

ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD) RISK ASSESSMENT OF THE SOUTH AUSTRALIAN CHARTER BOAT FISHERY

JULY 2010



**Government
of South Australia**

Primary Industries
and Resources SA

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1. INTRODUCTION

Ecologically Sustainable Development (ESD) principles are the basis of fisheries and aquatic resource management in South Australia. Within the South Australian *Fisheries Management Act 2007*, ESD 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*”.

The Fisheries Division of Primary Industries and Resources South Australia (PIRSA) is responsible for fisheries management under the Act and must:

- sustain the potential of aquatic resources of the State to meet the reasonably foreseeable needs of future generations;
- safeguard the life-supporting capacity of the aquatic resources of the State; and
- avoid, remedy or mitigate adverse effects of activities on the aquatic resources of the State.

Similar ESD based management objectives are now widely accepted as the foundation of Australian State and Commonwealth fisheries and environmental management legislation, and ESD principles also underpin key international fisheries treaties and agreements. These include the United Nations Convention on the Law of the Sea (UNCLOS), and the Food and Agriculture Organisation (FAO) Code of Conduct for Responsible Fisheries.

ESD concepts also drive key fisheries aspects of the Australian Government’s overarching *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This legislation requires that all Commonwealth, State and Territory fisheries that export some or all of their catch are assessed against fisheries sustainability criteria before being licensed for export. This EPBC Act assessment process is focussed on the ecological impacts of fishing to ensure that management outcomes avoid overfishing and recover overfished stocks; maintain biodiversity; and minimize adverse impacts on ecosystem structure, function, and productivity.

Achieving strong ESD outcomes for commercial fisheries is a complex balancing act. It requires careful integration of immediate, medium, and long term resource use priorities with the full range of environmental, economic and social considerations facing business and communities. South Australia’s commercial and recreational fisheries are a significant part of the States identity, and are very important both economically and culturally. The commercial wild catch fishing sector has an annual production value of around \$207.5 million and it is estimated that 236,000 South Australians enjoy recreational fishing each year. The viability of these important commercial and recreational activities relies on healthy and productive ecosystems, supported by an efficient regulatory and business framework.

1.1. Fishery Management Plans and ESD Reporting

The *Fisheries Management Act 2007* has been in place since 1 December 2007. Since then, the Fisheries Council of South Australia has been established and is the peak advisory body to the Minister. The primary functions of the Fisheries Council are to prepare fisheries management plans under the *Fisheries Management Act 2007* and to advise the Minister on key aspects of fisheries and aquatic resource management.

To coincide with these changes, Fishery Management Committees (FMCs) were discontinued from 1 July 2007 and PIRSA Fisheries has signed communication protocols with the representative industry body for each commercial fishery sector. For the South Australian Charter Boat Fishery this is the Surveyed Charter Boat Owners and Operators Association (SCBOOA).

Under the Act, the preparation of fishery management plans on behalf of the Minister is a key responsibility of the Fisheries Council. Management plans are a significant instrument, guiding decisions on annual catch or effort levels, the allocation of access rights, and establishing the tenure of valuable commercial licences.

The Act also describes the nature and content of fishery management plans including mandatory requirements. Among other things, management plans must describe the biological, economic and social characteristics of a fishery. Management plans must also include a risk assessment of the impacts or potential impacts of the fishery on relevant ecosystems. This risk assessment will then be used to develop management strategies that will best pursue fishery specific ESD objectives. The broad process is outlined in Figure 1 on the following page.

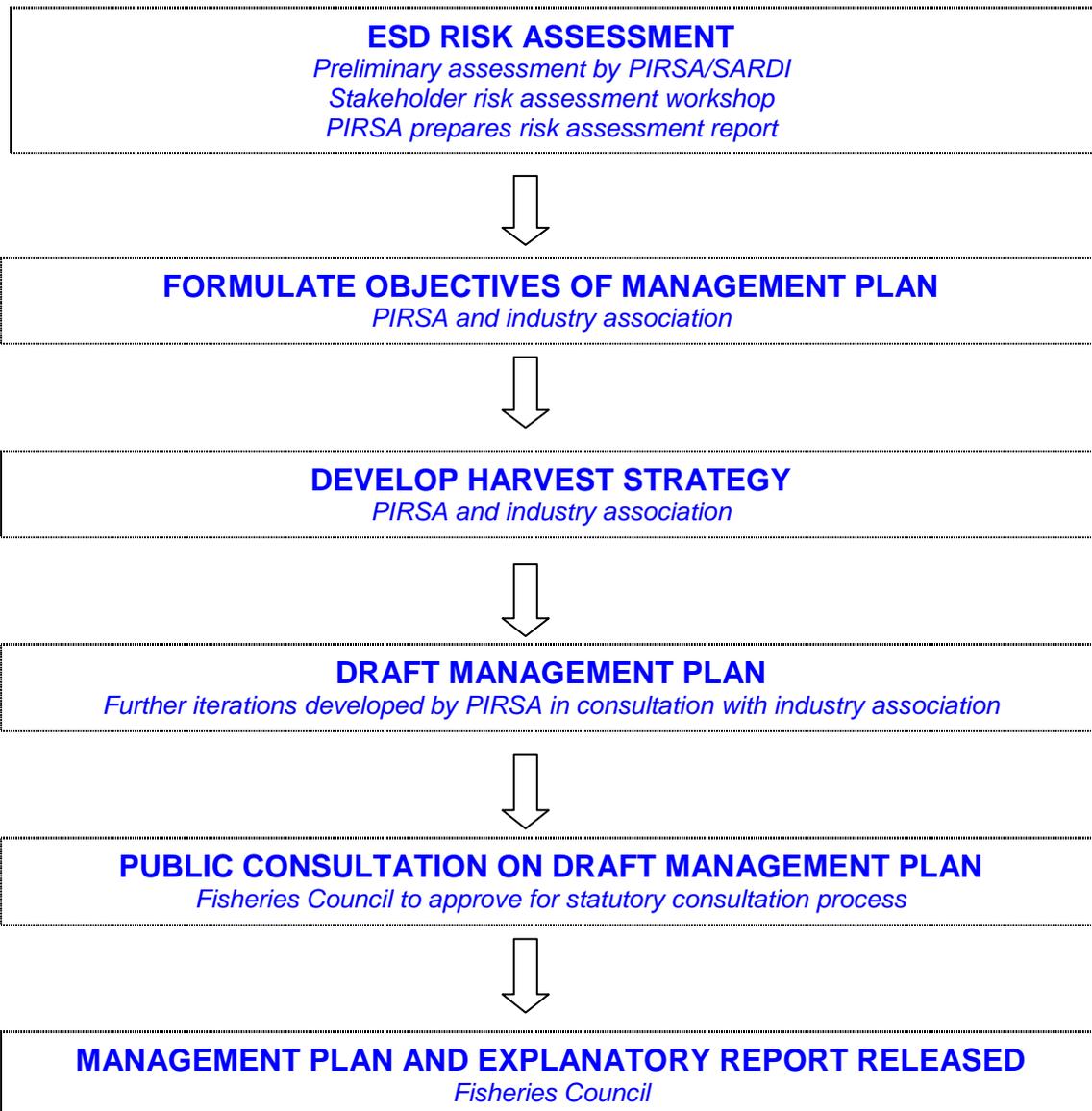


Figure 1. Process for Preparing a Fishery Management Plan

The Act specifies that management plans may remain in force for up to 10 years from commencement. For developmental fisheries they may remain in force for up to 3 years. To ensure that management plans remain relevant, efficient, and focussed on the legislative and policy objectives of the day, the Fisheries Council must conduct a detailed review of the operation of a management plan after 5 years. This process will include a review of the ESD risk assessment.

1.2. The ESD Risk Assessment and Reporting Process

To efficiently meet its ESD accountabilities under both State and Commonwealth legislation, PIRSA Fisheries has adopted the National ESD Reporting Framework for Fisheries¹. This approach, developed in Australia, has been extensively used to analyse and report on the ESD performance of commercial fisheries, and has the potential to drive substantial performance improvements. When applied appropriately the national framework will:

- substantially improve knowledge about the environmental, economic, and social issues relevant to the ESD performance of a fishery;
- enable consistent and comprehensive analysis and reporting of the current and strategic operating environment for fisheries (this may also usefully inform industry strategic and business planning initiatives);
- engage industry, key fishery stakeholders, managers and scientists in a proven, transparent, and clearly defined collaborative process to understand and improve fisheries management performance; and
- improve the efficiency and quality of performance reporting against a range of public and private sector accountabilities (such as the EPBC Act Strategic Assessment process, or industry business planning initiatives).

In mid May 2009, PIRSA arranged the first of several ESD risk assessment workshops with key fishery stakeholders, engaging an independent facilitator to run the workshop process. These workshops built on earlier scoping work by fisheries managers and industry to identify the majority of management issues facing each fishery and to start the process of developing detailed fishery specific ESD component trees. The key steps undertaken at the broader stakeholder workshops to inform the development of this full ESD report are outlined below:

1. The generic ESD component trees were modified through an iterative process with stakeholders into a set of trees specific to each fishery. This process was used to identify all of the issues relevant to ESD performance of a fishery.
2. A risk assessment of the identified issues (or components) was completed based on the likelihood and consequence of events that may undermine or alternatively contribute to ESD objectives. This was an iterative process involving managers, scientists, industry and key stakeholders.

