
South Australian Fisheries Management Series

Ecological Assessment of the South Australian Abalone Fishery

Reassessment Report

Prepared for the Department of Environment, Water,
Heritage, and the Arts

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

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ATTACHMENTS¹

1. Management Plan for the South Australian Abalone Fishery
2. Southern Zone Abalone Fishery Stock Assessment Report 2006/07.
3. Central Zone Abalone Fishery Stock Assessment Report 2007
4. Western Zone Region A Abalone Fishery Stock Assessment Report 2006
5. Western Zone Region B Abalone Fishery Stock Assessment Report 2007
6. Biomass of greenlip abalone (*Haliotis laevis*) off Cowell in 2008.
7. PIRSA Disease Response Plan: Abalone viral ganglioneuritis, 2009

¹ Attachments can be accessed from the PIRSA website at http://www.pir.sa.gov.au/fisheries/commercial_fishing/abalone_fishery

8. South Australian Wild Fisheries Information and Statistics Report.
9. Towards optimising the spatial scale of abalone fishery management

1 Purpose

This report has been prepared by the Fisheries Division of the Department of Primary Industries and Resources, South Australia (PIRSA Fisheries). Its purpose is to provide a revised assessment of the management arrangements in place for the South Australian Abalone Fishery and to update information provided to the Australian Government Department of the Environment and Water Resources (now known as Department of Environment, Water, Heritage and Arts; DEWHA) in 2004 for assessment against the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been prepared in accordance with the “*Guidelines for the Ecologically Sustainable Management of Fisheries*” 2nd Edition and particularly addresses the level of change that occurred in the fishery since the last assessment by DEWHA.

2 Background

The regulations that govern the management of the South Australian Abalone Fishery are the *Fisheries Management Act 2007*, the *Fisheries Management (Abalone Fisheries) Regulations 2006*, the *Fisheries Management (General) Regulations 2007* and the *Fisheries Management (Fish Processor) Regulations 2006*.

The ‘Management Plan for the South Australian Abalone Fishery’ by Nobes et al. (2004) currently provides the broad policy framework to guide management decision-making and the harvest strategy for the fishery. It can be found on PIRSA Fisheries’ website www.pir.sa.gov.au and covers all fishing activity related to abalone undertaken within South Australian waters, including commercial, recreational, traditional and any illegal fishing. This plan also provides a reference for the broader community in relation to the management measures that have been introduced to ensure the long-term sustainability of South Australia’s abalone resource.

An updated management plan for the South Australian Abalone Fishery is scheduled to be available for comment by mid-2009 and completed by PIRSA Fisheries by the end of 2009, under the *Fisheries Management Act 2007*. The new management plan will operate for ten years (2009-19) and will be subject to annual review and amendments that are considered necessary by the Fisheries Council, the Director of Fisheries or the Minister for Agriculture, Food and Fisheries. It will include a Strategic Research and Monitoring Plan,

which will be reviewed every two years, after which, research needs, priority and timing will be revised. The harvest strategy of the new plan is expected to contain target and limit reference points, as well as TACC decision rules, which will invoke a specific response in terms of TACC increases or reductions when triggered, as requested by DEWHA in the 2004 South Australian Abalone Fishery assessment.

3 Level of Assessment

The South Australian Abalone Fishery was last assessed by DEWHA against the original version of the *'Guidelines for ecological sustainable management of fisheries'* in 2004. The fishery was considered to be managed in an ecologically sustainable way and its operation was consistent with the objects of Part 13A of the EPBC Act. The South Australian Abalone Fishery was subsequently provided with a five-year exemption from the export controls of the Act to allow its product to be exported, subject to some recommendations for ongoing improvement. Since DEWHA's last assessment of the South Australian Abalone Fishery, there have only been three significant changes in the areas of interest as outlined in page 5 of the *Guidelines for the Ecologically Sustainable Management of Fisheries, 2nd Edition*. One of these changes has been in the management of the fishery, another in external influences and the third on stock status (see Table 1).

Table 1 Level of assessment required by the South Australian Abalone Fishery.

Issue	Area of Interest	Yes	No
Fishery	Has there been any change to management arrangements, and/ or fishing practices?	X	
External Influences	Has there been any change to an environmental issue/influence outside of the fishery management agencies control?	X	
Interaction with protected species	Has there been any change in the nature, scale, intensity of impact, and/or management response?		X
Ecosystem impact	Has there been any change in the nature, scale or intensity of impact, and/or subsequent management response?		X
Target Stock Status	Has there been any change in the target stock status	X	
By-product/ bycatch status.	Has there been any change in the by-product and/or bycatch stock status?		X

With only three changes out of a possible six in the areas of interest, the level of submission required to be provided by PIRSA Fisheries for the re-

assessment of the South Australian Abalone Fishery was 'Standard plus ancillary level of information'. It is important to note that much of the progress in the recommendations over the last five years have been previously communicated to DEWHA through the annual reporting process. The last annual report was provided by PIRSA to DEWHA in December 2008.

4 Fishery

The South Australian Abalone Fishery targets the blacklip abalone *Haliotis rubra* and greenlip abalone *Haliotis laevis*. Another three species of abalone, namely *Haliotis cyclobates*, *Haliotis scalaris* and *Haliotis roei*, can be taken, but as they rarely reach the legal minimum size limit of 130 mm SL, they are seldom landed by the fishery. The South Australian Abalone Fishery provides approximately 20% of the national wild abalone production and is the third most valuable fishery in South Australia, behind the Southern Rock Lobster and Western King Prawn fisheries. More than 95% of the annual catch of South Australian abalone is exported to South East Asia and the total revenue generated by this fishery for the financial year of 2007-08 was AUS \$31 million (Knight et al. 2009).

A new management plan is currently being developed to conform to the requirements of the *Fisheries Management Act 2007* (The Act). The Act requires fisheries management plans to:

- (a) identify the fishery to which the plan relates; and
- (b) describe the biological, economic and social characteristics of the fishery; and
- (c) identify the impacts or potential impacts of the fishery on its associated ecosystem or ecosystems, including impacts on non-target species of fish or other aquatic resources; and
- (d) identify any ecological factors that could have an impact on the performance of the fishery; and
- (e) assess the risks (if any) identified under paragraphs (c) and (d) to determine the most serious risks; and
- (f) set out strategies for addressing those risks; and
- (g) set out methods for monitoring the performance of the fishery and the effectiveness of the plan, including performance indicators, trigger points for review or action and progress reporting; and
- (h) specify the share of aquatic resources to be allocated to each fishing sector under the plan; and
- (i) prescribe a method, or establish an open and transparent process for determining the method, for adjusting allocations of aquatic resources between the different fishing sectors during the term of the plan; and

- (j) provide that compensation will be paid to persons whose licences or licence entitlements are compulsorily acquired in order to reduce the share of aquatic resources allocated to the commercial fishing sector and increase the share allocated to another sector.

PIRSA Fisheries are undertaking the Ecological Risk Assessment (ERA) of the South Australian Abalone Fishery which will serve to address requirements c,d, and e of the management plan. The ERA will be carried out in accordance with the National Ecologically Sustainable Development reporting framework as developed by Fletcher et al 2002 and as set out by the *National ESD Reporting Framework for Australian Fisheries (2002) - Version 1.01*. Both State and Commonwealth DEH will be invited to attend stakeholder workshops to undertake in the ERA process.

4.1 Commercial Fishery

4.1.1 Management Zones

In South Australian waters, the State Government has management jurisdiction for abalone from the low water mark out to three nautical miles. The South Australian Government also has jurisdiction from three nautical miles out to the edge of the Australian Fishing Zone (200 nautical miles) under an Offshore Constitutional Settlement (OCS) agreement between the South Australian and Commonwealth governments.

For management purposes, the South Australia Abalone Fishery is separated into three management zones. These are; the Southern, Central and Western Zones (see Fig. 1). The Southern Zone includes all coastal waters of South Australia east of Meridian 139°E, with the exception of the Coorong and waters inside the Murray River mouth (Fig. 1). This Zone is sub-divided into non-fish down areas (non-FDA) and four “fish-down” areas (FDA). Within these FDA, “stunted” (110-124.9 mm SL) abalone can be legally harvested (Nobes et al. 2004). The Central Zone of the South Australian Abalone Fishery includes all coastal waters between the Meridians 136°30'E and 139°E. Although Cowell is found within the boundaries of the Central Zone, this area of ~25 km² is managed separately. The Western Zone of the South Australian Abalone Fishery includes all coastal waters between the Western Australian/South Australian border and Meridian 136°30'E. The latter is sub-divided into Region A (Meridian 133°50.8'E to 136°30'E) and Region B.

The most recent stock assessment reports by the South Australian Research and Development Institute, Aquatic Sciences (SARDI, Aquatic Sciences) for the Southern Zone, Central Zone, and both the Western Zone Region A and Region B abalone fisheries have been attached to this report. Previous stock assessment reports for these various management zones are available on the PIRSA Fisheries website at www.pir.sa.gov.au/fisheries. The most recent biomass survey for Cowell (Mayfield et al. 2008) is also attached to this report.

