

# PIRSA

## **Ecologically sustainable development (ESD) risk assessment of the South Australian Abalone Fishery**

2021



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# Introduction

This report provides the outcomes of a review of the 2009 Ecologically Sustainable Development (ESD) risk assessment of the South Australian Commercial Abalone Fishery.

ESD principles are the basis of fisheries and aquatic resource management in South Australia. ESD in the Act is described as — “*the use, conservation, development and enhancement of the aquatic resources of the State in a way, and at a rate, that will enable people and communities to provide for their economic, social and physical well-being*”. To efficiently meet its ESD accountabilities, PIRSA Fisheries has adopted the National ESD Reporting Framework for Fisheries (Fletcher et al. 2002).

A ten-year Management Plan for the South Australian Abalone Fishery was approved and adopted in 2012 by the then Minister for Agriculture, Food and Fisheries (PIRSA 2012). An ESD risk assessment was carried out in May 2009 to inform the development of this management plan (PIRSA 2009).

Under section 49 of *the Fisheries Management Act 2007*, a mid-term review required to be conducted as soon as practicable after the fifth anniversary of the commencement of the plan.

A review of the ESD risk assessment is considered an important step in reviewing the management plan to objectively assess if risk rankings have changed over the duration of the management plan. A revised risk assessment will also provide important information for development of a revised management plan if one is required.

## Background

The South Australian Abalone Fishery targets blacklip (*Haliotis rubra*) and greenlip (*H. laevigata*) abalone. Other abalone species such as *H. roei* can also be taken, however as these other species rarely reach the maximum legal size, the take of these other species is negligible.

The fishery contributed approximately \$51.3 M to South Australia’s Gross State Product in 2017-18 of which \$21.6 M came from fishing directly. The fishery generates around 312 full time equivalent jobs, many of which are in regional areas of the State.

The commercial fishery began in the mid 1960s with the number of entrants in the commercial fishery soon exceeding 100. In 1971, licences were made non-transferable and the fishery was divided into three separate fishery management zones, in recognition of the significant differences in geological and ecological character between the western, central and southern borders of the South Australian coast. These fishery management zones are constituted as the Western, Central and Southern Zone Abalone fisheries, and are still in operation today (Figure 1). Licences became transferable in 1980 at which time 35 licences were in operation.

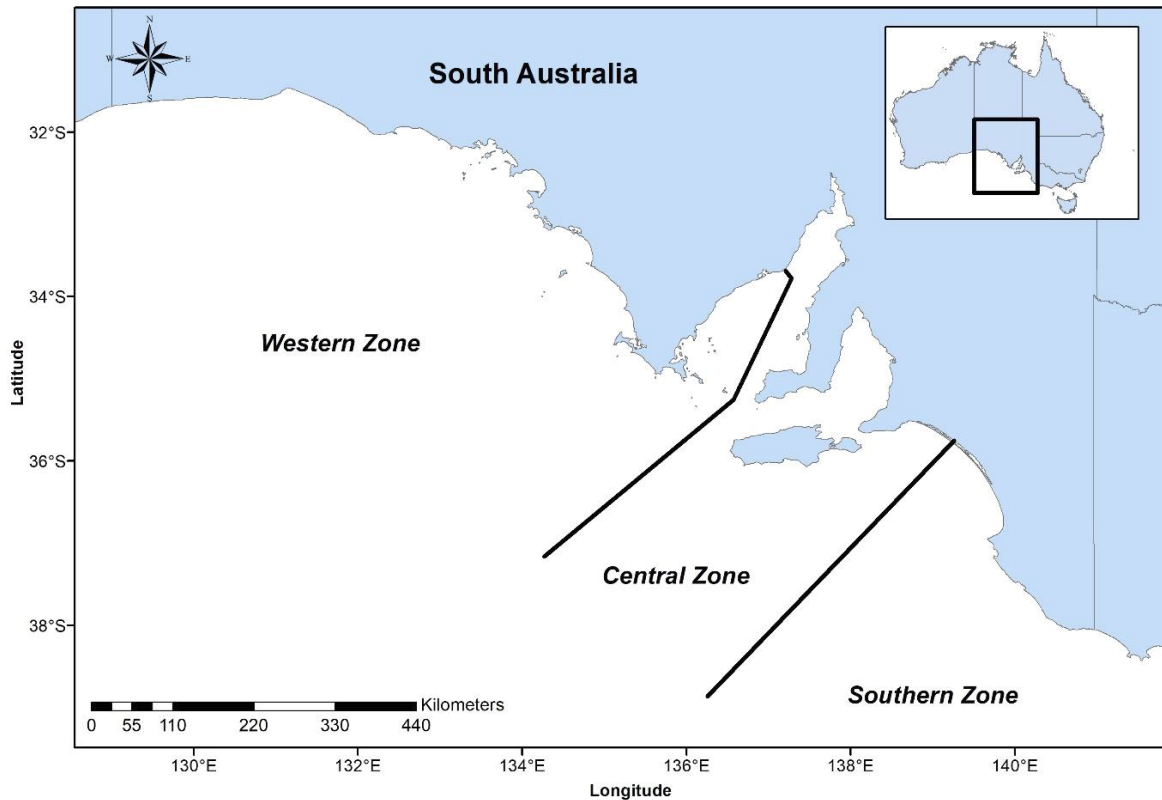


Figure 1: Area of the Commercial South Australian Abalone Fishery showing fishing zones.

Regulatory arrangements for the South Australian commercial Abalone Fishery are contained within the *Fisheries Management (Abalone Fisheries) Regulations 2017* and *Fisheries Management (General) Regulations 2017*. One of the main tools used to manage the abalone resource is a quota management system. This system requires a Total Allowable Commercial Catch limit to be set every year in each management zone for both target species. Minimum legal size limits, and other input and output controls are also in place to maintain sustainable fish stocks.

## Methods

The scope of this ESD Risk Assessment includes:

1. Commercial fishing in the South Australian Abalone Fishery under normal fishing practices in the area of the fishery.
2. Assessment of potential impacts of or on the fishery in the next five years

The process for the review of the current risk assessment was:

1. Collated new documented information related to all risks components included in the 2009 risk assessment report that had become available since the last risk assessment.