¹ The National ESD Reporting Framework was initially developed under the Standing Committee for Fisheries and Aquaculture. The framework was then finalised under FRDC project (FRDC 2000/145). The series of PIRSA Fisheries ESD reports commencing with the Abalone, Blue Crab, and Recreational Charter Boat Fisheries draw heavily on this national approach. See Fletcher *et al.* (2002); or www.fisheries-esd.com for details.

3. Risks were then prioritised according to their severity. For higher level risks a detailed analysis of the issue, associated risks, and preferred risk management strategies was completed. For low risk issues, the reasons for assigning low risk and/or priority were recorded.
4. For higher level risks a full ESD performance report in the context of specific management objectives was prepared. This includes operational objectives, indicators, and performance measures.
5. A detailed fishery specific background report was also prepared to guide the identification of issues, risks and management strategies. This report includes the history of the fishery and its management, the areas of operation and their biological and physical characteristics, target species and by-product and bycatch species, and other relevant information.

The full ESD reporting process outlined above provides a logical framework for managers and stakeholders to identify, prioritise, and efficiently manage risks to achieve agreed ESD objectives. Where there are substantial knowledge gaps, the process informs cost effective and efficient research strategies targeted to high risk areas.

2. BACKGROUND

2.1. South Australian Charter Boat Fishery

The South Australian Charter Boat Fishery is a commercial platform for recreational fishing activities. As such, all catch from the fishery is regarded as recreational catch. Recreational fishers use the Charter Boat Fishery to access grounds and knowledge which may not be available to the average recreational fisher.

In 2000/01 the National Recreational and Indigenous Fishing Survey estimated that about 328,000 people over the age of 5 years (24% of the South Australian population over the age of 5), and 29% of all South Australian households contained at least one person who participated in some form of recreational fishing. Both of these participation levels were greater than the national average (which was 20 and 24% respectively). Of these recreational fishers, 2.3% belonged to fishing clubs and they owned 38,713 recreational fishing vessels (Henry & Lyle, 2003). More recently, in the 12 months prior to October 2007, an estimated 236,000 SA residents fished at least once, representing a participation rate of 16.2% of the SA population (Jones, 2009).

Licence holders are permitted to register any size vessel on their fishing licence. Vessels need to meet requirements of Class 1 or Class 2 Certificate of Survey from the Department for Transport, Energy and Infrastructure to be able to be used as part of a fishing charter.

There are three classes of vessels which the licence holders are able to register on their fishing licence:

- Passenger vessel surveyed for up to 6 unberthed passengers;
- Passenger vessel surveyed to take 7 to 12 unberthed passengers; or
- Passenger vessel surveyed to take over 12 unberthed passengers.

The size of the vessel is directly linked to the fee the licence holder has to pay to endorse that vessel on the licence.

2.1.1. Location of the Fishery

The Charter Boat Fishery operates throughout the coastal marine waters of the state, with no charter boat operations currently using inland waters. Data collection for the fishery is based on the same statistical areas used by the marine scalefish sector. For charter fishing, these have been modified to provide finer scale catch and effort information and are illustrated below.

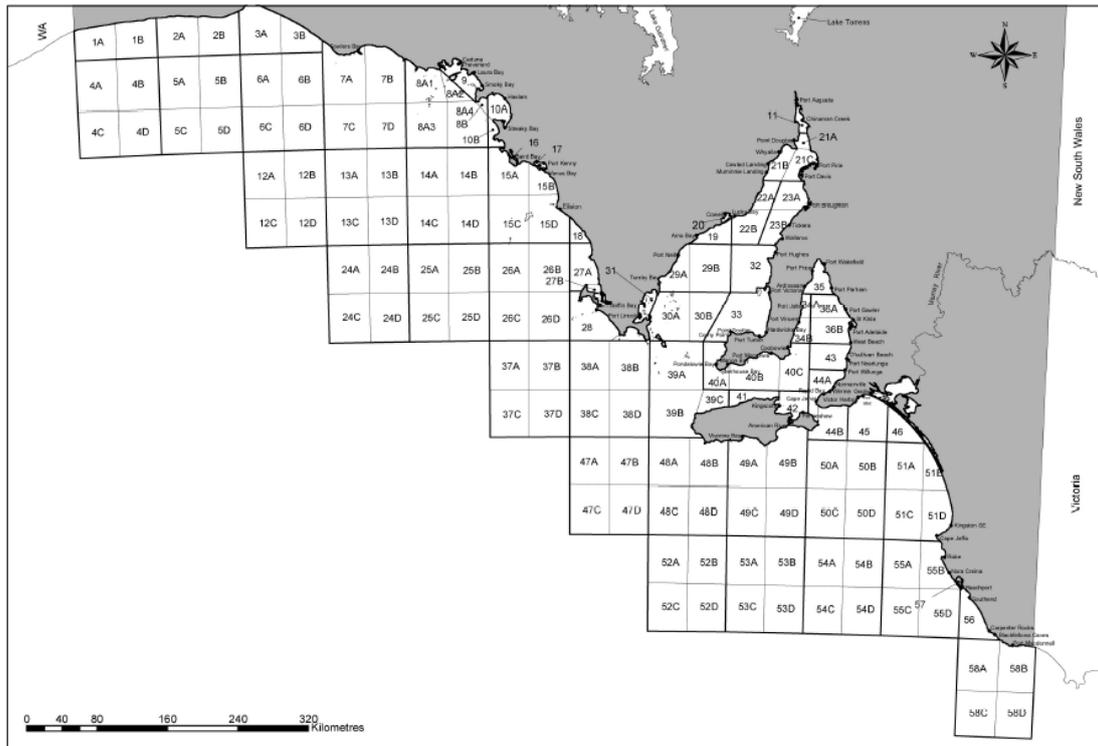


Figure 2. Charter Boat Fishery Statistical Areas

2.1.2. Access to the Fishery

The Charter Boat Fishery is a limited entry fishery and currently there are 108 fully transferable licences. Licences were granted through an eligibility process carried out by PIRSA Fisheries during 2004/05. Applicants were required to produce documentation to clearly demonstrate that they were either:

- a) operating as a charter fishing business prior to 28 November 2003; or
- b) in the process of establishing a charter fishing business.

This process was aimed at limiting the effort in the fishery and to set a cut off point for new operations. There were specific eligibility criteria for licences. A working group consisting of industry, government and external stakeholders was established to determine the criteria. The criteria aimed to recognise and provide access to the fishers for legitimate charter fishing businesses and to prevent people who had exited the industry in re-entering the fishery once the new licensing requirements were introduced.

2.1.3. Fishing Methods

The Charter Boat Fishery is permitted to use recreational fishing gear outlined in the *Fisheries Management (General) Regulations 2007*. For the most part the fishery is a rod and line fishery with nearly all fish taking using this method. Charter operators are not allowed to have their own rock lobster pots on the vessel; however pots are permitted to be used on the charter fishing trip if they are brought onboard by passengers and are registered to those passengers in line with PIRSA Fisheries requirements.

Charter boat fishing is generally a half day or full day exercise conducted from a single vessel operated by the charter licence holder. There are some multi-day live-onboard style operations, which generally consist of larger vessels that are self sufficient. Other operations use a 'mother ship' with smaller fishing vessels operating from the main vessel to access harder to reach fishing grounds (e.g. shallower grounds to target King George Whiting).

2.1.4. Retained Species

There are two groups of species targeted within the Charter Boat Fishery. The first are the primary target species of Snapper (*Pagrus auratus*) and King George Whiting (*Sillaginodes punctata*). These make up the largest numbers and weights of fish taken by the boat sector and are considered 'icon' species of South Australia.

The second group are species are taken in much smaller numbers and tonnages within the state and are considered 'regional target species'. This group includes Bight Redfish (*Centroberyx affinis*), Snook (*Sphyraena novaehollandiae*), Western Australian Salmon (*Arripis truttacea*), Yellow Tail Kingfish (*Seriola lalandi*) and Samson Fish (*Seriola hippos*).

There are other species caught that may be retained by passengers. Various species of finfish, crustaceans, molluscs or other non-targeted species may be retained by fishers to varying degrees. The *Fisheries Management (General) Regulations 2007* determine the species that may be taken by recreational fishers.

2.1.5. Non-Retained Species

Non-retained species are either caught in the gear used by fishers; or interact with but aren't caught by the gear. Non-retained species captured by fishing gear potentially include threatened, endangered and protected species (TEPS), or other species not valued by clients.

The most likely TEPS interactions identified in consultation with the industry include various sea birds species and great white sharks. Each of these species could potentially be incidentally caught on the gear used during charter fishing activities. Species which may be unwanted or unpalatable for passengers and returned to the water include Port Jackson Sharks, Toadfish species, various ray and skate species and other species shown in Table 8.