South Australian Abalone Fisheries: Production by Mapcode (based on 2002-2006 data)

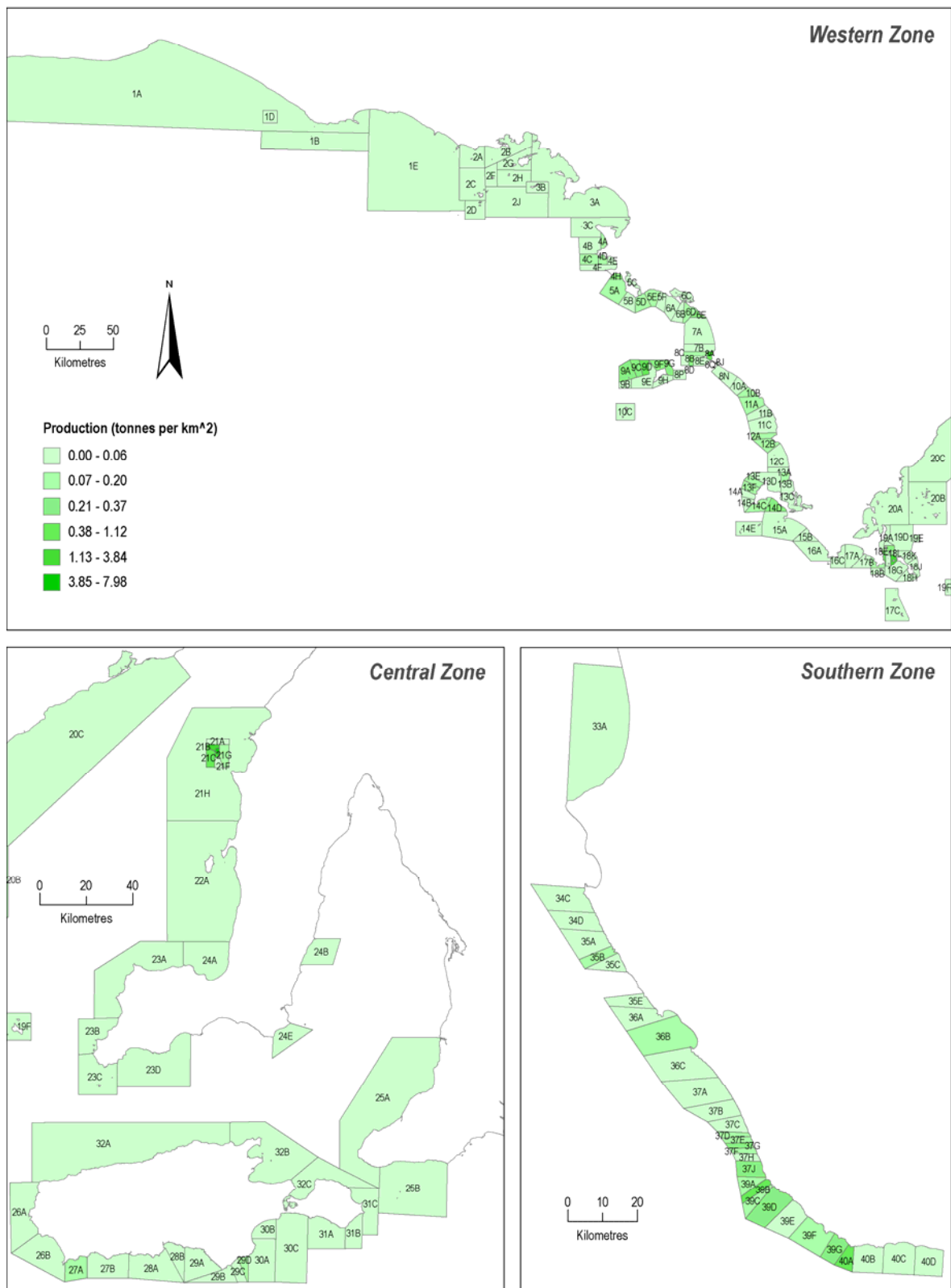


Figure 1 The Southern, Central and Western Zones of the South Australian abalone fishery (the numbered boxes are data collection map codes).

When the *Fisheries Management Act 2007* replaced the *Fisheries Act 1982* on 1 September 2007, the Abalone Fishery Management Committee was discontinued and a new entity called the Abalone Management South Australia Limited (AMSA) was created. This entity is recognised by PIRSA Fisheries and the abalone industry as the body representing the sustainable management interests of the commercial abalone fisheries of South Australia.

Table 2 Summary of management measures for the Commercial South Australian Abalone Fishery in 2008*. sw = shell weight; mw = meat weight; SL = shell length.

Management tool	Southern Zone	Central Zone	Western Zone
Limited entry	6	6	23
TACC (t)	Greenlip 6 (sw) <u>Non FDA</u> Blacklip 99 (sw) <u>FDA</u> Blacklip 45 (sw)	Greenlip 143.1 (sw) Blacklip: 24.3 (sw) <u>Cowell</u> Greenlip 2.9 (mw)	<u>Region A</u> Greenlip 227.7 (sw) Blacklip 295.25 (sw) <u>Region B</u> Total 41.4 (sw)
Quota season	1 September to 31 August	1 January to 31 December	1 January to 31 December
Minimum legal limit (SL)	130 mm Greenlip 110 mm Blacklip 125 mm Blacklip	130 mm Greenlip 130 mm Blacklip	145 mm Greenlip 130 mm Blacklip
Minimum quota unit holding (units)	Greenlip % <u>Non FDA</u> Blacklip 50 <u>FDA</u> Blacklip 50	Blacklip 25 Greenlip 25	<u>Region A</u> Greenlip 25 Blacklip 25 <u>Region B</u> combined 5
Catch and effort data	Daily logbook, submitted monthly		
Catch and disposal records	Daily records, submitted upon landing		
Landing times	Any time during the season		
Landing locations	Anywhere in the zone		
Vessel Monitoring System (VMS)	No		

* 2007/08 in Southern Zone

Southern Zone

Since the 2004 assessment of this fishery by DEWHA, the following management changes have been implemented in the Southern Zone Abalone Fishery:

- a. In the 2004/05 fishing season, the greenlip abalone TACC was 3 t (shell weight), the blacklip abalone TACC in non-FDA was 96 t (shell weight) and the blacklip abalone TACC in FDA was 51 t (shell weight).
- b. In the 2005/06 fishing season, the greenlip abalone TACC was increased to 6 t (shell weight), the blacklip abalone TACC in non-FDA was increased to 99 t (shell weight) and the blacklip abalone TACC in FDA was reduced to 45 t (shell weight).

Further information is available in the Southern Zone stock assessment reports (Mayfield et al. 2006a; Mayfield, Hogg & Saunders 2007).

Central Zone

Since the 2004 assessment of this fishery by DEWHA, the following management changes have been implemented in the Central Zone Abalone Fishery:

1. In 2005, the blacklip abalone TACC was reduced from 42.3 t to 29.7 t (shell weight) and the greenlip abalone TACC was maintained at 143.1 t (shell weight). The latter was supported by a voluntary cap on the total harvest from Tiparra Reef to no more than 15 t total shell weight per licence holder (which equates to a total catch of 90 t shell weight).
2. The blacklip abalone TACC was reduced from 29.7 t to 24.3 t (shell weight) in 2006.
3. In 2009, the voluntary cap on the greenlip abalone catch from Tiparra Reef was increased to 100 t (shell weight) and a voluntary cap of 5 t was also implemented in Fishing Area 22.
4. A spatially explicit quota has been allocated each to an area off Cowell since 2006. Quotas for this region in 2006, 2007 2008 and 2009 have been set at 5.53, 3.40, 2.93 and 2.16 t (meat weight), respectively based on TACC decision rules.

Further information is available in the Central Zone stock assessment reports (Mayfield, Carlson & Chick 2006; Mayfield & Carlson 2007; Mayfield, Carlson & Chick 2008) and the Cowell biomass reports (Carlson et al. 2006; Mayfield et al. 2006b; 2007; 2008).

Western Zone

Since the 2004 assessment of this fishery by DEWHA, the following management changes have been implemented in the Western Zone Abalone Fishery:

1. The TACC for greenlip abalone and blacklip abalone in Region A for both 2004 and 2005 was 207 t and 293.25 t (shell weight), respectively.
2. The TACC for greenlip abalone stocks in Region A was increased to 227.7 t (shell weight) in 2006.
3. The combined TACC for greenlip and blacklip abalone in Region B has been set at 41.4 t (shell weight) since 1994.

Further information is available in the Western Zone Region A (Chick et al. 2006; 2008) and Region B stock assessment reports (Chick & Mayfield 2006; Chick et al. 2007).