2. Conducted workshop of stakeholders<sup>1</sup> on 7 August 2019 to:
  - a. Identify risk components that were relevant to the new information and determine if the new information would significantly change the risk ranking.
  - b. Complete risk assessments of the identified risk components based on the likelihood and consequence of events described in PIRSA (2009) using consequence and likelihood matrix provided in Table 2 in Appendix 1.
  - c. For those risks for which no new information is available, or the available information was not significant, the risk rating from the 2009 risk assessment was adopted.
3. Risks were prioritised according to their severity detailing the information considered and the reasons (information used, or adoption of previous risk rating) in assigning risk.
4. For higher level risks a full ESD performance report in the context of specific management objectives was prepared. This includes operational objectives, indicators, data required and performance measures.
5. This detailed fishery-specific background report was also prepared.

It was agreed at the workshop that a simpler Consequence x Likelihood risk matrix would be used in this risk assessment compared to that used in the 2009 assessment. This simpler risk matrix is modified from Fletcher et al. (2011) and Fletcher (2015). In this assessment, it was agreed that the overall risk rating for a score of Major consequence (C4) and Possible likelihood (C3) would be considered as High, rather than Severe.

Where it was agreed in this assessment that the previous risk rating from the 2009 assessment be adopted, this rating was converted using the simpler matrix (in Table 2 in Appendix 1).

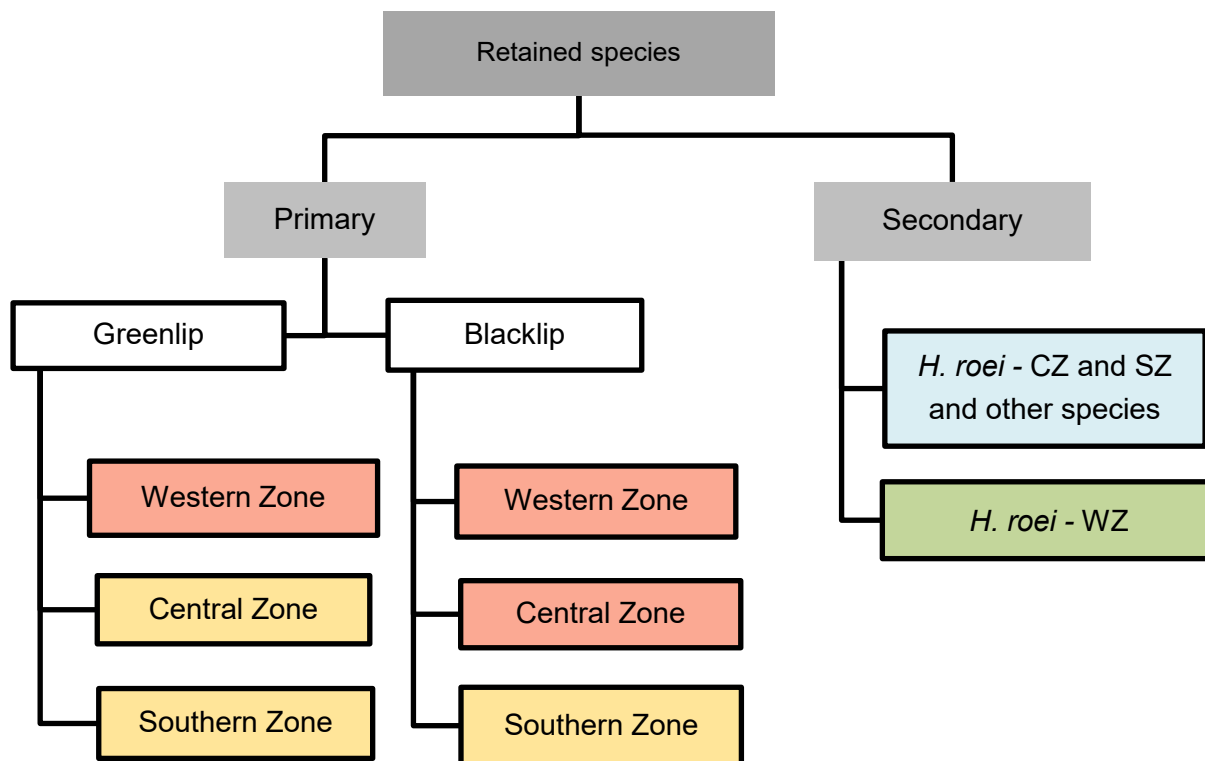
Further detail of the general ESD Risk Assessment methodology can be found in the 2009 risk assessment for the fishery (PIRSA 2009).

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<sup>1</sup> A list of participants at the workshop/s are provided at Appendix 2

# Performance reports

## Retained species



### **Primary Species**

Objective - Ensure the abalone resource is harvested within ecologically sustainable limits.

The latest fishing information and stock status published in the following SARDI reports were taken into consideration.

- Central Zone Greenlip Abalone (*Haliotis laevigata*) and Blacklip Abalone (*H. rubra*) Fishery in 2017. Burnell et al (2018).
- Status of the Southern Zone Blacklip (*Haliotis rubra*) and Greenlip (*H. laevigata*) Abalone Fisheries in 2016/17. Ferguson et al (2018)
- Western Zone Greenlip Abalone (*Haliotis laevigata*) and Blacklip Abalone (*H. rubra*) Fisheries in 2017. Stobart et al (2018)

### **Greenlip**

Western Zone - Greenlip stock is currently classified as depleted (Stobart et al. 2018). Changes to fishing season and temporal management were discussed and taken into account. Given the current stock as depleted indicates that the level of depletion is

unacceptable but not as yet affecting recruitment levels (Consequence level **High – C3**). It was noted that the likelihood of this consequence was dependant on the effectiveness of the new harvest strategy that was anticipated to be implemented within the risk assessment scope. The likelihood that the High consequence would be realised was considered to be **Possible (L3)**. The risk rating was therefore **High**.

Central Zone – Greenlip stock is currently classified as sustainable. Stable total catch and stable catch rates have been recorded over some years. It was noted that the spatial complexity and some inconsistency in performance indicators makes determination of stock status challenging, however most of the evidence suggests stocks are stable or improving (Burnell et al. 2018).

Considered that stock was at maximum level of exploitation and this was likely to continue into the future. **Moderate (C2)** consequence on the population and that this is **likely (L4)** to continue into the future. Risk rating **Medium**.