The second category of non-retained species includes the groups that may have an interaction with the charter fishing operation but are not directly captured in the gear. This could include incidents such as collisions with marine mammals, seabirds landing on the vessel or eating discarded fish or a curious great white shark making contact with the vessel. These interactions are required to be recorded by licence holders in specific wildlife interaction logbooks carried onboard all vessels.

2.1.6. Bait

The bait used in this fishery is primarily Australian Sardines (*Sardinops sagax*) derived from the South Australian Sardine Fishery. Other bait used includes shellfish (Pipi, Razorfish), cephalopods (Southern Calamari, Giant Cuttlefish) and similar species that are imported for use as bait. Advice from charter operators indicates that the use of imported baits is not a common practice in the fishery as the results are not as good as locally sourced bait.

Charter operators estimate that a single fishing trip could use up to 1-5 kg of bait. This is influenced by the type of trip, fishing conditions and catch rates.

2.1.7. Aboriginal Traditional Involvement in the Fishery

Current Aboriginal traditional fishing involvement in the Charter Boat Fishery is minimal. Operators may employ Aboriginal people as crew on some operations although there is very little information available about this aspect of the fishery.

The *Fisheries Management (Charter Boat Fishery) Regulations 2005* provide that Aboriginal signatories to an Indigenous Land Use Agreement (ILUA), which includes provisions for charter boat fishing, would be eligible to apply for a Charter Boat Fishery licence. Such an application would require a business plan for charter boat fishing.

2.2. Summary of Management Arrangements and Objectives

2.2.1. History of the Fishery

The Charter Boat Fishery is well established and PIRSA Fisheries recognised the need for direct management controls in the mid 1990s, following the increasing popularity of these tourism ventures. The potential existed for large charter operations to take many passengers on regular trips and take significant quantities of fish. Charter fishing operations needed to be better managed to ensure the sustainability of fish resources.

The industry initially operated under recreational daily bag and boat limits. Operators using larger vessel experienced difficulties in providing an equitable share of fish to passengers, especially with large numbers (i.e. greater than 3 passengers). For this reason a Ministerial exemption was required to increase individual passenger limits and total boat limits to cater for larger passenger numbers. The industry came under new licensing arrangements managed by Primary Industries and Resources South Australia (PIRSA) on 1 July 2005. The *Fisheries Management (Charter Boat Fishery) Regulations 2005* were gazetted on 21 July 2007. The increased passenger limits which were provided through Ministerial exemptions were then gazetted through regulations.

On 28 November 2003, the Minister for Agriculture, Food and Fisheries released a Policy Directions Paper on the proposed management of charter boat fishing in South Australia for public consultation. There were 27

recommendations in the Policy Directions Paper relating to definitions, licensing, licence endorsements, regulations, industry representation and the development and review of a management plan for the fishery.

A Charter Boat Working Group was established in February 2004 and comprised of charter boat operators, government agencies including PIRSA and Transport SA, South Australian Recreational Fishing Advisory Council (SARFAC), Tourism Commission and the commercial Marine Scalefish fishery sector. The working group met on four occasions to provide advice on proposed management arrangements and the preparation of a management plan.

The draft management plan was released on 18 October 2004 for further public consultation and was subsequently finalised in May 2005. In 2007 the new *Fisheries Management Act 2007* was introduced and the Charter Boat Fishery regulations were carried over under the new Act. A new wildlife interaction logbook requirement was also introduced to all commercial fisheries with mandatory reporting of interactions with TEPS.

2.2.2. Legislation

The *Fisheries Management Act 2007* provides the broad statutory framework to provide for the conservation and management of South Australia's aquatic resources. In the administration of the Act, the Minister for Agriculture, Food and Fisheries must pursue the following objectives, outlined in Section 7 of the Act:

- (1) An object of this Act is to protect, manage, use and develop the aquatic resources of the State in a manner that is consistent with ecologically sustainable development and, to that end, the following principles apply:
 - (a) proper conservation and management measures are to be implemented to protect the aquatic resources of the State from over-exploitation and ensure that those resources are not endangered;
 - (b) access to the aquatic resources of the State is to be allocated between users of the resources in a manner that achieves optimum utilisation and equitable distribution of those resources to the benefit of the community;
 - (c) aquatic habitats are to be protected and conserved, and aquatic ecosystems and genetic diversity are to be maintained and enhanced;
 - (d) recreational fishing and commercial fishing activities are to be fostered for the benefit of the whole community;
 - (e) the participation of users of the aquatic resources of the State, and of the community more generally, in the management of fisheries is to be encouraged.

- (2) The principle set out in subsection (1)(a) has priority over the other principles.
- (3) A further object of this Act is that the aquatic resources of the State are to be managed in an efficient and cost effective manner and targets set for the recovery of management costs.
- (4) The Minister, the Director, the Council, the ERD Court and other persons or bodies involved in the administration of this Act, and any other person or body required to consider the operation or application of this Act (whether acting under this Act or another Act), must—
 - (a) act consistently with, and seek to further the objects of, this Act; and
 - (b) insofar as this Act applies to the Adelaide Dolphin Sanctuary, seek to further the objects and objectives of the *Adelaide Dolphin Sanctuary Act 2005*; and
 - (c) insofar as this Act applies to the River Murray, seek to further the objects of the *River Murray Act 2003* and the *Objectives for a Healthy River Murray* under that Act; and
 - (d) insofar as this Act applies to areas within a marine park, seek to further the objects of the *Marine Parks Act 2007*.
- (5) For the purposes of subsection (1), **ecologically sustainable development** comprises 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 while—
 - (a) sustaining the potential of aquatic resources of the State to meet the reasonably foreseeable needs of future generations; and
 - (b) safeguarding the life-supporting capacity of the aquatic resources of the State; and
 - (c) avoiding, remedying or mitigating adverse effects of activities on the aquatic resources of the State,

(taking into account the principle that if there are threats of serious or irreversible damage to the aquatic resources of the State, lack of full scientific certainty should not be used as a reason for postponing measures to prevent such damage).

The regulations that govern management of the Charter Boat Fishery are the *Fisheries Management (Charter Boat Fishery) Regulations 2005* and the *Fisheries Management (General) Regulations 2007*.

2.2.3. Current Management Arrangements

The management arrangements in the Charter Boat Fishery include both input and output controls. Current input controls include:

- Limit on the number of licences,

- Restrictions on the number of vessel that can be used on the water at any one time,
- Gear limits per passenger; and
- Limited number of qualified registered masters per vessel.

Output controls include limits on the length of retained fish, and bag limits on a per boat and trip basis.

These arrangements are legislated under the *Fisheries Management (General) Regulations 2007* and *Fisheries Management (Charter Boat Fishery) Regulations 2005* and are in place to pursue ESD outcomes for the fishery.

Charter operators must also meet marine vessel survey requirements, and hold appropriate levels of public liability insurance. Operators must also clearly display their charter fishing licence number while on fishing charters.

A summary of size, boat and passenger trip limits are tabled below.

Table 1. Size and catch limits applying to South Australian managed species

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Species	Waters	Size	Individual passenger catch limit[‡]	Charter boat limit[‡]	Individual passenger catch limit[‡]	Multi-day charter trip catch limits
			Up to 3 passengers	Up to 6 passengers	More than 6 passengers	More than 3 days
			#fish/passenger	#fish/boat	#fish/passenger	
Snapper	Gulf St Vincent, Investigator Strait and Backstairs Passage	38 – 60 cm	5	15	3	Three times catch limits specified in columns 4, 5, or 6, which ever is applicable
		> 60 cm	2	6	1	
	Other waters	38 – 60 cm	10	30	5	
		> 60 cm	2	6	1	
Cuttlefish/Squid (Combined)	All waters		15	45	8	
Snook			20	60	10	
Sweep			20	60	10	
Trevally, Silver			20	60	10	
Whiting, Yellowfin			20	60	10	
School Whiting			20	60	10	
Flounder			20	60	10	
Aust. salmon		21 – 35 cm	20	60	10	
		>35 cm	10	30	5	
Australian Herring			60	180	30	
Garfish			60	180	30	
Mullet			60	180	30	
Bream			10	30	5	
Flathead			10	30	5	
Yellow Eye Redfish			10	30	5	
Swallowtail			10	30	5	
Morwong, Blue (Queen Snapper)			5	15	3	
Samson fish			2	6	1	
Kingfish, Yellowtail			2	6	1	
Mulloway		>75 cm	2	6	1	
Groper, Blue	Gulf waters, Investigator Strait and Backstairs Passage		0	0	0	
	All other waters		2	6	1	
Crabs – Blue & Sand (combined)			40	120	20	
Razorfish			25	75	13	
Scallop			100	300	50	