4.1.2 Harvest strategy

The current harvest strategy for the South Australian Abalone Fishery was designed in accordance with the specific goal to implement a precautionary approach to managing the fishery and to set the TACC at sustainable levels (Nobes et al. 2004). It employs biological performance indicators that are assessed at both the whole-of-fishery level and at the regional level. Breaking the assessment down into individual regions in this way refines management of the fishery to a finer spatial scale and ensures that greater caution is factored into management arrangements (Mayfield & Saunders 2008). Improved spatial management also ensures that one region of the fishery is not propping up another region, particularly during periods of low recruitment. Similarly, if the overall fishery is performing strongly, a downturn in one area may not necessarily lead to a TACC reduction for the whole Zone (Mayfield & Saunders 2008).

For detailed information about the management arrangements of the South Australian Abalone Fishery, including the harvest strategy, stock assessment and research, ecosystem impacts and compliance and monitoring arrangements, please refer to the 'Management Plan for the South Australian Abalone Fishery' by Nobes et al. (2004).

4.2 Recreational Fishery

The recreational sector is managed through a combination of output controls that aim to ensure the total recreational catch is maintained within sustainable limits and that access to the fishery and fishing opportunities are equitably distributed between participants. These regulations are outlined below in Table 1 and include legal minimum legal lengths, as well as daily bag and boat bag limits. The *Fisheries Management Act 2007* also provides for the imposition of possession limits by regulation. Most of the regulations used to manage the recreational sector have been enforced for many years and can be found in the South Australian Recreational Fishing Guide, which is available on the PIRSA Fisheries website.

Table 3 Summary of management measures for the Recreational South Australian Abalone Fishery, 2007-08.

Management tool	Southern Zone	Central Zone	Western Zone
Minimum legal length	130 mm SL Blacklip 130 mm SL Greenlip	130 mm SL Blacklip 130 mm SL Greenlip	130 mm SL Blacklip 145 mm SL Greenlip
Daily boat limit	10 per day	10 per day	10 per day
Daily bag limit	5 per person per day	5 per person per day	5 per person per day
Possession limit	15	15	15

The new management plan will be released for public comment, by mid-2009 and is due for completion by the end of 2009. In this plan, the recreational and commercial catch will be capped at a percentage of the total state-wide abalone catch. The former will be set at 1% of the state-wide catch if the results of 2000/01 NIRS survey (Henry & Lyle 2003) are used to allocate the recreational catch. Under this arrangement, if more than 1% of the total state-wide catch of abalone is taken by the recreational sector, the Minister for Agriculture, Food and Fisheries and Director of Fisheries will use various management measures to ensure the long term catch levels remain within the established benchmark.

The allocation of catch between the commercial and recreational sectors will be adjusted each time a state-wide recreational survey is conducted. Presently, PIRSA Fisheries has an intention to implement such a survey every 3 years, with the next one due in mid- to late-2009.

5 External Influences

Blacklip abalone are contiguous throughout southern Australia from Coffs Harbour in NSW to Rottnest Island in WA and inhabit rock crevices and sheltered reefs generally in shallow waters up to 10 m in depth. Greenlip abalone are also contiguous throughout southern Australian, but with a more limited range from Corner Inlet in Victoria to Cape Naturaliste in WA. They generally occur in rocky habitats in deeper waters ranging from 10-30 m in depth. Within their geographic range, abalone tend to be clustered in groups of suitable habitat patches, and these groups are themselves clustered in larger groups (called local populations), which can extend over several hectares (Shepherd 2008). Local populations are scattered along the coast in suitable habitat, and the ones that are linked by dispersal of their larvae are called meta-populations (Shepherd 2008). Factors that affect the dispersal of larvae, such as water temperature and currents can therefore have a large impact on recruitment and the productive capacity of the population.

Impacts of the South Australian Abalone Fishery on the general ecosystem are being assessed through the ERA process (see Fig. 2) and will be addressed in the new management plan, due for completion by the end of 2009.

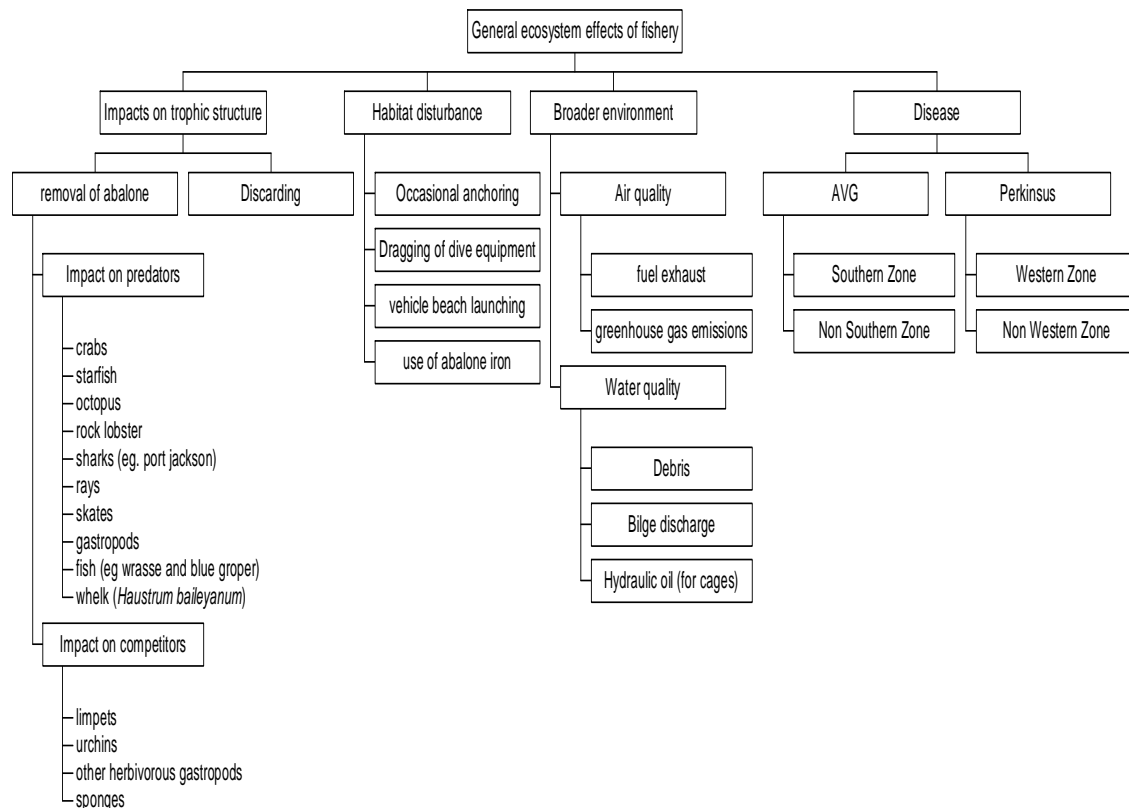


Figure 2 General Environment Impacts of the South Australian Abalone Fishery.

The threat of disease is always present in abalone (Shepherd 2008). The parasite, *Perkinsus*, is widespread in gastropod species, and even a slight warming of water of 1-2°C may precipitate a decline in abundance of all abalone species.

Another serious disease is the abalone ganglioneuritis virus (AVG). This virus infected abalone farms and decimated wild blacklip populations in Western Victoria in mid-2006. Very little is known about AVG, including how it infects abalone, how long it survives outside the host and whether or not healthy abalone can carry the virus.

There is a real risk AVG may spread to South Australia naturally or with the translocations of stock, equipment and abalone products such as abalone gut (which is often used as fishing bait). To negate this risk, a Disease Response Plan (2009) has been written by PIRSA Fisheries (see attachment 7). This Response plan provides a framework for PIRSA Fisheries staff to prepare for, and respond to, a suspected or confirmed case of AVG in the South Australian wild fisheries or aquaculture sectors.

6 Interaction with Protected Species

PIRSA Fisheries implemented a generic wildlife interactions logbook in 2007 to report all interactions with threatened, endangered and protected species (TEPS) across all South Australian commercial fisheries, including the South Australian Abalone Fishery. Data is now being collected and recorded. PIRSA Fisheries is in the process of developing a memorandum of understanding on TEPS reporting between PIRSA Fisheries and DEWHA, to streamline reporting of TEPS interaction by South Australian commercial fishers.

The impact of the South Australian Abalone Fishery on TEPS is being assessed during the ERA process on non-retained species (Figure 3) and is expected to be of low risk. This is not surprising given that interactions with threatened species are limited to visual interactions.