Southern Zone – It was noted that catch of Greenlip in the Southern Zone is low compared to Blacklip in that zone comprising on around 3% of the total commercial harvest. The low catch and limited data on Greenlip in the Southern Zone prevents reliable determination of stock status and it is therefore defined as Undefined. In 2016/17 catch reduced to only 3.2 tonnes (Ferguson et al. 2018).

Given the small catch of this species it was considered that the stock was at worst at maximum level of exploitation and this was likely to continue into the future. **Moderate (C2)** consequence on the population and that this is **likely (L4)** to continue into the future. Risk rating **Medium**.

## **Black lip**

Western Zone – There is evidence of ongoing declines in harvestable biomass of Blacklip stocks in the Western Zone which is now at its lowest level since 1979. The stock is currently classified as depleting and that the current fishing mortality is likely to cause the stock to become recruitment impaired (Stobart et al. 2018).

It was considered that the level of depletion is unacceptable but not affecting recruitment levels as yet (Consequence level **High – C3**). It was noted that the likelihood of this consequence was dependant on the effectiveness of the new harvest strategy that was anticipated to be implemented within the risk assessment scope. The likelihood that the High consequence would be realised was considered to be **Likely (L4)**. The risk rating was therefore **High**. This risk rating took into account the co-management arrangements implemented voluntarily by the industry and the current harvest strategy.

Central Zone – Blacklip in the Central zone comprised 12% of the combined TACC in 2017. Evidence suggests that the stock in the central zone is in a weak position and is currently classified as depleted (Burnell et al. 2018). It was noted that in 2018, the industry voluntarily closed the Blacklip harvest in the Central Zone and the TACC was set at zero. However, in 2019, under co-management arrangements a TACC for Blacklip was provided to allow for collection of fishery-dependent data to inform stock assessment and monitoring of the stock.

The risk rating took into account the strategies in place to address the current depletion of the stock, including co-management arrangements and the current harvest strategy. Given this information, it was considered that the consequence was **Major (C4)** as recruitment has, or is likely to be impacted. Given the management arrangements in place, it is considered the likelihood of this consequence was **Possible (L3)**. Risk Rating **High**.

Southern Zone – the level of TACC in 2016/17 was considered to have stabilised a decline in stock observed from 2010/11 to 2015/16. The biomass is considered to be at a level sufficient to ensure that on average future levels of recruitment are adequate. The fishery is currently classified as sustainable (Ferguson et al. 2018).

Considered that stock was at maximum level of exploitation and this was likely to continue into the future. **Moderate (C2)** consequence on the population and that this is **Possible (L3)**. Risk rating **Medium**.

### **Secondary Species**

Due to the selective nature of fishing in the Abalone fishery the by-product in this fishery is very limited. In addition, as many of the secondary species of abalone do not reach the current minimum legal size limits set in the fishery regulations, take of species other than Blacklip and Greenlip is highly restricted.

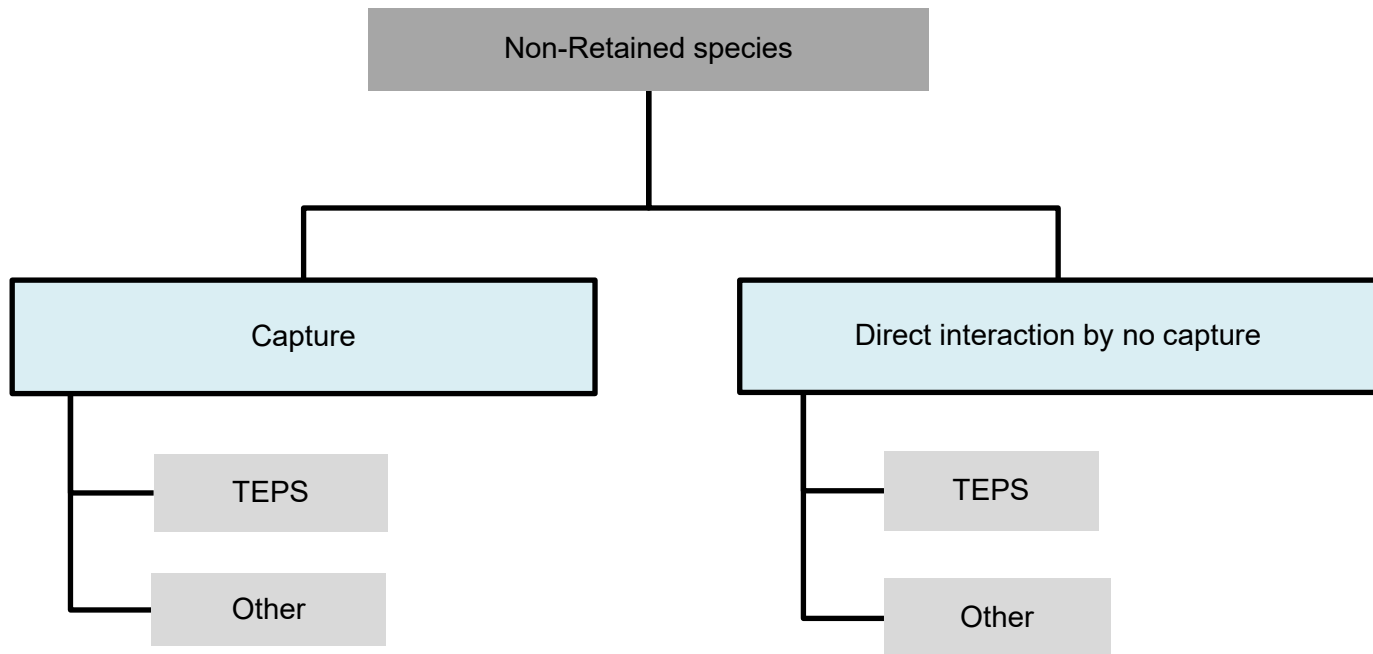
### **Roe's Abalone**

In recent years, there has been some harvest of Roe's Abalone (*H. roei*) through a reduction in the size limit allowing for harvest of Roe's Abalone in the Western Zone. This arrangement provides fishery-dependent data to inform consideration of future management arrangements for sustainable commercial harvest of this species. The management arrangements applied limits total catch of Roe's Abalone. Total catch of this species has been below the TACC set for this species. While the information available on this species is limited and a stock status can't be assessed it is considered that catch is within sustainable levels and not likely to impact on recruitment (**Moderate C2**), and the likelihood of this continuing in light of the current management arrangements was **Possible (L3)**. Risk rating **Low**.