Table 2. Catch limits applying to South Australian managed species

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>	<i>Column 7</i>
Species	Waters	Size	Individual passenger catch limit [‡]		Individual passenger catch limit [‡]	Multi-day charter trip catch limits
			Up to 3 passengers		> 3 passengers	> 3 days
			#fish/passenger		#fish/passenger	
Whiting, King George			12		10	Three times catch limits specified in columns 4, or 6, which ever is applicable
Rock Lobster			4		2	
Abalone			5		3	
Pipi			300		300	
Cockle, Mud			300		150	
Giant Crab			2		2	

Table 3. Catch limits applying to Commonwealth managed species

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>	<i>Column 7</i>
Species	Waters	Size	Individual passenger catch limit [‡]	Charter boat limit [‡]		Multi-day charter trip catch limits
			Up to 3 passengers	More than 3 passengers		More than 3 days
			#fish/passenger	#fish/boat		#fish/boat
Southern Blue Fin / Yellow Fin Tuna (combined)			2	6		6
Shark, School & Gummy (combined)			2	6		6
Albacore			2	6		6
Bight Redfish (Nannygai)			10	30		30
Gemfish			10	30		30
Barracouta			10	30		30
Ling			3	18		18
Morwong (Jackass)			10	30		30
Warehou (Blue/Silver)			10	30		30

2.2.4. Catch and Effort Reporting

Prior to 1 July 2005 there were no formal data collection protocols in place for the Charter Boat Fishery. From 1 July 2005, new licensing requirements for the fishery required the operators to fill in fishing logbook sheets for each trip. This information is used to understand the impacts of the fishery, to improve stock status and stock assessment reporting and to inform fisheries management decisions.

A review of the logbook was conducted in 2007. The revised logbook has an improved capacity to collect catch per unit effort (CPUE) data to enable that information to be used to support stock assessments and reporting.

These mandatory monthly logbook returns are compiled by charter fishers and are sent to the South Australia Research and Development Institute (SARDI). Charter Boat Fishery licence holders report catch (kg) of Snapper and King George Whiting, with 'other' species recorded by numbers retained. Snapper and King George Whiting sizes are grouped into small and large classes for Snapper and small, medium and large for King George Whiting. Catch location is reported by statistical areas shown in Figure 1. Fishing occurs throughout the year however there is a Snapper fishing closure in place for all sectors during November each year.

As the Charter Boat Fishery mainly targets marine scalefish species, the information collected is incorporated in the SARDI stock assessment reports for the commercial Marine Scalefish Fishery. As such, the Charter Boat Fishery does not have a specific stock assessment. Fisheries management arrangements for the fishery are informed by the outcomes of these stock assessment reports.

Table 4. Recent Annual Catches of all species targeted by the Charter Boat Fishery (retained) (Knight *et al.* 2007)

<i>Species</i>	August 2005 to June 2006	2006-07	2007/08	July 2008 to March 2009
Albacore	✓	63	✓	✓
Australian Herring	1,218	886	2,718	1,831
Australian Salmon	1,378	5,196	6,732	5,835
Barracouta	305	100	225	137
Blue Crab	1,256	974	1,424	1,365
Blue Groper	27	37	101	✓
Blue Mackerel	185	137	212	✓
Blue Morwong	48	72	101	✓
Bronze Whaler Shark	35	24	39	✓
Cuttlefish	67	28	34	✓
Flathead	1,245	1,326	1,119	1,070
Garfish	2,792	1,049	1,365	5,449
Goulds Squid	✓	✓	✓	✓
Gummy Shark	261	189	248	214
Jackass Morwong	331	466	686	442
King George Whiting,	40,885	48,275	52,491	41,588
Knife Jaw	✓	✓	✓	✓
Leather Jacket	1,564	1,934	1,932	1,606
Ling	11	18	43	32
Other - Aggregated Species*	179	210	181	338
Other Or Mixed Species	21	101	28	10
Parrotfish	369	361	608	538
Razor Fish	✓	✓	✓	✓
Red Mullet	2,579	1,535	2,373	1,335
Bight Redfish (Nannygai)	5,613	9,462	14,903	11,326
Samson Fish	64	51	97	40
School Shark	65	68	83	71
School Whiting	1,410	492	588	345
Snapper	30,761	23,337	34,439	24,072
Snook	3,034	3,125	5,376	2,914
Southern Bluefin Tuna	358	501	554	328
Southern Calamary	2,324	2,289	2,137	1,562
Southern Rock Lobster	63		23	✓
Striped Perch	132	103	85	✓
Swallowtail	570	1,198	4,930	4,586
Sweep	1,392	1,390	2,177	2,832
Trevally	1,957	3,318	3,796	3,009
Weedy Whiting	✓	40	47	✓
Yellowtail Kingfish	55	54	118	34
Totals	103,650	109,439	143,224	113,602

*Refer to Appendix 1, Table 11 for a complete list of Other – Aggregated Species

✓Denotes data where the species has been harvested but the licence count is less than 5

2.3. Biology of Species

2.3.1. Biology of Target Species

SNAPPER (*Pagrus auratus*)

Snapper are a member of the family Sparidae, occurring throughout the warm, temperate and sub-tropical waters of the Indo-Pacific region, including Japan, the Philippines, India, Indonesia, as well as Australia and New Zealand (Kailola *et al.* 1993). They are found in a broad range habitats from shallow, coastal, demersal areas to the edge of the continental shelf across a depth range from 1 – 200m. The broad distribution is thought to be divisible into a number of separate stocks, including a division between Victorian and South Australian stocks in the vicinity of the mouth of the Murray River. Snapper can also form separate stocks at spatial scales smaller than the regional geographic scale, however there is little evidence for any finer-scale genetic differentiation amongst snapper captured from the remaining SA waters.

Spawning in the Northern Spencer Gulf commences late November, peaking in December and declining in January and finishing in early February. The timing appears to be approximately one month later in the Southern Spencer Gulf (Fowler *et al.* 2010). Snapper are multiple batch spawners that spawn over several consecutive days. While spawning seems to occur widely through SA, the main nursery areas are thought to be in the northern parts of both gulfs, particularly Spencer Gulf (Fowler *et al.* 2008). Mature adults form large schools in preferred spawning areas. Spawning generally occurs in waters less than 50m deep although on occasions schooling does take place at the surface (Kailola *et al.* 1993).

Snapper eggs are pelagic and the larvae remains pelagic after hatching, approximately 36 hours at 21°C and the juveniles become demersal. Studies on the distribution patterns of eggs are limited however they indicated the pattern was patchy and suggested distinct spawning hotspots. Recruitment of snapper is highly variable (Fowler *et al.* 2010). The life history model for snapper suggest that the majority of fish remain resident to their region whilst a lower proportion of fish are migrants (Fowler *et al.* 2008)

The oldest estimate of age obtained so far for snapper from SA is 36 years. Snapper are long-lived and slow-growing fish. The age structures of snapper from different regions of SA show the presence of strong and weak year classes (Fowler *et al.* 2010). Age at first maturity also varies throughout their distribution. Snapper from New South Wales are, on average, 3 years old and 30cm fork length at first maturity. Snapper in Port Philip Bay first breed when they are about 4 years old and 27 cm total length, while those from Southern Australian waters are about 28cm total length at first maturity. In New Zealand, some juvenile Snapper change sex from female to male but all such changes are completed by the onset of maturity. There have been no investigations of sex reversal in Australian Snapper populations (Kailola *et al.* 1993).

Snapper in Victorian waters feed primarily on crustaceans, bivalve molluscs and small fish. Juveniles and small adults in South Australia feed heavily on Western King Prawns (*Penaeus latisulcatus*), while larger fish also feed on thick shelled animals such as Blue Swimmer Crabs (*Portunus pelagicus*) and mussels (Mytilidae). Whaler sharks (e.g. *Carcharhinus obscurus*) are known to accompany spawning aggregations of Snapper, but their significance as a predator is unknown (Kailola *et al.* 1993).

KING GEORGE WHITING (*Sillaginodes punctatus*)

King George Whiting is a member of the family Sillaginidae and is endemic to the shelf waters of southern Australia ranging from Port Jackson on the east coast through Bass Strait and west to Jurien Bay on the west coast (Kailola *et al.* 1993). Juveniles occur in shallow waters to depths of 20m, whilst adults are found in a range of

habitats and depths from sandy patches in seagrass meadows to more exposed waters along coastal beaches and reef areas in the continental shelf waters to depths of 50m and greater (Kailola *et al.* 1993). The nursery areas for King George Whiting are shallow, protected bays where the post-larvae arrive during the winter and spring each year (Fowler *et al.* 2008).

Spawning occurs at the offshore grounds to which fish migrate, including Investigator Strait along the north coast of Kangaroo Island the south-eastern Spencer Gulf around Corney Point and Wardang Island (Fowler *et al.* 2008). Spawning typically occurs between March and May. King George Whiting are serial batch spawners, yet the number of spawnings in a season is unknown. Fecundity increases as the female fish grow – from an average of 100 000 eggs at 34cm total length to 800 000 eggs at 45cm (Kailola *et al.* 1993).