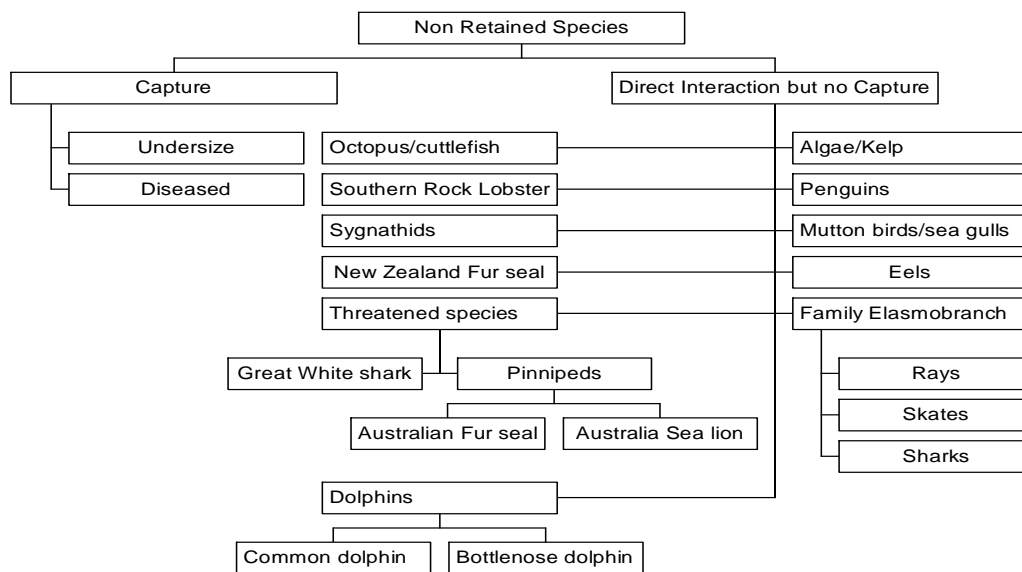


Figure 3 Issues Related To the Non Retained Species of the South Australian Abalone Fishery

7 Target Stock Status

At present, the key biological performance indicators used to assess the Southern, Central and Western Zone Abalone Fisheries are catch rate (catch per unit effort; CPUE), mean daily catch, mean daily effort and mean size. Additional performance indicators include fishery-independent surveys, mean size, catch vs. TACC and egg production.

7.1 Southern Zone Abalone Fishery

The most recent Southern Zone Abalone Fishery stock assessment report (2005/06) was published in July 2007 (Mayfield, Hogg & Saunders 2007). In addition to assessing the status of the fishery, this report also identified both current and future research needs. The current stock assessment is considered reliable, and the following points are worth mentioning:

7.1.1 Greenlip abalone

1. Almost half the catch is harvested from Fishing Area 39.

Limited data suggest that Greenlip abalone occur in low density and is patchily distributed. These data are currently inadequate for determining the impact on the stock from the increase in the TACC, in place since 2004/05 fishing season. The costs of obtaining additional fishery-independent data for assessment of the greenlip fishery are restrictive given the small TACC and low value of this species in the Zone.

7.1.2 Blacklip abalone-‘Non fish-down areas’

1. Catches have generally been stable over the last 20 years.
2. Between 2004/05 and 2005/06, fishing effort increased sharply (11%), mean CPUE decreased by 10% and the proportion of small blacklip abalone in the commercial catch increased sharply (>20%).
3. Fishery-independent estimates of abalone at three survey sites were at the lowest level since surveys were initiated in 2002/03.

The assessment of non-FDA was impeded by inconsistent inferences of stock status from different datasets. Thus, while there is evidence that the resource on which the fishery is based has weakened between 2004/05 and 2005/06, other data do not support this conclusion (Mayfield, Hogg & Saunders 2007).

7.1.3 Blacklip abalone-‘Fish-down areas’

1. The catch in these areas contributed 33% of the total catch in 2005/06 fishing season. The mean catch since 2003/04 was 45% greater than that from 1968/69 to 2002/03.
2. Catches from FDA 4 have accounted for >45% of the total catch since the fishing season of 2001/02.

Much of the data suggest that the level of catch from FDA 4 may not be sustainable in future years. The status of stocks in FDA 1 and 3 was unclear due to inconsistencies in the different data sets.

7.1.4 Future needs

The most pressing need for the Southern Zone is to ensure that there is adequate data with which to determine the impact on, and future management of, the resource should the herpes-like virus, causing ganglioneuritis in individuals and resulting in widespread mortality in wild abalone populations in south-western Victoria, spread into South Australia (Mayfield, Hogg & Saunders 2007). These authors also suggest that future assessments would benefit from more formal integration of the biological and fishery datasets, and by interrogating the fishery data at a finer spatial scale (e.g. mapcode rather than fishing areas). Such an approach enables consideration of the large variability in key population parameters, such as rates of growth and length at maturity, across a range of spatial scales and may overcome the ambiguity in the assessment related to inconsistent references from the different datasets (Mayfield, Hogg & Saunders 2007). A key step to achieving this is to make extensive use of the data and information obtained in FRDC 2004/19: *Towards optimising the spatial scale of abalone fishery management*. Undertaking this process will also provide a framework within which the current management arrangements and performance indicators can

be reconsidered (Mayfield & Saunders 2008), not just for the Southern Zone but for all Zones.

7.2 Central Zone Abalone Fishery

The most recent Central Zone Abalone Fishery stock assessment report was published in June 2008 (Mayfield, Carlson & Chick 2008). The most recent biomass estimate of greenlip abalone from Cowell was obtained in 2008 (published in November 2008 by Mayfield et al. 2008). Both these stock assessments are considered reliable and can be summarized as follows:

7.2.1 Greenlip abalone-Central Zone

1. Most (~70%) of the catch is harvested from Fishing Area 21 (i.e. Tiparra Reef). The implementation of a “catch cap” on Tiparra Reef since 2005 has resulted in a substantial increase in catches in nearby Fishing Areas 22 and 24.
2. Mean daily catch has declined significantly in Fishing Area 21 since 2003 and in Fishing Area 24 between 2006 and 2007. In Fishing Area 22, mean daily catch has decreased by >45% since 2004, to the lowest level since 1993.
3. Total effort has increased significantly since 2003, to the highest level since 1999.
4. Mean CPUE has declined significantly since 2001 in the Central Zone. Mean CPUE declined significantly between 2006 and 2007 in Fishing Areas 21 and 24. In Fishing Area 22, it has decreased by 35% since 2004.
5. The mean length of greenlip abalone in the commercial catch has decreased, and the proportion of the sample <145 mm SL has increased in Fishing Area 21 and 24 over the last five years. Overall, the mean length was smallest and the proportion of the sample <145 mm SL greatest in 2007.
6. The abundance of legal-sized greenlip abalone observed on fishery-independent surveys at Tiparra Reef and Hardwicke Bay have decreased by >35% over recent years.

Consistent with previous assessment reports, there is continued evidence that the legal-sized, greenlip abalone biomass is declining at Tiparra Reef, and that the resource on which the Central Zone greenlip abalone fishery is based has weakened over recent years (Mayfield, Carlson & Chick 2008).

7.2.2 Blacklip abalone-Central Zone

1. Most (>80%) of the catch is harvested around Kangaroo Island in Fishing Areas 26, 27 and 29. In 2007, Fishing Area 26 contributed >50% of the catch. There are concerns that this level of catch may not be sustainable in the future.

2. Mean daily catch has declined significantly in Fishing Area 26, 27 and 29 since 2000, 2004 and 2003, respectively. Despite increases in mean daily catch in fishing Areas 26 and 29 within recent years, mean daily catch remained >20% below contemporary maxima.
3. CPUE in Fishing Area 26 increased between 2005 and 2007, but still remained >20% below that in 2000. Significant declines in catch rates since 2003 were evident in Fishing Area 29 while those in Fishing Area 27 for the years 2006 and 2007 were lower than the catch rates of 2005.
4. The mean length of blacklip abalone in the commercial catch has increased, and the proportion of the sample <145 mm SL has decreased in Fishing Area 26, 27 and 29 since 2005. These patterns suggest the progression of a cohort through the fishery, with poor recruitment in recent years.

There is evidence to suggest that the blacklip abalone resource has weakened in the Central Zone, with current years among the weakest on recent record (Mayfield, Carlson & Chick 2008). This is disputed by industry; a process is being developed to resolve this disagreement.

7.2.3 Cowell

1. Sequential declines in mean daily catch, CPUE and survey-measured, legal-sized bled-meat-weight biomass suggest that the resource has weakened since exploitation re-commenced off Cowell in 2006.

The legal-sized, greenlip abalone biomass has gradually declined at Cowell over the last three years.

7.3 Western Zone Abalone Fishery

The most recent Western Zone Region A stock assessment report (2006/07) was published in June 2008 (Chick et al. 2008), while that of the Western Zone Region B (2005/06) was published in September 2007 (Chick et al. 2007). Both these assessments are considered reliable and can be summarized as follows:

7.3.1 Greenlip abalone-Region A

1. CPUE declined from a historical high of 79.0 kg.hr⁻¹ in 2005 to 75.9 kg.hr⁻¹ in 2007. The latter was the lowest level since 2002.
2. Since 2004, the mean length and modal length classes of greenlip measured from the commercial catch has exceeded the minimum length limit (MLL) of 145 mm SL by >15 mm and >5 mm, respectively.
3. Fishery-independent surveys indicate that greenlip abalone at Ward Island and Hotspot have generally increased since 2003. In contrast,

abalone at Pearson Island, Point Avoid and the 'The Gap' have generally decreased over the same period.