Given the negligible harvest for other secondary species of *H. cyclobates* and *H. scalaris*, and for Roe's Abalone in the Central and Southern zones, the risk rating for these species was considered to be **Negligible**.



## Non-retained species

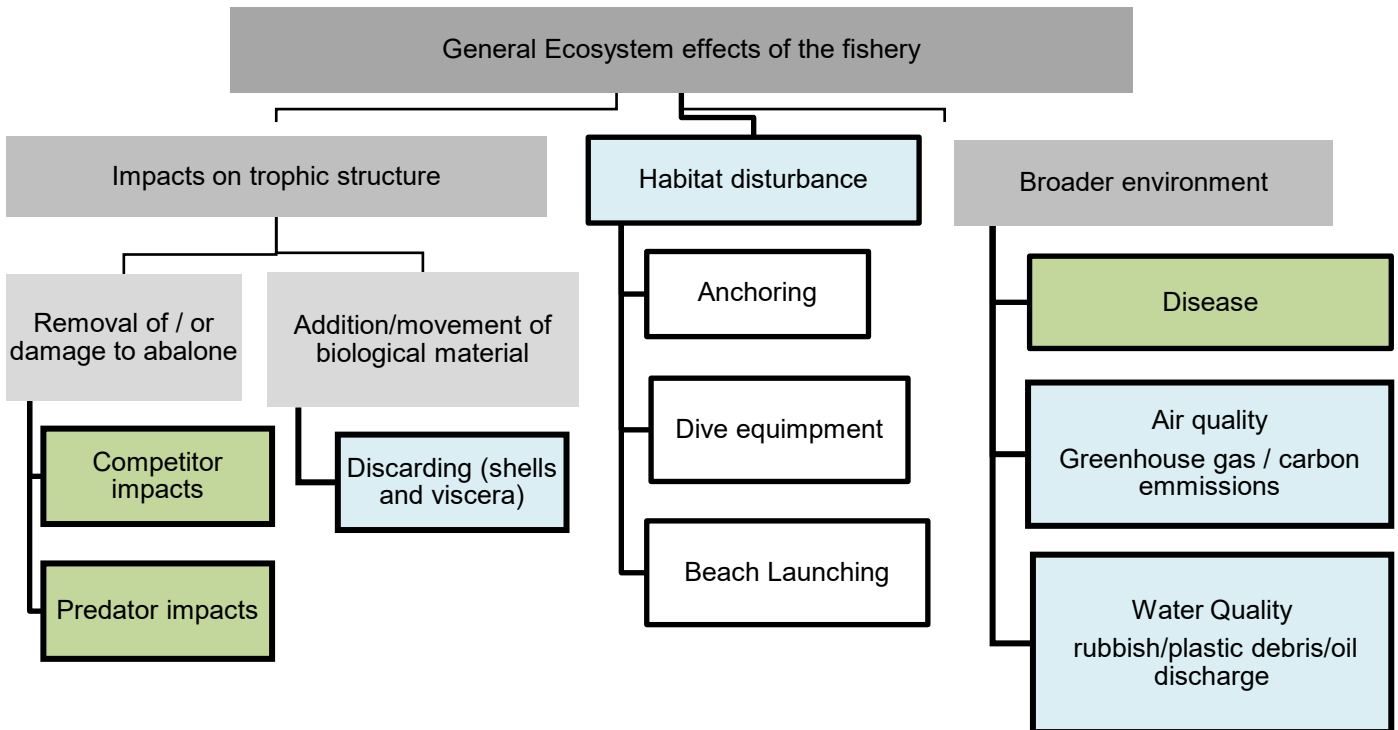


The South Australian Abalone Fishery is a selective fishery, using hand-collection of abalone. Because of this, by-catch is limited to the unavoidable removal of encrusting and boring organisms such as limpets and algae that use the shell of the abalone as habitat.

This view is supported by annual reports summarising interactions with wildlife in Wildlife Interaction Logbooks (Mackay 2018). The latest report noted that the only reported interactions with TEPS species in the Abalone Fishery were sightings of White Shark by divers (Mackay 2018). These reported interactions would have no impact on the shark population. No interactions with any other species were reported.

Risk rating **Negligible** for all components.

# General ecosystem impacts of fishing



## Commercial Fishing (removal of or damage to abalone)

Abalone are one of many herbivorous algae consumers that exist on the rocky reefs of South Australia (Shepherd 2008). The total tonnage of abalone removed by the fishery is relatively small compared to overall size of abalone stocks throughout southern Australia.

It was therefore considered that the South Australian Abalone Fishery could have a **minor (C1)** impact on grazing competitors, but the likelihood of this occurring was considered **possible (L3)** given the management controls in place. Risk rating **LOW**.

The South Australian Abalone Fishery could have a **moderate (C2)** impact on predators, and the likelihood of this occurring was considered **Unlikely (L2)** given the management controls in place. Risk rating **LOW**.

## Discarding of shells and viscera

The discarding of shells has been reduced since the 2009 assessment due to higher amounts of abalone being sold as whole in shell. It is therefore considered that the risk would not be worse than the previous risk ranking of **Negligible**.

## Habitat disturbance

It was considered that fishing operations had not changed substantially since the 2009 assessment with regard to the gear used (boats, cages, beach launching) and it was agreed that the previous risk rating would be retained. Risk rating **Negligible**.