King George Whiting eggs are buoyant and the larvae are planktonic. The larvae move inshore to sheltered areas and settle out of the plankton when 60-80 days old and 15-18mm long. Juveniles remain in protected waters for 2-3 years. Older King George Whiting (more than 25cm total length) move to deeper water, particularly during winter (Kailola *et al.* 1993).

Estimates of longevity differs between sexes, with a sampled male reaching 19 years and the oldest female 14 years old (Fowler *et al.* 2008) A maximum age of 15 years, and a maximum size of 72cm total length and 4.8kg have been recorded. Growth rates vary from region to region, depending on the water temperature. King George Whiting grow very little in winter, but grow rapidly in summer months of December to March. They can reach 28cm in 2-3 years (Kailola *et al.* 1993).

Maturity is attained at 3 or 4 years of age when males are between 27cm and 32cm total length and females between 32cm and 36cm total length. The sex ratio at that time is even, but among older fish (greater than 50cm total length), females are 4 times more numerous as males (Kailola *et al.* 1993).

Juvenile King George Whiting feed on benthic amphipods and other crustaceans. As they grow larger, the fish's diet expands to include polychaete worms, molluscs and peanut worms (Sipuncula). Adult King George Whiting are preyed upon mostly by sharks, whilst juveniles are eaten by other fish such as Flathead (Platycephalidae), Australian Salmon (*Arripis species*) and Barracouta (*Thyrsites atun*).

2.4. Major Environments

2.4.1. Physical Environment

The Charter Boat Fishery operates throughout the coastal marine waters of South Australia, and in a variety of different habitat areas. An Inventory of Important Coastal Fisheries Habitats in South Australia (Bryars, 2003) identified 12 habitats in South Australia which include:

- Reef
- Surf beach
- Seagrass meadow
- Unvegetated soft bottom
- Sheltered beach
- Tidal flat
- Tidal creek
- Estuarine river
- Coastal lagoon
- Mangrove forest
- Saltmarsh
- Freshwater spring

The majority of charter fishing activities occur around reef, seagrass meadows, un-vegetated soft bottom, sheltered beaches and tidal flats.

2.4.2. Economic Environment

The Charter Boat Fishery is not permitted to sell the fish caught by passengers. The fishery operates as a cost for service style sector, meaning passengers pay the licence holder under an agreement for charter boat fishing services for the opportunity to participate in good quality recreational fishing.

3. METHODOLOGY

The current series of PIRSA ESD performance reports have been prepared to ensure that South Australian fisheries management is both effective and efficient in the context of achieving ESD outcomes. In addition to meeting the statutory requirements of the *Fisheries Management Act 2007*, and national environmental legislation, this approach will also provide the fishing industry, key stakeholders, and the broader community with an ongoing opportunity to contribute to, and influence, fisheries management outcomes.

The reports will also provide the basis for the development of statutory management plans required under the *Fisheries Management Act 2007*. On behalf of the Fisheries Council of South Australia, PIRSA Fisheries has used the comprehensive issue identification and subsequent risk assessment and priority setting process to collaboratively develop more effective management arrangements under the Act. Where necessary this may include development of fishery specific harvest strategies, and related research and monitoring programs for each of the fisheries assessed.

The issue identification, risk assessment, and reporting process described in detail below, as well as the final report format, is closely based on the National ESD Framework *How To Guide* (see www.fisheries-esd.com), as well as the Department of Fisheries Western Australia ESD performance reports pioneered by Dr Rick Fletcher and other WA Fisheries staff.

3.1. Scope

This ESD report describes “**the contribution of the South Australian Charter Boat Fishery to ESD**” in the context of South Australian Fisheries legislation and policy. The report is based on preliminary scoping and issue identification work by PIRSA Fisheries staff in conjunction with the SCBOOA representatives. This initial scoping was then refined and validated through a broader stakeholder workshop on 15 May 2009 facilitated by Dr Fletcher.

The scope of the assessment was contained to issues relevant to the Charter Boat Fishery. The recreational catch will be assessed separately through an ESD assessment of South Australian recreational fishing.

The assessment process examined an extensive range of issues, risks and opportunities identified by stakeholders during various blue crab workshops. The identification of issues was informed by the generic ESD component tree approach with each fishery component tree refined specifically for this fishery. Each major component tree reflects the primary components of ESD, and the ESD report assesses the performance of the fishery for each of the relevant ecological, economic, social and governance issues facing the fishery (Table 5. below). The process also identifies where additional (or reduced) management or research attention is needed, and identifies strategies and performance criteria to achieve management objectives to the required standard.

Table 5. Primary ESD Components

Retained Species	<i>Ecological Wellbeing</i>
Non-Retained Species	
General Ecosystem	
Community Wellbeing	<i>Human Wellbeing</i>
Aboriginal Community	
Governance	<i>Ability to Achieve</i>
External Factors Affecting	
Fishery Performance	

3.2. Overview

The steps followed to complete this Charter Boat Fishery ESD report are detailed below:

6. A set of “Generic ESD Component Trees” were modified through an iterative process with stakeholders into a set of trees specific to the fishery. This process identified the issues relevant to ESD performance of the fishery under the categories described in Table 5 above.
7. A risk assessment of the identified issues (or components) was completed based on the *likelihood* and *consequence* of identified events that may undermine or alternatively contribute to ESD objectives. This was an iterative process involving managers, scientists, industry and key stakeholders.
8. Risks were then prioritised according to their severity. For higher level risks - where an increase in management or research attention was considered necessary - a detailed analysis of the issue, associated risks, and preferred risk management strategies was completed. For low risk issues, the reasons for assigning low risk and/or priority were recorded.
9. For higher level risks a full ESD performance report was prepared (Section 4 of this report). This was completed in the context of specific management objectives and includes operational objectives, indicators, and performance measures.
10. A background report providing context and necessary supporting information about the fishery was also prepared to guide the identification of issues, risks and management strategies. This report includes the history of the fishery and its management, the areas of operation and their biological and physical characteristics, target species and by-product and bycatch species, and other relevant information.

The process is illustrated in Figure 3 below.

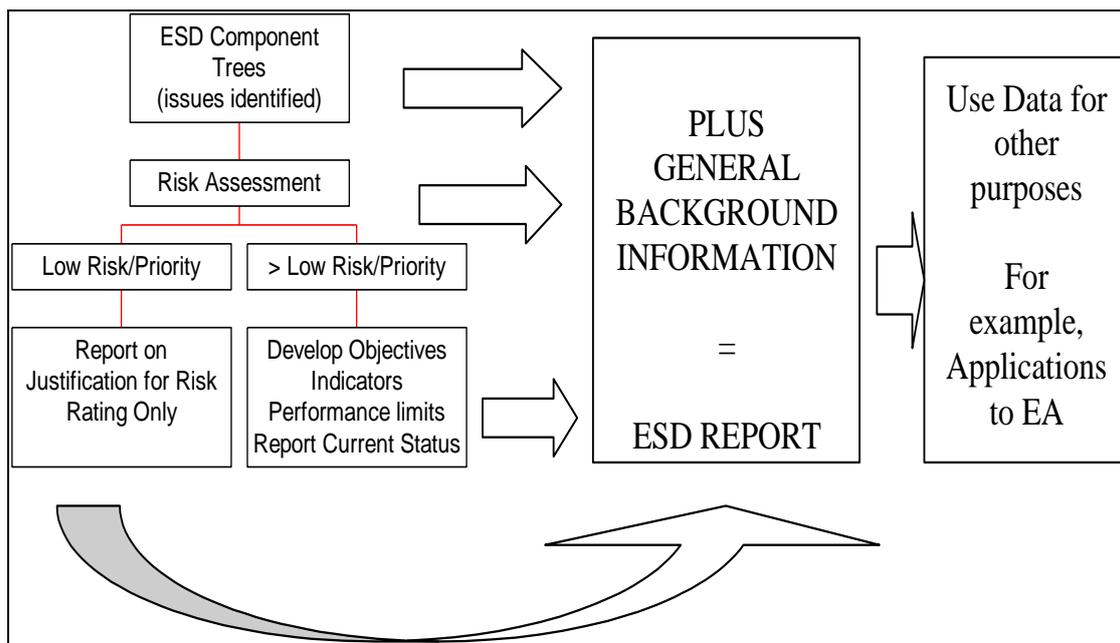


Figure 3. Summary of the ESD reporting framework processes
(Source: ESD Reporting *How to Guide*).

3.3. Issue Identification (component trees)

The Charter Boat Fishery ESD reporting component trees are a refined version of the generic trees suggested in the National ESD Reporting Framework (see Table 5, Section 3.1). The generic trees and the issues that they encompass were the result of extensive consideration and refinement during the initial development of the National Fisheries ESD approach. The trees were designed to be very comprehensive to ensure that all of the conceivable issues facing a fishery would be considered during the workshop process. The fishery specific component trees developed after expert and stakeholder consideration provide a more realistic and practical illustration of the issues facing a particular fishery.

The generic component trees have been used as the starting point to ensure thorough, consistent, and rigorous identification and evaluation of ESD issues across all of the South Australian Fisheries being assessed. When developing each of the major fishery specific component trees, each primary component is broken down into more specific sub-components for which operational objectives can then be developed.