Unambiguous assessment of the current status of greenlip abalone stocks in Region A was impeded by inconsistent inferences from the datasets available. While some of the data suggest that the stocks remain in a strong position, other data, notably decreases in CPUE in key fishing areas, suggest the stock has weakened since 2005 (Chick et al. 2008).

7.3.2 Blacklip abalone-Region A

1. The spatial distribution of catch was more restricted in 2007 than in previous years.
2. An average of 20% of the catch has been harvested from Fishing Area 9 since 1997, though catch from this area has decreased since 2005.
3. CPUE between 2003 and 2006 was stable, but declined between 2006 and 2007, to the lowest level since 2002.
4. Since 2003, the mean length of blacklip measured from the commercial catch has exceeded the MLL of 130 mm SL by >15 mm and the modal length class has varied by <10 mm SL.

The assessment of the current status of the blacklip stocks in Region A was complicated by the inconsistent inferences from the available datasets. Some data suggest the stocks remain in a relatively strong position, while others suggest decreases in catch and CPUE in key fishing areas (evident in the last 2-3 years) (Chick et al. 2008).

7.3.3 Region B

1. Over 80% of the catch in this region was obtained from Fishing Area 2 in 2006.
2. The catch rate of greenlip abalone has declined significantly since 2002. In 2006, it was 44 kg.hr⁻¹, the lowest value since 1998, and >30% below the maximum of 1982.
3. The catch of blacklip abalone has increased since 2003. In 2006, it was 18.4 t, the highest since 1997.
4. CPUE for blacklip has increased since 2004, reaching 56.8 kg.hr⁻¹ in 2006, but remains >20% below the maximum observed in 1993.

Current data from Region B generally support the conclusion that greenlip abalone stocks are in decline (Chick et al. 2007). This is because the recent decrease in catch, CPUE and the mean size of the commercial catch are consistent with declining stock abundance. Divers from this Region dispute the inference that there has been a decline in greenlip abalone abundance.

The data to assess the status of blacklip abalone in Region B generally support the conclusion that stocks are stable or increasing. However, the rapid recent change in the patterns of the catch and CPUE, in combination with the decrease in mean size of blacklip abalone between 2005 and 2006 suggest that continuation of these patterns may not be sustainable and warrant careful monitoring (Chick et al. 2007).

7.4 Recreational Fishery

The first and only comprehensive survey of recreational catch and effort levels in South Australia was undertaken for the period May 2000 to April 2001 (Henry & Lyle 2003). The recreational catch by this National Recreational and Indigenous Fishery Survey (NRIFS) was estimated at 17,780 abalone or 8.9 tonnes (~1% of total commercial catch). The most recent estimate of an annual recreational catch of 14.45 tonnes or 1.7% of the total commercial abalone catch was derived from a non-targeted survey in 2002 that was aimed at estimating the recreational catch of rock lobsters (Venema et al. 2003).

PIRSA Fisheries has undertaken a state-wide recreational fishing survey in August 2007; this survey has followed the same parameters used in NRIFS to allow for comparison. The on-site phase of this survey has been finalised and the results are now being analysed. The final report is expected in mid- to late-2009, and will be incorporated in to the decision making process, when allocating resources to the different sectors.

8 By-product and by-catch stock status

The South Australian Abalone Fishery is a selective fishery, using hand-collection of the abalone. As such, there is no by-product. The only by-catch is the few species that are found on the shell of abalone. These include shell boring polychaetes, algae, bivalves and gastropods, as can be observed in Figure 3.

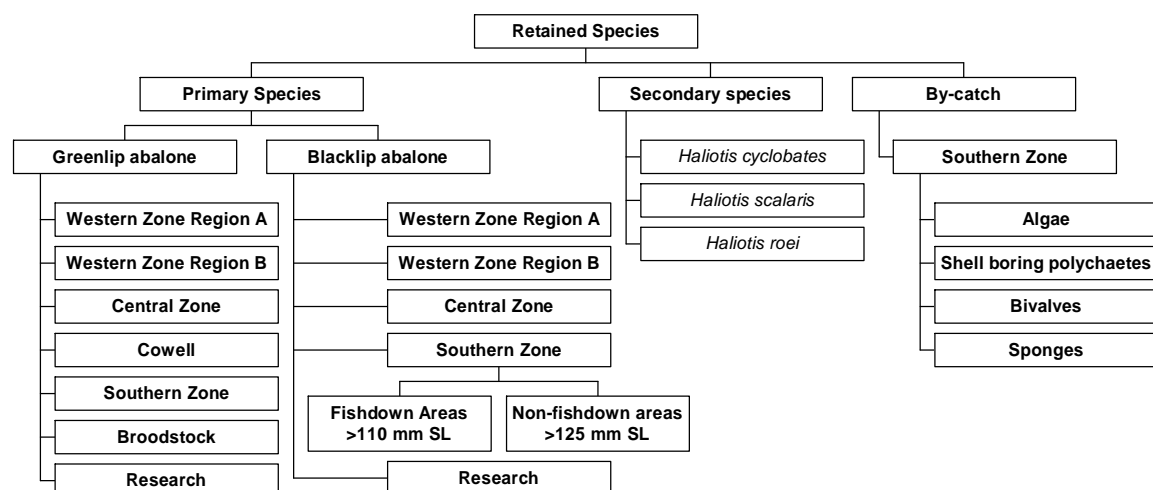


Figure 4 Issues Related to the Retained Species of the South Australian Abalone Fishery

9 Additional Information²

South Australian Wild Fisheries Information and Statistics Report, January 2009: Provides an estimate of catch, effort and landed beach price of the South Australian commercial fish up to the financial year ending June 2008.

Southern Zone Abalone Fishery Status Report: Produced every two years by SARDI

Central Zone Abalone Fishery Status Report: Produced every two years by SARDI

Western Zone Abalone Fishery Status Report: Produced every two years by SARDI

South Australian Fisheries Resources, Current Status and Recent Trends, 2006: Brings together all the available information of key stocks managed by the South Australian Government. It provides detail on the biological status of the major fish stocks in South Australian waters and describes the management measures in place to ensure their long term sustainability (published every three years).

² Additional information can be accessed from the PIRSA website at http://www.pir.sa.gov.au/fisheries/commercial_fishing/abalone_fishery

10 Recommendations

Recommendation 1: *PIRSA Fisheries to consult with other fishery agencies on the development and implementation of appropriate biological parameters and reference points for abalone harvesting, and pursue with these agencies a national process for developing, adopting and reviewing these indicators, and for periodically reviewing abalone stock assessment processes.*

South Australia shares management and stock assessment information with Tasmania and Victoria through regular updates and both the provision and formal review of stock status and stock assessment reports.

The need for a project that develops appropriate biological parameters and reference points for abalone harvesting was identified by PIRSA Fisheries, SARDI Aquatic Sciences and the Abalone Industry Association of South Australia several years ago. The latter sought support for this project from the Abalone Council of Australia (ACA) and received it. The ACA, PIRSA Fisheries and SARDI Aquatic Sciences then submitted a proposal to FRDC to fund a national workshop to progress this project. To ensure jurisdictional support for the project, PIRSA Fisheries and SARDI Aquatic Sciences engaged with other abalone producing States.

In September 2007, a national workshop was funded by FRDC to develop an agreed research and development program that will result in the implementation of a national performance based harvest management system for abalone fisheries. A notable outcome of this workshop was to specifically develop and implement appropriate biological parameters and reference points that can be used nationally to harvest abalone. Both PIRSA Fisheries and SARDI Aquatic Sciences will participate in this FRDC project (Management Strategy evaluation; MSE), which starts in July 2009 and is focussed on South Australia and Tasmania.

Recommendation 2: *PIRSA to inform DEH of any future amendments to the Management Plan for the South Australian Abalone Fishery or managerial commitments made in the submission.*

PIRSA Fisheries has, and will, continue to maintain open and regular lines of communication with DEWHA. PIRSA Fisheries has produced annual stock assessment reports to communicate with DEWHA on management changes that have taken place to address recommendations arising from the assessment process. In addition, PIRSA Fisheries has advised DEWHA that:

- a new management plan for the South Australian Abalone Fishery is due for completion by the end of 2009 and a draft copy will be

available in mid-2009 for consultation by all relevant stakeholders prior to its completion;

- in developing the Management Plans for the fishery, the first step is to undertake an Ecological Risk Assessment (ERA). The ERA process is currently being undertaken for the Abalone fishery. Through this process, State and Commonwealth DEH will be invited to attend stakeholder workshops to provide input into the process.
- the management and regulation of fishing in South Australia comes under the *Fisheries Management Act 2007* (replaces the *Fisheries Act 1982*).