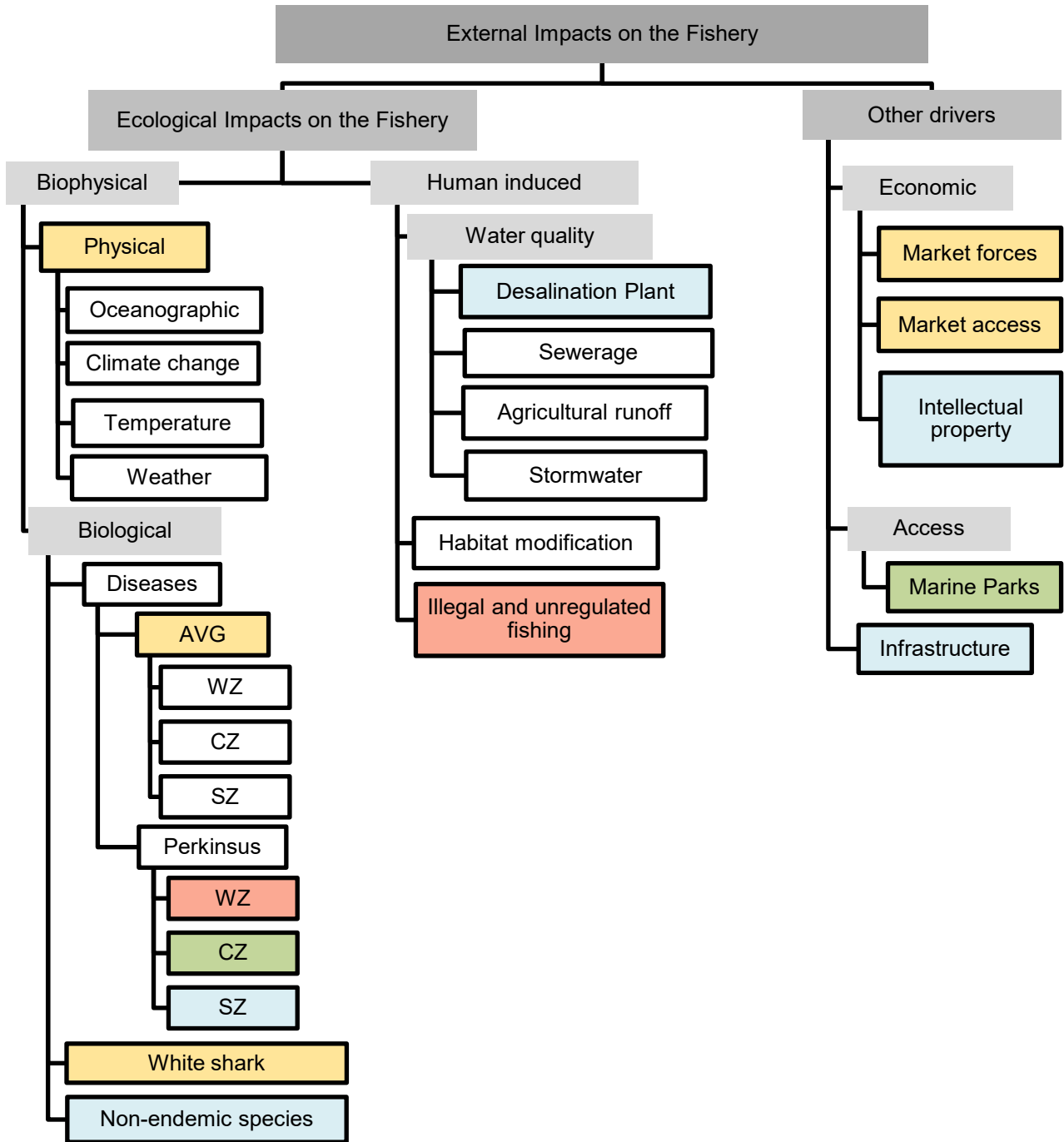
### Air and water quality

Due to improvements in technology of engines used in the industry it is considered that emissions would have decreased in the period from the previous assessment in 2009. Therefore, considered the risk would not be greater than that from the previous assessment of **Negligible**.

Disease – The introduction, or spread of a disease such as AVG by the fishery and the potential impact on the ecosystem was considered in this component. It was noted that changes in diver behaviour had reduced significantly the biosecurity risk related to the abalone fishery. It was therefore considered that risk would be not higher than the previous risk assessment (2009) of Low.

The impacts on the general ecosystem by disease transferred by the abalone fishery were considered to have a **Moderate (C2)** consequence and the likelihood of this outcome was be **Unlikely (L2)**. Risk rating **LOW**.

# External impacts on the fishery



It was noted that there is limited new information to inform risk assessment of biophysical impacts on the fishery.

## **Ecological impacts**

### **Biophysical impacts**

Given the unpredictable nature of environmental perturbations that could impact on the fishery, it was considered that physical ecological impacts were **Possible (L3)** to have a **Moderate (C2)** consequence on the fishery over the next 5 years. Risk rating **Medium**.

### **AVG**

AVG was considered following the impact of the disease on the Victorian Fishery some years ago. It was noted that the disease was not detected in South Australia, and management arrangements to mitigate the introduction or spread of AVG in South Australia are in place.

The impact of AVG on the performance of the fishery in all three zones was considered to be having a **High (C3)** consequence on the fishery but was **Unlikely (L2)** to occur with the current management arrangements in place. Risk rating **Medium**.

### **Perkinsus**

Perkinsus was most prevalent in the Western Zone and considered to be exacerbated by warming water temperatures. It was noted that recently there had been some impact on Greenlip in the Central Zone and Blacklip in the Western Zone. The risk rating related to Perkinsus considered the current management arrangements related to shucking in some areas that aim to reduce the spread of the disease.

In the Western Zone where the impact of this disease is considered to be highest, the consequence of this disease was considered to be **High (C3)** and was **Possible (L3)**. Risk rating **High**.

In the Central Zone the consequence of this disease was considered to be **Moderate (C2)** and **Unlikely (L2)**. Risk rating **Low**.

In the Southern Zone the risk from Perkinsus was considered to have remained the same as the previous risk assessment, that is **Negligible**.

### **White Shark**

White shark in this risk assessment was related to the risk of White Shark interactions on the wellbeing of Abalone divers. It was noted that many of the interactions reported from the Abalone Fishery in the Wildlife Interaction logbooks were related to sightings of White Sharks by Abalone divers operating in the industry.

White sharks were considered to potentially have a **Moderate (C2)** consequence on the Abalone Fishery but the likelihood of this consequence was **Possible (L3)**. Risk rating **Medium**.

## **Non-endemic species**

This risk component was mainly related to impact of non-endemic species for example sea urchins barrens forming following influx of non-endemic sea urchin species. Sea urchin barrens have developed on the east coast of Tasmania and had significant impacts on the Abalone fishery in that area.

Non-endemic species were considered to potentially have a **High (C3)** consequence on the Abalone Fishery but the likelihood of this consequence was **Remote (L1)** in the next five years. Risk rating **Negligible**.

## **Human induced impacts**

### **Desalination plant.**

It was considered that desalination plans could have a negligible consequence on the fishery. Risk rating **Negligible**.

### **Illegal and unregulated fishing**

This was a new element considered in this ESD risk assessment and was related to poaching. While it was recognised that the absolute levels of removals of Abalone through illegal and unregulated fishing was not fully known that the risk of these activities on the fishery should be considered.