For example, the component tree identifying *external factors affecting ESD performance of the fishery* that was refined during the stakeholder workshop for the Charter Boat Fishery is reproduced below.

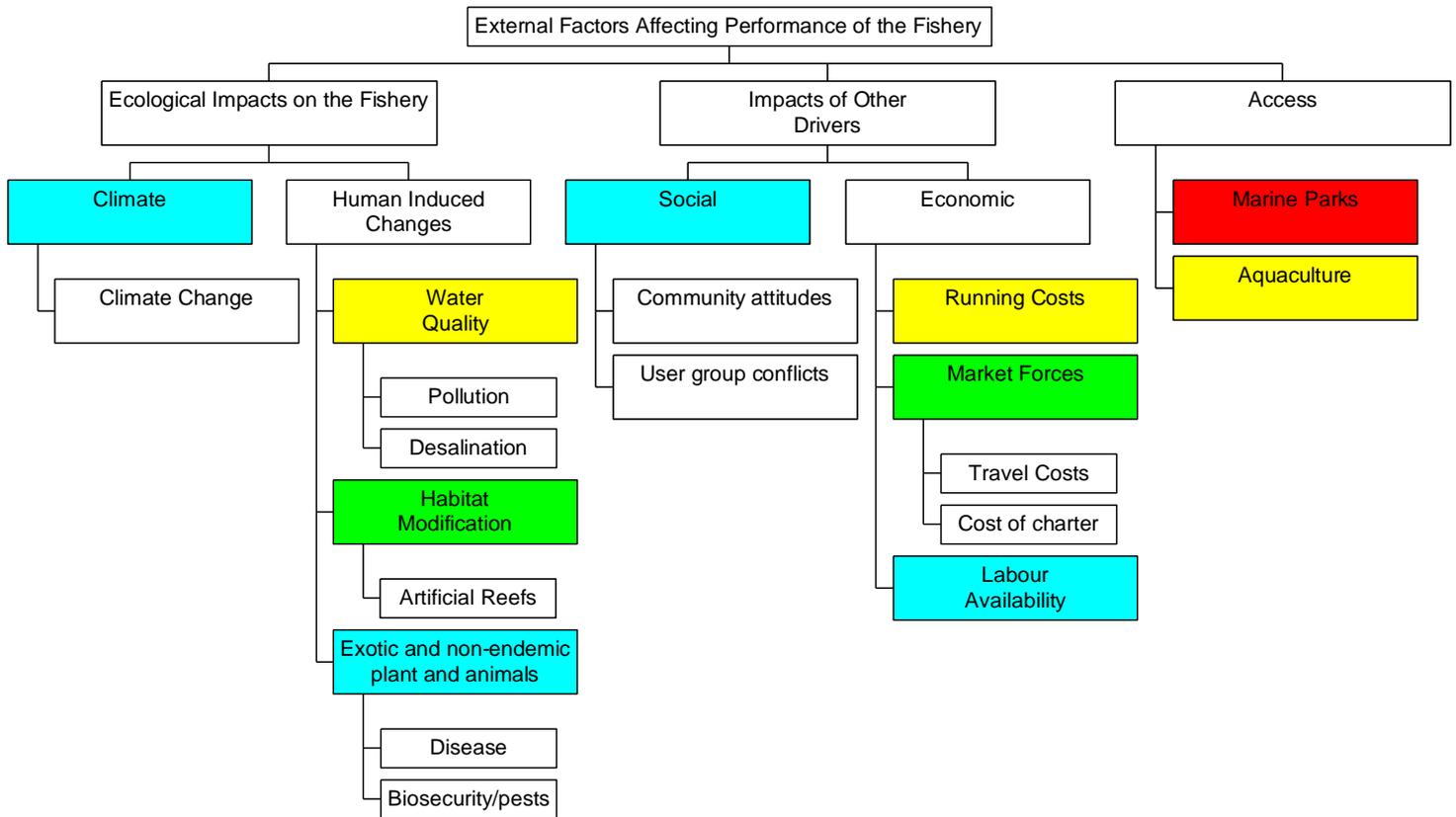


Figure 4. South Australian Charter Boat Fishery Component Tree Structure

3.4. Risk Assessment and Prioritisation of Issues

Once the fishery specific component trees were developed and reviewed by stakeholders, the focus moved to the assessment and prioritisation of risks and opportunities facing the fishery. These have been considered in the context of the specific management objectives for each fishery being assessed. The higher level management objectives and desired ESD outcomes are those described in the *Fisheries Management Act 2007*. Risks and opportunities are also evaluated against more detailed fishery specific objectives - such as those articulated in the fishery's management plan.

The risk assessment of issues identified for the Charter Boat Fishery has been done on the basis of existing management which is currently managing risks to the fishery. Hence the risk assessment conducted during stakeholder workshops considered the residual risk after the existing risk treatments were taken into account. For example, PIRSA Fisheries current compliance program for the Charter Boat Fishery is itself based on a separate compliance risk assessment process. This process identifies compliance risks in the context of the fishery's management objectives, and then develops and applies strategies to mitigate those risks. The ESD assessment and reporting process works across the full suite of fishery ESD objectives in a similar way.

Risk assessment applied under the national ESD framework has been designed to be consistent with the Australian Standard AS/NZS 4360:1999 for Risk Management. Subject matter experts and key fishery stakeholders consider the range of potential consequences of an issue, activity, or event (identified during the component tree development process) and how likely those consequences are to occur. The estimated consequence of an event is multiplied by the likelihood of that event occurring to produce an estimated level of risk.

What is Risk Analysis?

“Risk analysis involves consideration of the sources of risk, their consequences and the likelihood that those consequences may occur.”

Australian and New Zealand Standard (AS/NZS) 4360 – 1999

ESD workshop participants worked methodically through each component tree from the top down and conducted a qualitative risk assessment of each issue. An estimate of the consequence level for each issue was made and scored from 0-5, with 0 being negligible and 5 being catastrophic/irreversible (see Appendix 2 for details of the risk consequence tables). The consequence estimate was based upon the combined judgement of workshop participants who had considerable expertise in the issues being assessed.

The level of consequence was estimated at the appropriate scale and context for the issue in question. For the target species the consequence assessment was based at the population not the individual level. Killing one fish is catastrophic for the individual but not for the population. Similarly, when assessing possible ecosystem impacts this was done at the level of the whole ecosystem or at least in terms of the entire extent of the habitat, not at the level of an individual patch or individuals of non-target species².

The likelihood of that consequence occurring was assigned to one of six levels from remote (1) to likely (6). This was based on a judgement about the probability of the events - or chain of events - occurring that could result in a particular adverse consequence. This judgement about conditional probability was again based on the collective experience and knowledge of workshop participants. See Appendix 2 for details of the likelihood table.

From the consequence and likelihood scores, the overall risk value (Risk = Consequence x Likelihood), was calculated. On the basis of this risk value each issue was assigned a Risk Ranking within one of five categories (see Table 5).

² These descriptions and detailed guidance about developing consequence and likelihood scores for fishery issues are provided in the ESD How to Guide at www.fisheries-esd.com.

Table 6. Risk ranking definitions

RISK	Rank	Likely Management Response	Reporting
Negligible	0	Nil	Short Justification Only
Low	1	None Specific	Full Justification needed
Moderate	2	Specific Management Needed	Full Performance Report
High	3	Possible increases to management activities needed	Full Performance Report
Extreme	4	Likely additional management activities needed	Full Performance Report

Where a more detailed and/or quantitative risk assessment and management process was in place for the fishery - such as a robust quantitative stock assessment for a target species - the resultant risk score could be expected to be moderate to low. The risk score in this example reflects the fact that the risk is effectively being managed through existing arrangements.

The national ESD reporting framework suggests that only those issues scored at moderate, high and extreme risk, which require additional management attention, need to have full ESD performance reports completed. This is the approach that has been used in the PIRSA ESD reports. The rationale for scoring other issues as low or negligible risk has also been documented and form part of these reports. This encourages transparency and should help stakeholders to understand the basis for risk scores and the justification for no further management, or for additional management action if necessary. The process is summarised earlier in this section (Figure 3).

3.5. Performance Reports for Higher Risk Issues

As noted above, a comprehensive ESD performance report has only been prepared for higher risk/priority issues that require additional management attention (Section 4 of this Charter Boat Fishery ESD Report). The content of these reports is based on the standard subject headings recommended in the ESD Framework's *How to Guide*.

The full performance report for the Charter Boat Fishery was developed by PIRSA Fisheries, informed by the initial consultation with industry and then broader stakeholders at the Adelaide ESD workshop on 15 May 2009. A preliminary draft ESD report was sent to industry members and other stakeholders for review. The review period was brief due to the short time frame available to finalise the reports before consideration by the Fisheries Council in June 2009. This report is the final ESD risk assessment of the South Australian Charter Boat Fishery.