The new Act:

- Includes new offences and heavier penalties;
- Gives Fisheries Officers powers to search a person suspected of hiding evidence of an offence;
- Establishes a new Fisheries Council of members from commercial, recreational and indigenous fishing to advise the Minister on fisheries issues;
- Provides for a more ecosystem-based approach to managing fisheries, with conservation objectives, risk-based assessments of potential impacts on the ecosystem and tools to protect fish habitats;
- Provides for specific possession limits of fish species, above which a person would have committed an offence.

A co-management approach will continue under this Act with the establishment of a Fisheries Council to provide advice to the Minister on the management of fisheries, whether for commercial use, recreational use or for Aboriginal traditional fishing purposes.

Fisheries Council

The Fisheries Council, which held its first meeting in October 2007, has 9 members appointed by the Governor, plus the Director of Fisheries as an ex-officio member.

The Fisheries Council members are appointed based on their expertise in fisheries management and knowledge and experiences of Aboriginal traditional fishing. The membership also has representative expertise in the following areas:

- Commercial fishing and the processing of aquatic resources;
- Recreational fishing;
- Research and development relevant to the use of aquatic resources;
- Conservation of aquatic resources;
- Business; and
- Law.

The Council has a broad advisory role and its main purpose is to prepare and review management plans, promote the co-management of fisheries, promote

research, education and training in relation to fisheries and their management, and advice the Minister on all fisheries related matters as set out under Section 16 of the Act.

Management plans under the new Act can extend the period and tenure of commercial fishing licences from the current one-year period to periods of up to 10 years, providing an improved investment climate for the commercial fishing industry. The Act also provides for a decision-making framework to ensure that management plans must be either continued or replaced upon their expiry.

To assist with its advisory role to Government, the Fisheries Council will be required to establish advisory committees and co-opt expertise as necessary to ensure robust advice on fisheries management issues.

Recommendation 3: *PIRSA to ensure that the new stock assessment model be developed by the end of 2005 and be used as part of the stock assessment process from 2006.*

The National Abalone Model developed by Gorfine et al. (2005) is an integrated, length-structured stock assessment and risk analysis model. It was used to assess the status of blacklip abalone stocks in the Southern Zone (Mayfield et al. 2005b), the Central Zone (Mayfield et al. 2005; 2006) and the Western Zone (Mayfield et al. 2005a). Those assessments used Bayesian techniques to estimate:

- (1) model parameters;
- (2) determine the sensitivity of the model outputs to alternative time series;
- (3) determine current stock status relative to that in 1968 (i.e. B_0); and
- (4) determine the uncertainty of those estimates.

Subsequent reviews of the model found several major deficiencies, including: (1) a lack of performance evaluation tools; (2) model coding errors; (3) and the spatial scales at which the model was applied. Given these deficiencies, this model was no longer used in the stock assessment process.

A corrected version of this model will be used in 2009/10 to assess the greenlip abalone stock of Tiparra Reef.

Recommendation 4: *PIRSA, within 12 months, to more accurately quantify the extent of recreational, indigenous and illegal catch, and to take into account of all removals, including aquaculture broodstock, in the stock assessment process and the determination of the annual TACC.*

PIRSA Fisheries has developed an assessment of the recreational catch and effort information for the South Australian regional component of the 2000/01 National Recreational and Indigenous Fishing Survey (NIRFS) by Henry and Lyle (2003). That survey was the most comprehensive survey undertaken in South Australia and, for the first time, provided a detailed picture of recreational fishing on a state-wide and regional basis- including information on the levels of targeting, harvest and catch rates for key species. To update the information gained through the NIRFS survey, PIRSA Fisheries began another state-wide recreational fishing survey in August 2007. This 12 month survey covers:

- All South Australian water, both marine and freshwater;
- All non-commercial fishing activity by South Australian residents, aged 5 years or more;
- Data on the numbers of fishers and the level of fishing effort, harvest, and release will be collected on a regional basis.

The on-site phase of the latter survey has been finalised and the results are now being interpreted. The final report is expected in mid 2009, and will be incorporated in to the decision making process, when allocating resources to the different sectors.

PIRSA Fisheries is in the process of negotiating Indigenous Land Use Agreements (ILUAs) with Native Title claim groups in South Australia and preparing Aboriginal Traditional Fishing management plans. This process also includes the development of methodologies for measuring Aboriginal traditional fishing activities in South Australia. Funding arrangements are currently being investigated to undertake a monitoring program for this component of the fishery. Data collected on catch and effort by the Aboriginal traditional fishing sector will be incorporated into stock assessment models for the key species.

Some illegal abalone fishing is undoubtedly undertaken in the South Australian Abalone Fishery. However, as in most fisheries, it is difficult to quantify the quantity of abalone illegally removed from the fishery each year. Past estimates, such as those from the FRDC project "*Assessment of Illegal Catches of Australian Abalone*" by Gorfine et al (2002), may not be a reliable representation of the extent of illegal harvesting in South Australia. The implementation of systems for monitoring the TACC combined with the prior reporting system has reduced opportunities for the disposal of illegal catches. Regardless, methods to quantify illegal catch levels, and its biological and economic impact, have been identified as a strategy in the current

management plan and strategic research plan, and will continue in the new management plan due to be completed by the end of 2009.

Annual compliance risk assessments consider illegal fishing activities in the South Australian Abalone Fishery and guide compliance activities and management decision-making. During 2005, Fisheries Compliance identified, through information and other reports, that 7,340 individual abalone may have been taken illegally. In addition to this, information reports also indicated that approximately 2,365 kg (meat weight) of abalone may have been illegally harvested within the Western Zone (Chick et al. 2006). Since Fisheries Compliance would not have been notified of all reports alleging that abalone theft had occurred within the Western Zone during 2005, the actual extent of illegal take is likely to have been higher. By attributing an estimate of 140 g to the meat weight of an illegally harvested whole abalone, the estimated total illegal catch of abalone in the Western Zone equates to ~3.4 tonnes meat weight (cited in Chick et al. 2006).

PIRSA Fisheries also tracks the number of abalone collected for broodstock use through Ministerial Exemption Notices. In 2007, the operators holding Ministerial Exemption Notices were allowed to harvest a less than a couple thousand greenlip abalone for broodstock use. This represents < 0.1% of the average annual commercial catch of greenlip abalone.

All available removal estimates are taken into consideration by SARDI Aquatic Sciences during stock assessments.

Recommendation 5: *PIRSA, within 2 years, to develop and implement enhanced fishery-independent research and monitoring programs for greenlip and blacklip abalone in the Central and Western Zones, representative of species distribution and catch across these zones of the fishery, to improve the understanding of the stock status in these zones and support the development of more refined stock assessments and models.*

Each year, SARDI Aquatic Sciences undertakes their fishery-independent sampling programs to address priority areas in the Southern, Central and Western Zones abalone fisheries. These areas surveyed include:

(1) *Southern Zone Greenlip and Blacklip Abalone:* Cape Northumberland, Middle Point, Lingwood Reef, Gerloffs Bay, Jones Bay and Douglas Bay.

(2) *Central Zone Greenlip Abalone:* Tiparra Reef, Port Victoria and Hardwicke Bay.

(3) *Central Zone Blacklip Abalone:* NIL. Non-research divers will be used to survey stocks from this Zone from 2009/10.

(4) *Western Zone Blacklip Abalone:* Sheringa, Ward Island, Hotspot, Drummond and Granites.

(5) *Western Zone Greenlip Abalone*: Black Rocks, Flinders Island, Ward Island, Hotspot, the Gap, Point Avoid and Pearson Island.

To help improve the understanding of stock status in these Zones, an integrated, two-stage survey approach was developed to measure the spatial distribution and harvestable biomass of abalone (Mayfield et al. 2008). In the first stage of this survey, commercial fishers conduct systematic surveys to identify areas with abalone at harvestable densities. CPUE measures from these surveys are used to map and stratify a bounded survey region, within which ledged line surveys measure absolute density and harvestable biomass. Decision tables, showing minimum biomass at various probabilities versus harvest fractions, are developed to provide a risk assessment framework for quota setting (Mayfield et al. 2008). Such an approach provides estimates of absolute biomass over large spatial scales and affords multiple advantages for the assessment and management of abalone stocks (Mayfield et al. 2008). This approach was successfully used to determine the distribution, abundance; biomass and commercial potential of greenlip abalone off Cowell in the Central Zone over the last few years (see Carlson et al. 2006; Mayfield et al. 2006b; 2007; 2008).