It was considered that illegal and unregulated fishing could have a **High (C3)** consequence on the Abalone Fishery and was **Possible (L3)** that this could occur in the next five years. Risk rating **High**.

## **Other drivers**

### **Market forces and Market access**

The industry participants noted that the industry had little influence on the price paid to them for Abalone and that beach price was mainly influenced by the market in China. It was considered that Chinese/American trade relationship could have an impact on the fishery.

It was considered that market forces and access could have a **Moderate (C2)** consequence on the fishery and was **Possible (L3)** in the next five years. Risk rating **Medium**.

### **Intellectual Property**

Intellectual property was a new category added to this risk assessment and was related to integrity of electronic data as the fishery transfers to electronic monitoring.

It was considered that intellectual property could have a **Major (C4)** consequence on the fishery but this consequence was **Remote (L1)**. Risk rating **Negligible**.

### **Marine park access**

The impacts of marine parks sanctuary zone implementation over the next five years were taken into consideration. It was considered that there had been no change to the risk rating for Marine Parks from the last assessment.

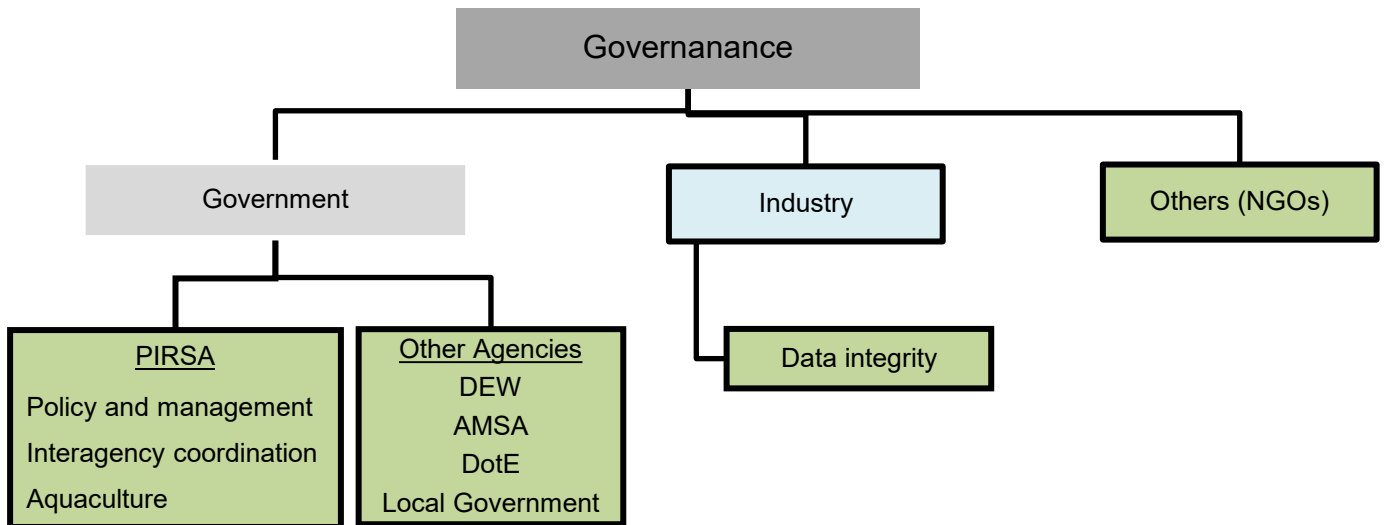
**Minor (C1)** consequence on the fishery and was **likely (L4)** to occur in the next five years. Risk rating **LOW**.

### **Infrastructure**

The availability and maintenance of infrastructure such as boat ramps can impact on the operation of the fishery.

It was considered that infrastructure could have a **Moderate (C2)** consequence on the fishery and this consequence was **Remote (L1)**. Risk rating **Negligible**.

# Governance



The workshop participants requested simplification to this component tree where possible as reflected in the figure above.

Governance arrangements related to PIRSA policy and management, interagency coordination and aquaculture were considered to have a **Minor (C1)** consequence to the fishery and this was **Possible (L3)**. Risk rating **Low**.

Other government agencies were considered to have a **Minor (C1)** consequence to the fishery and this was **Possible (L3)**. Risk rating **Low**.

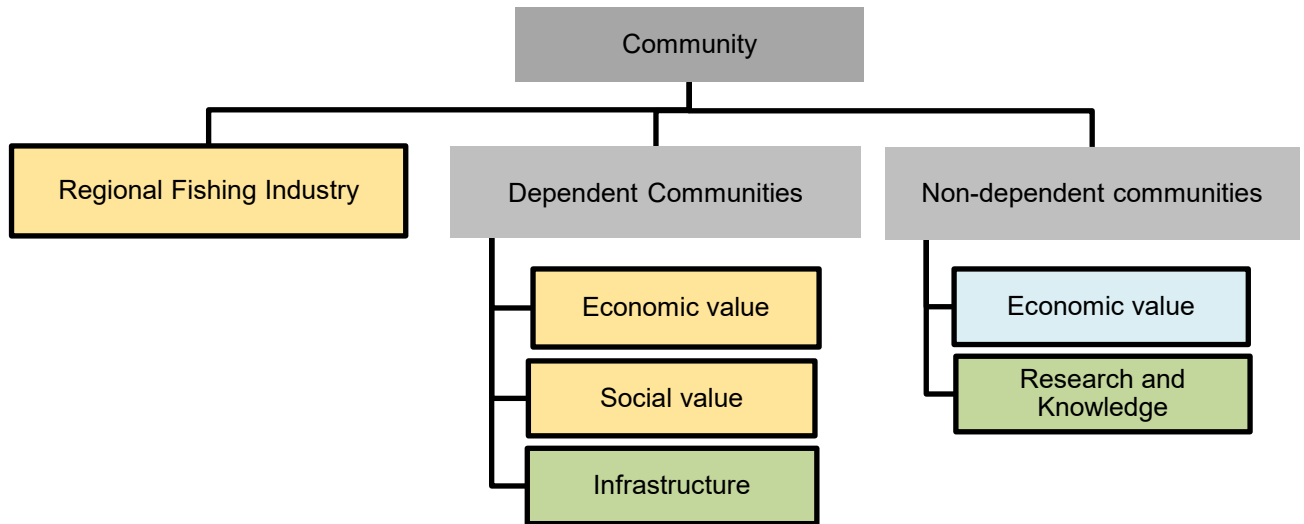
Governance arrangements related to the industry were considered to have a Negligible impact on the fishery. Risk rating **Negligible**.