3.6. Overview Table

The following table provides a summary of the material presented in the report.

Table 7. Overview of the SA Charter Boat Fishery Ecological Assessment Report

Issue	Risk / Priority	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	Actions
Retained Species							
Primary Target Species	M	Yes	Total Catch / CPUE	Increasing trend over a period of 3 years exceeding 10% of current level	Acceptable	Low	Review in 3 years
Regional Target Species	L N	Yes	Total Catch / CPUE	Increasing trend over a period of 3 years exceeding 10% of current level	Acceptable	Low	Review in 3 years
Species of Interest	M N	Yes	Total Catch	Take of Western Blue Groper remains below 100 fish/year	Acceptable	Low	Review with DENR in 3 years
Other	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Non-retained species							
Captured	N	Yes but negligible risk	Number of Interactions	To be determined	N/A	N/A	Review at next major assessment in 5 years
Direct Interaction but no Capture	N	Yes but negligible risk	Number of Interactions	To be determined	N/A	N/A	Review at next major assessment in 5 years
General Ecosystem Effects							

Issue	Risk / Priority	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	Actions
Fishing	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Bait Collection	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Recreational Rock Lobster Pots	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Benthic Biota	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Discarding	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Translocation – <i>Caulerpa taxifolia</i>	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Berleying	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Disease Risks	M	Yes	Number of reported disease outbreaks	N/A	N/A	N/A	Bio-security SA monitor disease outbreaks
Green House Emissions	M	Yes	Code of conduct developed about emissions	N/A	N/A	N/A	Review at next major assessment in 5 years
Water Quality	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
4WD Beach Launching	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Community							
Profit	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Employment	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Asset Value	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years

Issue	Risk / Priority	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	Actions
Occupational Health, Safely and Welfare	M	Yes, as per OHS&W Act	Number of injuries	Under different legislation	N/A	N/A	N/A - under different Act. Work closely with other Gov Dept.
Relationships	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Lifestyle	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Enjoyment	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Economic Value	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Social Value	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Infrastructure	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
City Centres	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Research / Knowledge	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Research Platform	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Governance							
OCS Arrangements – SBT Allocation	M	Yes	Bag and trip limits	Catches not exceeding limits	Acceptable	Medium	Subject to AFMA allocation
Information	H	Yes	Timely provision of information to SCBOOA	Reports provided to SCBOOA as available.	Acceptable	Medium	Improve provision of information to industry
Allocation	H	Yes	Delivery of fishery management plan; To be determined	To be determined	Acceptable	Medium	As per allocation policy

Issue	Risk / Priority	Objective Developed	Indicator Measured	Performance Measure	Current Performance	Robustness	Actions
Threatened, endangered and Protected Species	H	Yes	Timely provision of information to SCBOOA	Reports provided to SCBOOA as delivered.	Acceptable	Medium	Improve provision of information to industry
External factors affecting performance of the fishery							
Climate	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Water Quality	M	Yes	As per EPA water quality guidelines	As per EPA water quality guidelines	Acceptable	Low	N/A - under different Act Work closely with other Gov Dept.
Habitat Modification	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Exotic and Non-Endemic Plants and Animals	N	Yes but negligible risk	New species appearing in SA marine habitats	New species, changes in habitat diversity	Acceptable	Medium	Review at next major assessment in 5 years
Social	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Running Costs	M	Yes	Economic performance of fishery	To be determined	N/A	N/A	Pursue reporting of economic indicators for fishery Review at next major assessment in 5 years
Market Forces	L	N/A – low risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Labour Availability	N	N/A – negligible risk	N/A	N/A	N/A	N/A	Review at next major assessment in 5 years
Marine Parks	E	Yes	To be determined	To be determined	N/A	N/A	Industry and PIRSA Fisheries participate in Marine Parks planning processes
Aquaculture	M	Yes	To be determined	To be determined	N/A	N/A	Provide comments to Aquaculture Dept on new proposals

4. PERFORMANCE REPORTS

4.1. Retained Species

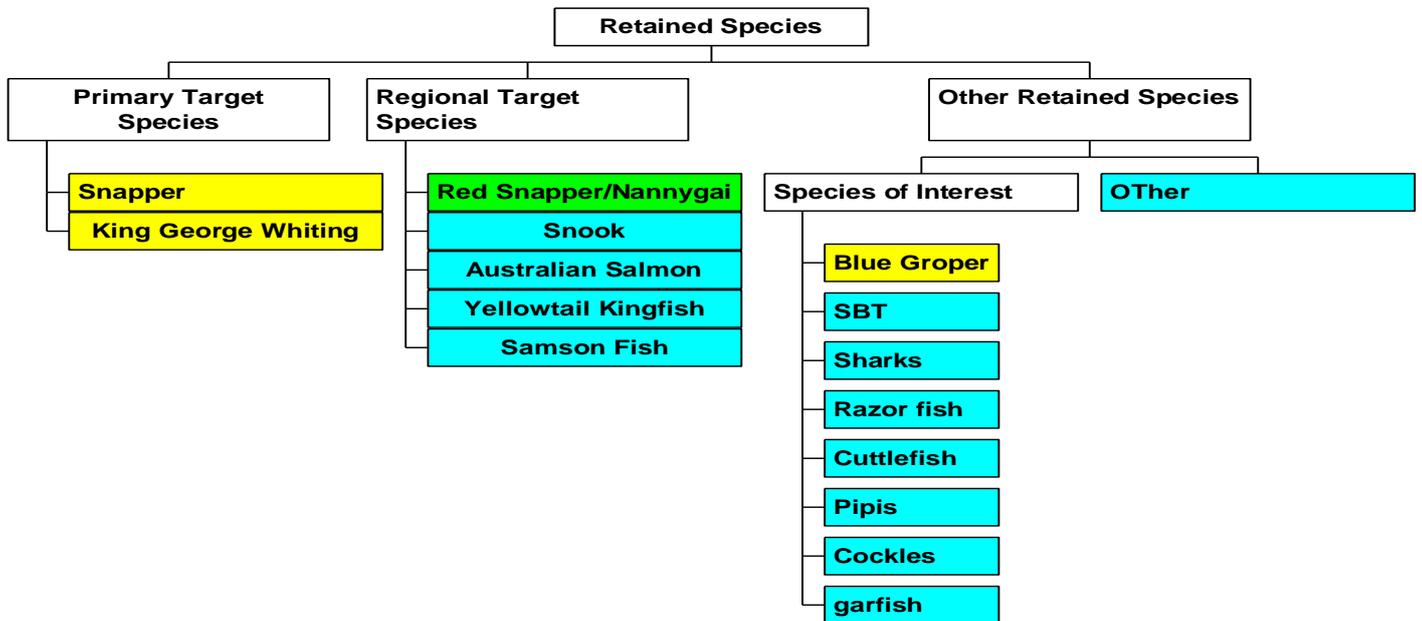


Figure 5. Component Tree for Retained Species

A yellow box indicates a moderate risk that warrants a full performance report. A green box indicates that a full justification is needed for why the issue was considered low risk. A blue box indicates that the issue was considered a negligible risk, with no specific management required, and only a justification is presented.

4.1.1. Primary Target Species

Snapper

Snapper (*Pagrus auratus*) is considered an 'icon' species for the state of South Australia. It is by far the most targeted species in the Charter Boat Fishery and is taken in the largest volume and numbers of fish. The species is distributed state wide and is generally targeted by all operators throughout the state.

Objective

Ensure the Snapper resource is harvested within ecologically sustainable limits to maintain adult biomass at levels that will maintain healthy recruitment.

ERA Risk Rating: Sustainable harvest levels of Snapper (*Pagrus auratus*) (MODERATE)

Snapper in their early years are believed to leave nursery areas in the northern gulfs, move southwards, leave the gulfs and migrate to the continental shelf. From there they make annual spawning migrations over a number of years back into the gulfs during which they are highly vulnerable to capture by different fishery sectors. By approximately 12 years of age fish become permanent residents to the northern gulfs (Fowler *et al.* 2007).

A state wide closure on Snapper fishing is in place for all sectors during the month of November every year. This closure was originally introduced in order to reduce effort in the MSF by 10% and was extended to all sectors. It was not intended to directly protect spawning fish, as may be commonly thought. Current management arrangements for Snapper (and commonly caught species) are shown in Table 1. A monthly harvest summary for Snapper can be seen below and shows clearly the effect off the November Snapper closure.

