of emergency response	3
	Marine pests impacting on abalone and abalone habitat	3
	Assessment of the environmental impact of abalone fishing	2
	Disease	3
	Mapping of habitat	4
	Interaction between abalone and other species	4
	Effects of climate change on abalone stocks	4
Compliance	Evaluation of the effectiveness of different enforcement strategies	2
	Quantifying the effects of poaching on the level of catch and sustainability	3
Marketing	Product accreditation –environmental	2
	Public relations and industry profiling	3
	Development of value added products	3
	Feasibility of a market authority for greenlip abalone	4
	Assessment of industry economics	4
Industry training and development	Building the leadership ability and capacity of industry	1
	Feasibility of fishery for Roe's abalone	2
	Feasibility of stock enhancement	2
	Development and adoption of seafood safety standards	3
	Maintenance of dive standards	4
	Feasibility of habitat enhancement	4
	Develop capacity for on-the-job training	5

* Priority ranking on a scale of 1-5, with 1 being for highest priority and 5 for lowest.

APPENDIX VII: LIST OF ACRONYMS

AFMC	Abalone Fishery Management Committee
AIASA	Abalone Industry Association of South Australia Incorporated
CDR	Catch and Disposal Record
CPUE	Catch per unit effort
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DNA	deoxyribonucleic acid
EA	Environment Australia
EPR	Egg-per-recruit
ESD	Ecologically Sustainable Development
FMC	Fisheries Management Committee
FRDC	Fisheries Research and Development Corporation
GVP	Gross Value of Product
ITQ	Individual transferable quota
MLL	Minimum Legal Length
MPA	Marine Protected Area
PIRSA	Primary Industries and Resources SA
R&D	Research and Development
SAFIC	South Australian Fishing Industry Council
SARDI	South Australian Research and Development Institute
SARFAC	South Australian Recreational Fishing Advisory Council
SCUBA	Self-Contained Underwater Breathing Apparatus
SL	Shell length
TAC	Total allowable catch
TACC	Total allowable commercial catch
YPR	Yield per recruit