Data integrity related to the Industry was considered to have potentially have a **Major (C4)** consequence on the fishery however, the likelihood of this consequence was **Remote (L1)**. Risk rating **Low**.

Other agencies (NGOs) were considered to have a **Minor (C1)** consequence to the fishery and this was **Possible (L3)**. Risk rating **Low**.



# Community



The workshop participants requested simplification to this component tree where possible as reflected in the figure above.

The fishery was considered to have a **Moderate (C2)** consequence on the fishing industry community in regional areas and the likelihood of this consequence was **Possible (L3)**. Risk rating **Medium**.

The fishery was considered to have a **Moderate (C2)** consequence to the economic and social value of dependent communities and this was **Likely (L4)**. Risk rating **Medium**.

The fishery was considered to have a **Minor (C1)** consequence on infrastructure available to dependent communities and this was **Likely (L4)**. Risk rating **Low**.

The impact of the fishery on economic value of non-dependent communities was considered to **negligible**.

The impact of the fishery on research and knowledge about Abalone in South Australia was considered in light of the contribution that fishery makes to the knowledge about Abalone stocks through the research and monitoring program. The impact of these activities were considered to have a **Minor (C1)** consequence and this was **Possible (L3)**. Risk rating **Low**.

# Risk Evaluation

A total of 42 issues associated with the South Australian Abalone Fishery were scored for risk across six component trees: retained species, non-retained species, general ecosystem, external factors, community wellbeing and governance. The majority of issues were evaluated as medium, low or negligible risk (Table 1). The majority of issues were identified in the External Factors component tree.

*Table 1: Summary of ESD Risk outcomes for Abalone Fishery*

<b>Component Trees</b>	<b>Severe</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Negligible</b>	<b>Total</b>
Retained Species		3	3	1	1	8
Non-retained species					2	2
General Ecosystem				3	4	7
External Factors		2	5	2	5	14
Governance				4	1	5
Community			3	2	1	6
<b>Total</b>		<b>5</b>	<b>11</b>	<b>12</b>	<b>14</b>	<b>42</b>

# References

Burnell, O., Mayfield, S., and Bailleul, F. (2018). Central Zone Green lip Abalone (*Haliotis laevis*) and Blacklip Abalone (*H. rubra*) Fishery in 2017. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2007/000611-9. SARDI Research Report Series No. 1003. 77pp.

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[https://pir.sa.gov.au/\\_data/assets/pdf\\_file/0005/333149/Operational\\_Interactions\\_with\\_Threatened\\_Endangered\\_or\\_Protected\\_Species\\_in\\_South\\_Australian\\_Managed\\_Fisheries\\_Data\\_Summary\\_200708\\_-\\_201617.pdf](https://pir.sa.gov.au/_data/assets/pdf_file/0005/333149/Operational_Interactions_with_Threatened_Endangered_or_Protected_Species_in_South_Australian_Managed_Fisheries_Data_Summary_200708_-_201617.pdf)

Stobart, B., Mayfield, S. and Heldt, K. (2018). Western Zone Greenlip Abalone (*Haliotis laevis*) and Blacklip Abalone (*H. rubra*) Fisheries in 2017. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2017/000331-2. SARDI Research Report Series No. 994. 101pp.

# Appendix 1: Risk matrix

Table 2: Risk Matrix

Consequence × Likelihood Risk Matrix		Likelihood			
		Remote (1)	Unlikely (2)	Possible (3)	Likely (4)
Consequence	Minor (1)	Negligible	Negligible	Low	Low
	Moderate (2)	Negligible	Low	Medium	Medium
	High (3)	Low	Medium	High	High
	Major (4)	Low	Medium	High	Severe

## Likelihood levels

These are defined as the likelihood of a particular consequence level actually occurring within the assessment period.

1	Remote	The consequence has never been heard of in these circumstances, but it is not impossible within the timeframe (Probability <5%).
2	Unlikely	The consequence is not expected to occur in the timeframe but it has been known to occur elsewhere under special circumstances (Probability 5 - <20%).
3	Possible	Evidence to suggest this consequence level is possible and may occur in some circumstances within the timeframe (Probability 20 - <50%).
4	Likely	A particular consequence level is expected to occur in the timeframe (Probability ≥50%).

## Consequence Levels

Note that if an issue is not considered to have any measurable impact, it is considered to be a 0 (Negligible) consequence.

Generic		
1	Minor	Measurable but minimal impacts that are highly acceptable and easily meet objective.
2	Moderate	Maximum acceptable level of impact that would still meet the objective.
3	High	Above acceptable level of impact. Broad and/or long-term negative effects on objective which may no longer be met. Restoration can be achieved within a short to moderate time frame.
4	Major	Well above acceptable level of impact. Very serious effects on objective which is clearly not being met and may require a long restoration time or may not be possible.

<b>1. Ecological: Target/Retained Species</b>		
1	Minor	Fishing impacts either not detectable against background variability for this population; or if detectable, minimal impact on population size and none on dynamics. Spawning biomass > Target level
2	Moderate	Fishery operating at maximum acceptable level of depletion. Spawning biomass < Target level but > Threshold level ( $B_{MSY}$ )
3	High	Level of depletion unacceptable but still not affecting recruitment levels of stock. Spawning biomass < Threshold level ( $B_{MSY}$ ) but > Limit level ( $B_{REC}$ )
4	Major	Level of depletion is already affecting (or will definitely affect) future recruitment potential of the stock. Spawning biomass < Limit level ( $B_{REC}$ )

<b>2. Ecological: Non-Retained (Bycatch) Species</b>		
1	Minor	Species assessed elsewhere and/or take is very small and area of capture small compared with known distribution (< 20%).
2	Moderate	Relative area of, or susceptibility to, capture is < 50% and species do not have a vulnerable life history.
3	High	N/A - Once a consequence reaches this point, it should be examined using target/retained species table.
4	Major	N/A.