Recommendation 6: *PIRSA, within 2 years, to further develop biological sampling programs, representative of species distribution and catch across all zones of the fishery, to provide the necessary data to inform the range of biological performance measures in the Management Plan for the South Australian Abalone Fishery and support the development of more refined stock assessment models.*

SARDI currently undertakes ongoing data collection programs in the Central Zone and both Region A and B of Western Zones. In the Central zone in Kangaroo Island 'Structured Research Fishing' in blacklip abalones by commercial divers is being trialled as a way to gather information in a joint effort driven by industry, and guided by SARDI scientists.

SARDI has recently, completed the FRDC project '2004/019: *Towards optimising the spatial scale of abalone fishery management*' (Mayfield & Saunders 2008) in the Southern Zone. This project was among the first to provide a mechanism to facilitate a reduction in the spatial scale of abalone fishery assessment and management. It was primarily focussed on:

- (1) developing a simple, practical and cost-effective tool to discriminate among, and estimate key life-history parameters of, blacklip abalone;
- (2) identifying potential Management Units (MUs) and their associated life-history characteristics; and
- (3) outlining an initial framework, including consideration of population genetics, fisheries compliance and stock-assessment modelling, for MU implementation.

A principal outcome of this project was the identification of a 'morphometric marker', based on the ratio between shell length and shell height, which could both discriminate among blacklip stocks and predict their biological characteristics (Mayfield & Saunders 2008). Thus, this tool can be used as a basis for identifying and managing MUs for blacklip at relevant ecological scales that are difficult to detect with genetic approaches. Importantly, it can be applied at any spatial scale, thereby overcoming the observed mix of variability and lack of predictability of the size and location of blacklip populations (Mayfield & Saunders 2008).

When used within a suitable management framework, it can provide the necessary information to enable practical reductions in the scale of blacklip fishery management, which have previously been hampered by the inability to gather detailed demographic data at appropriate spatial scales. This approach will aid optimisation of blacklip fishery management because individual stocks can now be identified and then separately managed on the basis of their key life-history characteristics (Mayfield & Saunders 2008). This provides the opportunity for better resource use and, consequently, a reduction in the risk of fishery collapse. In addition to these biological sampling programs, there is also routine measurement of the commercial catch in all three Zones. This sampling has been in place since 2001. The size frequency data of shells collected by fishery-independent surveys (i.e. by SARDI Aquatic Sciences) has also been monitored from many years. Both these data have been used to inform stock assessment and management decision-making (see Mayfield, Hogg & Saunders 2007; Mayfield, Carlson & Chick 2008; Chick et al. 2008).

Recommendation 7: *PIRSA to investigate and establish, over the next 3 years, appropriate decision rules or strategies, relevant to the regional or area scale management as required, to prevent serial depletion of blacklip and greenlip abalone stocks in all zones of the fishery.*

PIRSA Fisheries, with the help of AMSA have commenced preparing the new Management Plan for the South Australian Abalone Fishery. This plan is scheduled to be available for public comment by mid-2009 and to be completed by the end of 2009. A component of this task is to review the performance indicators and develop a harvest strategy that includes decision rules that will specifically prevent serial depletion of abalone stocks in all Zones. These methods will be refined during the life of the management plan as advances in knowledge are made, particularly from the FRDC project on performance indicators MSE. AMSA in conjunction with the Fisheries Council will progress discussion on setting stock limits and targets and undertake an annual review of the performance indicators for the fishery. Additional indicators of fishery performance may be developed over time as advances in knowledge are made and stock assessment methods are refined. Voluntary

measures are already in place to limit catch at finer spatial scale within all Zones. For instance, Waterloo Bay has been closed to fishing for several years and there has been a cap on the greenlip catch on Tiparra Reef since 2005.

Since exploitation re-commenced in an area off Cowell in 2006, the quota for greenlip abalone has been set at 10% of the fishable biomass (>130 mm SL) estimated with 80% confidence that the biomass is greater than this. This is known as the “80:10” decision rule (Mayfield et al. 2008). The sequential decline of several important fisheries variables such as CPUE and the proportion of legal-sized greenlip since exploitation re-commenced there suggest the current decision rule may not be conservative enough to ensure the long-term sustainability of the resource in Cowell. This decision rule, and others, will be reviewed when the new Management Plan is written.

Recommendation 8: *PIRSA to continue to work with other jurisdictions to develop effective strategies and response measures to quantify and reduce the extent of illegal take of abalone in South Australia.*

South Australia has intelligence-sharing arrangements with the Victorian Department of Primary Industries and there are joint compliance operations between South Australia, Victoria and Tasmania. PIRSA Compliance will continue to quantify illegal catch levels, and its biological and economic impact. To help achieve this goal, PIRSA Compliance will participate in National forums to address organised illegal activity in Australian abalone fisheries. The special operations group of PIRSA Compliance conduct several operations per year targeting organised illegal activity based on intelligence reports to regulate and deter illegal fishing.

To reduce the extent of illegal take of abalone in South Australia, higher penalties for illegal activity are in place under the new Act. *The Fisheries Management Act 2007* also includes provisions to implement a National Docketing System (NDS).

Recommendation 9: *PIRSA to develop within 18 months recovery strategies that can be applied to areas assessed as below key reference points or levels for stock abundance and recruitment. The recovery strategies should include preliminary recovery targets and monitoring arrangements, appropriate to the scale of fishing in the area, and associated timeframes.*

SARDI Aquatic Sciences undertakes regular stock assessments on both greenlip and blacklip abalone across all three Zones. These assessments provide an evaluation against the established key performance indicators and reference points outlined in the management plan and identify regions exhibiting undesirable levels of fishing pressure. When such regions are identified by the triggering of several performance indicators, a range of strategies are available to facilitate stock recovery. These include: applying

precautionary TACC reductions; regional catch limits such as the introduction of a cap on Tiparra Reef; the closure of an entire Fishing Area; and an increase in minimum length limits, etc.

When the new management plan is written, emphasis will be placed on designing a harvest strategy that will establish biological performance indicators that will contain target and limit reference points and TACC decision rules, which trigger a specific response in terms of TACC increases or reductions.

AMSA in conjunction with the Fisheries Council will undertake an annual review of the performance indicators and decision rules for the fishery.

Recommendation 10: *PIRSA, within 12 months, to develop options for the recording and reporting of protected species interactions in the fishery.*

PIRSA Fisheries has implemented a generic data recording logbook for wildlife interactions (including threatened, endangered and protected species - TEPS) in 2007 for all South Australian commercial fisheries. The logbook was implemented to ensure consistent reporting practices for interactions with TEPS and to fulfil the requirements under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC), as well as addressing the recommendations made by DEWHA for South Australian commercial fisheries export approval.

SARDI Aquatic Sciences is currently collecting and archiving the data from these logbooks. An annual report will be prepared by SARDI to summarise all data on TEPS interactions recorded in the logbook. PIRSA Fisheries is currently developing a memorandum of understanding (MoU) regarding TEPS reporting between PIRSA and DEWHA.

Recommendation 11: *PIRSA to give priority to developing environmental indicators that can be reported against in future Stock Assessment Reports*

SARDI Aquatic Sciences submitted a proposal to the FRDC to fund a project on the ecological impacts of abalone and rock lobster fishing in the temperate reef environments of the fishery. The aims of this project were to determine the indirect effects of fishing on temperate reef ecosystems and to develop appropriate Ecosystem-based performance indicators. This project application was not successful. Under the new *Fisheries Management Act of 2007*, a management plan for the South Australian Abalone Fishery is scheduled for completion by the end of 2009 and will be released for comment in mid-2009. An Ecological Risk Assessment is being undertaken during the development of this management plan, in accordance with the 'National Ecological

Sustainable Development Reporting Framework for Australian Fisheries' to identify the environmental impacts of abalone fishing. This was completed recently with the cooperation of industry. Due to the highly selective nature of harvest in the fishery, the risk of disturbance to substrate or interactions with other species was minimal.

10.1 Progress summary of recommendations

PIRSA Fisheries in conjunction with the AMSA and the respective Southern, Central and Western Zone licence holders, SARDI Aquatic Sciences and other stakeholders have completely implemented four recommendations (highlighted in blue) for the South Australian Abalone Fishery and made substantial progress on another four. The remaining three recommendations require ongoing assessment. Table 4 provides a summary of progress against the recommendations.

Table 4 Progress summary and target dates for the eleven recommendations of DEWHA for the South Australian Abalone Fishery.

No	Recommendation	Progress	Target
1*	PIRSA Fishery to consult with other fishery agencies on the development and implementation of appropriate biological parameters and reference points for abalone harvesting, and pursue with these agencies a national process for developing, adopting and reviewing these indicators and for periodically reviewing abalone stock assessment processes.		Ongoing
2	PIRSA to inform DEH of any future amendments to the Management Plan for the South Australian Abalone Fishery or managerial commitments made in the submission.		Ongoing
3	PIRSA to ensure that the new stock assessment model be developed by the end of 2005 and be used as part of the stock assessment process from 2006.	Complete	June 2006
4*	PIRSA, within 12 months, to more accurately quantify the extent of recruitment, indigenous and illegal catch, and to take into account of all removals, including aquaculture broodstock, in the stock assessment process and the determination of the annual TACC.	Substantial	Mid to late 2009
5	PIRSA, within 2 years, to develop and implement enhanced fishery-independent research and monitoring programs for greenlip and blacklip abalone in the Central and Western Zones, representative of species distribution and catch across these zones of the fishery, to improve the understanding of the stock status in these zones and support the development of more refined stock assessments and models.	Complete	June 2006
6	PIRSA, within 2 years, to further develop biological sampling programs, representative of species distribution and catch across all zones of the fishery, to provide the necessary data to inform the range of biological performance measures in the Management Plan for the South Australian Abalone Fishery and support the development of more refined stock assessment models.	Substantial	June 2007
7	PIRSA to investigate and establish, over the next 3 years, appropriate decision rules or strategies, relevant to the regional or area scale management as required, to prevent serial depletion of blacklip and greenlip abalone stocks in all zones of the fishery.	Substantial	June 2007
8	PIRSA to continue to work with other jurisdictions to develop effective strategies and response measures to quantify and reduce the extent of illegal take of abalone in South Australia.		Ongoing
9	PIRSA to develop within 18 months recovery strategies that can be applied to areas assessed as below key reference points or levels for stock abundance and recruitment. The recovery strategies should include preliminary recovery targets and monitoring arrangements, appropriate to the scale of fishing in the area, and associated timeframes	Complete	June 2006
10*	PIRSA, within 12 months, to develop options for the recording and reporting of protected species interactions in the fishery.	Complete	2007
11	PIRSA to give priority to developing environmental indicators that can be reported against in future Stock Assessment Reports	Substantial	June 2009

Table 5 Proposed strategies, target dates and actions employed to achieve the eleven recommendations of DEWHA for the South Australian Abalone Fishery.

No	Proposed Strategies	Actions	Target Date
1	<ul style="list-style-type: none"> • PIRSA Fisheries, SARDI Aquatic Sciences and the Abalone Council of Australia (ACA) to develop a FRDC proposal to assist development of performance indicators. • PIRSA and SARDI to engage other abalone producing States to ensure jurisdictional support for the project. • The ACA to investigate options to fund a national workshop to progress the project. 	National workshop held September 2007 to develop an agreed R & D program that will result in the implementation of a national performance based harvest management system for abalone fisheries.	Ongoing
2	<ul style="list-style-type: none"> • PIRSA Fisheries to provide DEWHA with an annual report to highlight the changes in management relevant to the assessed fisheries. 	Reports produced yearly	Ongoing
3	<ul style="list-style-type: none"> • SARDI to develop a stock assessment model for greenlip and blacklip abalone using the national abalone model developed in the FRDC project. 	SARDI has applied the model for both Southern Zone and Western Zone assessments.	June 2006
4	<ul style="list-style-type: none"> • Include estimates of all removals into stock assessment process and TACC determination. • Conduct recreational and indigenous fishing survey. • Track broodstock collection exemptions. • Estimate the allocation between the recreational and commercial sectors 	<p>SARDI is taking all available estimates into account during stock assessments.</p> <p>Special operations group (PIRSA Fisheries Compliance) conduct several operations per year targeting organised illegal activity based on intelligence reports.</p> <p>PIRSA is currently undertaking the recreational fishing survey, which will be included in the fishery stock status.</p>	Mid to late 2009
5	<ul style="list-style-type: none"> • SARDI to refine and expand fishery-independent sampling programs to address priority areas in the CZ and WZ abalone fisheries. • SARDI to develop and refine 	SARDI continues the implementation of independent blacklip surveys in CZ & WZ. SARDI has ongoing monitoring programs for greenlip abalone and independent surveys in CZ & WZ.	June 2006

	<p>sampling methods for blacklip abalone stocks.</p> <ul style="list-style-type: none"> • SARDI to continue to gather biological data for abalone populations with a particular focus on poorly understood blacklip abalone stocks across all zones and greenlip abalone in the lightly fished areas of the western zone. 	<p>Fishery-independent survey methods (leaded line technique) for estimating the change in abundance in blacklip abalone before and after fishing were tested in Waterloo Bay in June 2007. Catch and effort and biological information was also collected to allow the evaluation of the development of new performance indicators for the fishery.</p>	
6	<ul style="list-style-type: none"> • SARDI to identify priority areas that require further biological information to be collected and analysed in stock assessment. • SARDI to develop a strategy to collect biological information that is more representative of spatial scale of the fishery. 	<p>SARDI is collecting biological information on both species across all zones.</p> <p>SARDI has completed FRDC project ‘2004/019: <i>Towards optimising the spatial scale of abalone fishery management.</i>’ The project focussed on (1) developing a simple, practical and cost-effective tool to discriminate among, and estimate key life-history parameters of, blacklip abalone (<i>Haliotis rubra</i>; hereafter referred to as blacklip) stocks; (2) identifying potential Management Units (MUs) and their associated life-history characteristics; and (3) outlining an initial framework, including consideration of population genetics, fisheries compliance and stock-assessment modelling, for MU implementation.</p>	Complete 2007
7	<p>PIRSA Fisheries and SARDI to develop spatial management strategies for each zone of the fishery that incorporate appropriate harvest decision rules.</p> <p>SARDI complete fine scale management strategy FRDC project.</p> <p>PIRSA and SARDI to participate in the national FRDC project designed to promote participative reef scale management (Melbourne Uni:</p>	<p>National workshop held September 2007 to develop an agreed R & D program that will result in the implementation of a national performance based harvest management system for abalone fisheries.</p> <p>Voluntary measures introduced to limit catches at finer spatial scales within all three zones.</p> <p>The newly established Abalone Management SA Ltd (AMSA) to begin preparation of a new Management Plan under the new Act, a key component of which is</p>	June 2007

	<p>R. Day and J. Prince).</p> <p>SARDI to progress the development of predictive capacity in the stock assessment models to inform the development of harvest decision rules.</p> <p>AMSA in conjunction with the Fisheries Council will progress discussions on setting stock limits and targets.</p> <p>AMSA in conjunction with the Fisheries Council will undertake an annual review of the PI's for the fishery.</p>	<p>to review the performance indicators and develop harvest strategies (incl. decision rules) for different spatial scales.</p>	
8	<p>PIRSA Fisheries to undertake collaborative compliance activities.</p> <p>PIRSA Fisheries to continue to refine estimates of the illegal catch.</p> <p>PIRSA Fisheries to continue to participate in National forums to address organised illegal activity in Australian abalone fisheries.</p> <p>PIRSA implement National Docketing System (NDS) and updated penalties and other compliance provisions in the Fisheries Act.</p>	<p>Higher penalties for illegal activity are in place under the new Act.</p> <p><i>The Fisheries Act 2007</i> includes provisions to implement NDS.</p> <p>The special operations group (PIRSA Fisheries Compliance) conduct several operations per year targeting organised illegal activity based on intelligence reports to regulate and deter illegal fishing.</p>	Ongoing
9	<p>SARDI to undertake annual stock assessment.</p> <p>Apply precautionary TACC reductions for species within zones that exhibit undesirable levels of fishing pressure.</p> <p>Augment the TACC setting process by encouraging processes that enable precautionary changes of legal minimum size and regional catch limits to facilitate recovery</p>	<p>The stock assessment process has identified regions exhibiting undesirable levels of fishing pressure.</p> <p>Reductions in TACC implemented in the Central Zone blacklip fishery.</p> <p>Spatial allocation of TACC implemented in all zones, by way of nominal catch limits.</p> <p>AMSA to begin preparation of a new Management Plan under the new Act, a key component of which is to review the</p>	Complete 2006

	of local populations exhibiting undesirable levels of fishing pressure.	performance indicators and develop harvest strategies for different spatial scales. The harvest strategies will also establish reference points and recovery strategies through the development of appropriate decision rules.	
10	PIRSA to develop options for the recording and reporting of protected species interactions in the fishery.	Wildlife interactions log book implemented for all South Australian Fisheries.	Complete 2007
11	PIRSA, AMSA and SARDI to prepare a funding proposal to develop ecological indicators for abalone and rock lobster fisheries. PIRSA to conduct a risk assessment for the abalone fishery to identify ecological risks imposed by abalone fishing.	Several funding proposals have been developed and submitted to the SAFRAB for consideration. These proposals have not been supported.	June 2009

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12 Attachments³

1. Nobes, M., Casement, D. & Mayfield, S. (2004). Management plan for the South Australian Abalone Fishery. South Australian Fisheries Management Series No. 42. 47pp.
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7. PIRSA Disease Response Plan: Abalone viral ganglioneuritis
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³ Attachments can be accessed from the PIRSA website at http://www.pir.sa.gov.au/fisheries/commercial_fishing/abalone_fishery