<b>3. Ecological: Threatened, Endangered and Protected Species (TEPS)</b>		
1	Minor	Few individuals directly impacted in most years, level of capture/interaction is well below that which will generate public concern.
2	Moderate	Level of capture is the maximum that will not impact on recovery or cause unacceptable public concern.
3	High	Recovery may be affected and/or some clear, but short-term public concern will be generated.
4	Major	Recover times are clearly being impacted and/or public concern is widespread.

<b>4. Ecological: Habitat</b>		
1	Minor	Measurable impacts but very localized. Area directly affected well below maximum accepted.
2	Moderate	Maximum acceptable level of impact to habitat with no long-term impacts on region-wide habitat dynamics.
3	High	Above acceptable level of loss/impact with region-wide dynamics or related systems may begin to be impacted.
4	Major	Level of habitat loss clearly generating region-wide effects on dynamics and related systems.

<b>5. Ecological: Ecosystem/Environment</b>		
1	Minor	Measurable but minor changes to the environment or ecosystem structure but no measurable change to function.
2	Moderate	Maximum acceptable level of change to the environment or ecosystem structure with no material change in function.
3	High	Ecosystem function altered to an unacceptable level with some function or major components now missing and/or new species are prevalent.
4	Major	Long-term, significant impact with an extreme change to both ecosystem structure and function; different dynamics now occur with different species/groups now the major targets of capture or surveys.

<b>6. Economic</b>		
1	Minor	A small, measurable but temporary impact on the economic pathways for the industry or the community.
2	Moderate	Some level of reduction for a major fishery or a large reduction in a small fishery that the community is not dependent upon.
3	High	Major sector decline and economic generation with clear flow on effects to the community.
4	Major	Permanent and widespread collapse of economic activity for industry and the community including possible debts.

<b>7. Public Reputation &amp; Image</b>		
1	Minor	Low negative impact and news profile.
2	Moderate	Some public embarrassment, moderate news profile and minor ministerial involvement.
3	High	High public embarrassment, high impact and news profile, third-party actions, public and significant ministerial involvement.
4	Major	Extreme public embarrassment, prolonged news coverage, third-party actions/enquiry and government censure.

<b>8. Safety &amp; Health</b>		
1	Minor	First aid only.
2	Moderate	Some minor medical treatment required, visit to doctor's surgery. Less than a week off work.
3	High	Hospitalisation and/or intensive and extended treatment period required for recovery.
4	Major	Serious or extensive injuries, disease, permanent disability or death.

<b>9. Social Amenity &amp; Lifestyle</b>		
1	Minor	Temporary or minor additional stakeholder restrictions or loss of expectations (< 1 year).
2	Moderate	Ongoing restrictions or decrease in expectations.
3	High	Long-term suspension or restriction of expectations in some key activities.
4	Major	Permanent loss of all expectations in key activities.

<b>10. Community (Social Structures &amp; Culture)</b>		
1	Minor	Impacts may be measurable but minimal concerns.
2	Moderate	Clear impacts but no local communities threatened or social dislocations.
3	High	Major impacts at least at a local level, with disruptions now evident.
4	Major	Impacts occurring at a broader (regional) level or severe local impacts.

<b>11. Operational Effectiveness</b>		
1	Minor	Minor delay in achievement of a key deliverable.
2	Moderate	Minor element of one key deliverable unable to be achieved on time.
3	High	Significant delay but achievement of key deliverable.
4	Major	Non-achievement of more than one key deliverable, or major delay to entire strategic directive.

## Appendix 2: Stakeholder workshop

ESD Risk Assessment stakeholder workshop held on 7 August 2019, PIRSA 25 Grenfell St Adelaide.

### Participants

- Annabel Jones – Facilitator
- Jonas Woolford - Western Zone
- Jim Cope – Southern Zone
- Thomas McNab – Central Zone
- Chris Carrison – Southern Zone
- Nicole Hancox – Western Zone Industry
- Simon Bryers – DEW
- James Brooke, Conservation Council of South Australia
- Belinda McGrath-Steer - PIRSA
- Owen Burnell - SARDI
- Ben Stobart - SARDI



# Appendix 3: Risk rating scores

Table 3: Risk rating scores

	Consequence	Likelihood	Risk
<b>Retained species</b>			
Target species			
<u>Greenlip</u>			
• Western Zone	3	3	High
• Central Zone	2	4	Med
• Southern Zone	2	4	Med
<u>Blacklip</u>			
• Western Zone	3	4	High
• Central Zone	4	3	High
• Southern Zone	2	3	Med
Secondary Species			
• Roei Western Zone	2	3	Low
• Roei CZ and SZ and Other species	Negligible		Neg
<b>Non-retained species</b>			
Released	Negligible		Neg
No-capture	Negligible		Neg
<b>General Ecosystem impacts</b>			
<u>Removal/damage of abalone</u>			
• Impact on predators	2	2	Low
• Impact on competitors	1	3	Low
<u>Addition/movement of material</u>			
• Discarding (shells and viscera)	Negligible		Neg
Habitat disturbance	Negligible		Neg
<u>Broader environment</u>			
• Disease	2	2	Low
• Air quality	Negligible		Neg
• Water quality	Negligible		Neg
<b>External factors effecting the fishery</b>			
<u>Physical</u>	2	3	Med
<u>Biological</u> - diseases			
• AVG all zones	3	4	Med
• Perkinsus Western Zone	3	3	High

<b>Perkinsus Central Zone</b>	<b>2</b>	<b>2</b>	<b>Low</b>
• Perkinsus Central Zone			Low
• Perkinsus Southern Zone	Negligible		Neg
White Shark	2	3	Med
Non-endemic species	3	1	Neg
Human-induced impacts			
• Desalination Plant	Negligible		Neg
• Illegal and unregulated Fishing	3	3	High
Other Drivers			
Economic			
• Market Forces	2	3	Med
• Market Access	2	3	Med
• IP - electronic data integrity	4	1	Neg
Access - Marine parks	1	4	Low
Infrastructure	2	1	Neg
<b>Governance</b>			
PIRSA	1	3	Low
Other agencies	1	3	Low
Industry	Negligible		Neg
Data integrity	4	1	Low
Others (NGOs etc.)	1	3	Low
<b>Community</b>			
Regional fishing industry	2	3	Med
Dependent community			
• Economic value	2	4	Med
• Social value	2	4	Med
• Infrastructure	1	4	Low
Non-dependent communities			
• Economic value	Negligible		Neg
• Research and Knowledge	1	3	Low