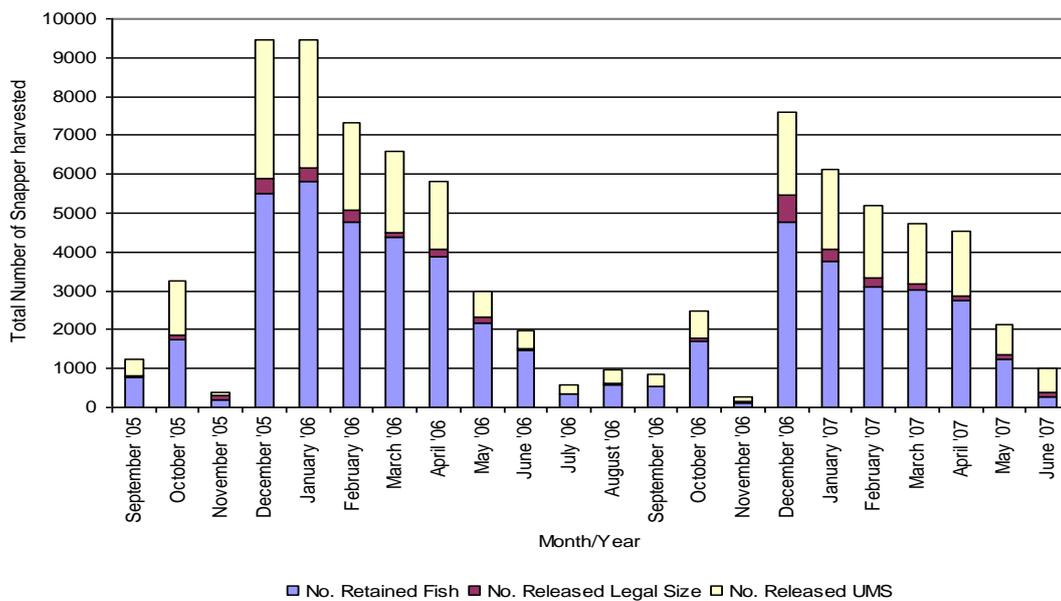


Figure 6. Snapper harvest by month (Knight *et al.* 2007)

The total catch of Snapper taken by the Charter Boat Fishery is a significant component of the state wide catch. Total charter catch of Snapper in 2006/07 was approximately 62.9 tonnes. For the same period the commercial catch was 643 tonnes (Knight and Tsolos 2009) with a further 370.5 tonnes estimated to have been taken by the recreational sector (Jones and Doonan 2005). The recreational catch was based on a survey of both South Australia residents, interstate residents and a very small percentage of SA charter operators. These totals place the Charter Boat Fishery harvest of Snapper at less than 6% of the total catch. The figures may have risen for the charter sector in recent years and harvest levels in the fishery may increase in the future with public demand.

Additional information provided by SARDI Aquatic Sciences in Figure 7 below indicates the take of Snapper over the 4 years since charter logbook requirements were introduced.

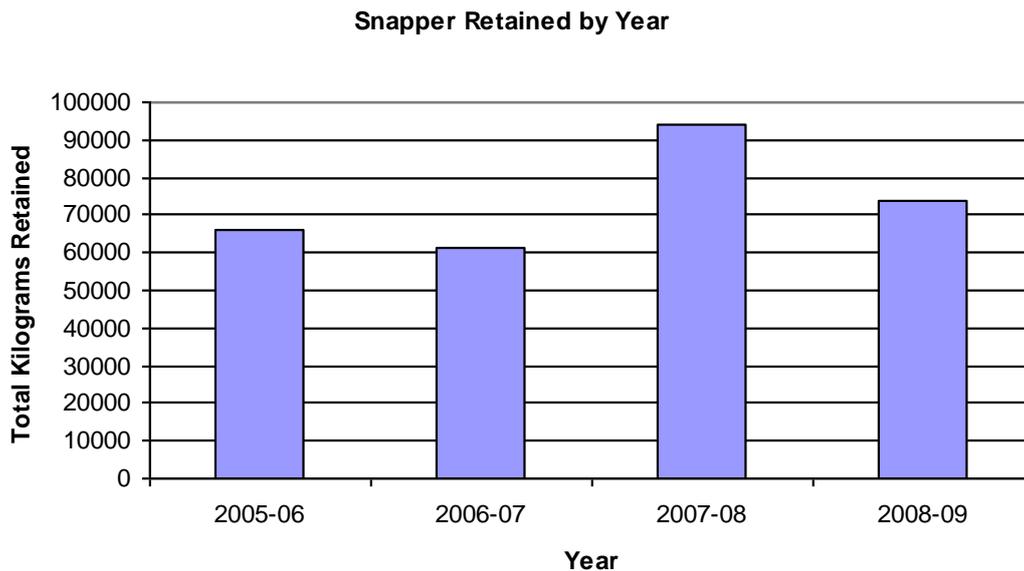


Figure 7. Snapper Harvest by Year (Provided by SARDI Aquatic Sciences).

Scientific advice indicates that there is a strong cohort in the fishery now and also good recruitment entering the fishery. This should increase the resilience of the stock to current fishing pressure.

It was noted that there is a risk of negative social issues associated with the Snapper fishery, associated with heavy targeting of the species by both the recreational and commercial sectors after the end of the annual November closure.

The workshop considered that the Charter Boat Fishery is currently sustainably harvesting South Australian Snapper resource at its full exploitation rate, having a **moderate (C2)** impact on the stocks. It was agreed that the fishery was **likely (L6)** to remain at this full exploitation rate over at least the next 5 years. This resulted in a risk rating of **MODERATE (12)**.

Indicator

- Total catch
- Total effort
- Catch per unit effort

The robustness of these indicators are considered to be low at the present time as there is only limited historical information on the charter fishing sector due to the relatively short reporting period.

Performance measure

- Increasing trend over a period of 3 years exceeding 10% of current level.

King George Whiting

King George Whiting (*Sillaginodes punctata*) is also considered an 'icon' species for of South Australia. It is the second most targeted species within the SARCBF. The species is distributed state wide and is targeted by most operators throughout the state.

Objective

Ensure the King George Whiting resource is harvested within ecologically sustainable limits.

ERA Risk Rating: Sustainable harvest levels of King George Whiting (*Sillaginodes punctata*) (MODERATE)

Nursery areas for King George Whiting are shallow, protected bays where post-larvae arrive during the winter and spring each year. Juveniles reside in these nursery habitats for a year or two before they move into gulf waters or deeper areas of the West Coast bays, which are characterised by broken, low profile reef and stands of seagrass (e.g. *Posidonia* spp) (Jones *et al.*, 1990).

A total of 17.98 tonnes of KGW were harvested by this sector in 2006/07 (Knight *et al.* 2007) compared to 354 tonnes for the same period by the commercial sector (Knight and Tsolos, 2009). A further 606.5 tonnes was estimated to be harvested by the recreational sector (Jones and Doonan, 2005). This places the charter sector catch at less than 2% of the total state catch for that year. It is estimated that these figures have changed since 2006/07 and harvest levels in the fishery may increase with public demand. The species is not targeted to the extent of Snapper in terms of 'trophy' fishing. A summary of KGW harvest by month can be seen below.

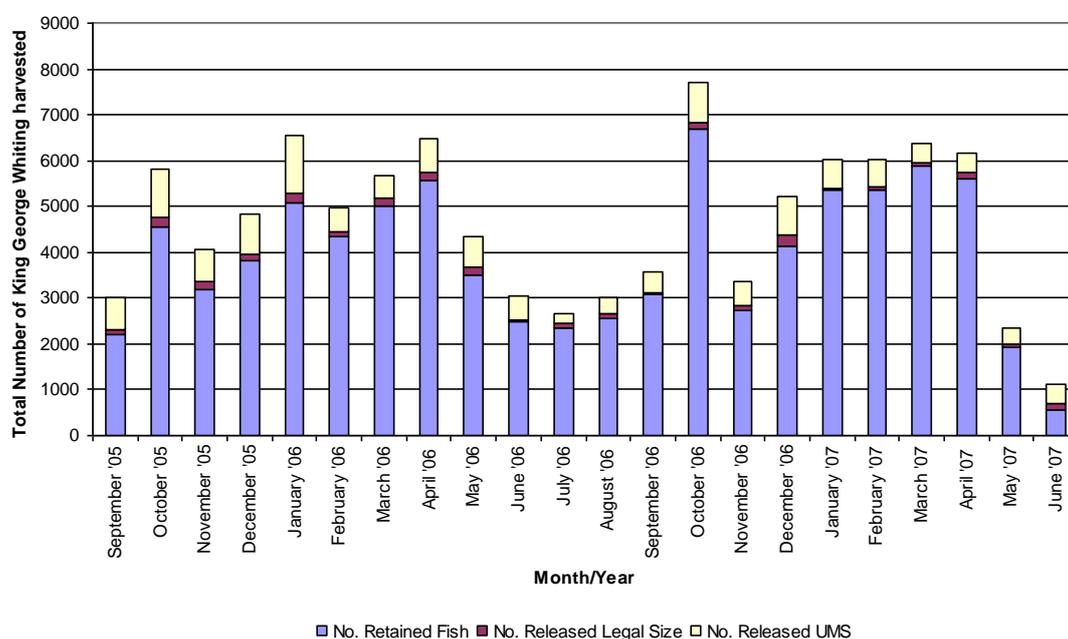


Figure 8. King George Whiting harvest by month (Knight *et al.*, 2007)

Additional information provided by SARDI Aquatic Sciences in Figure 8 below indicates the take of King George Whiting over the 4 years since charter logbook requirements were introduced.

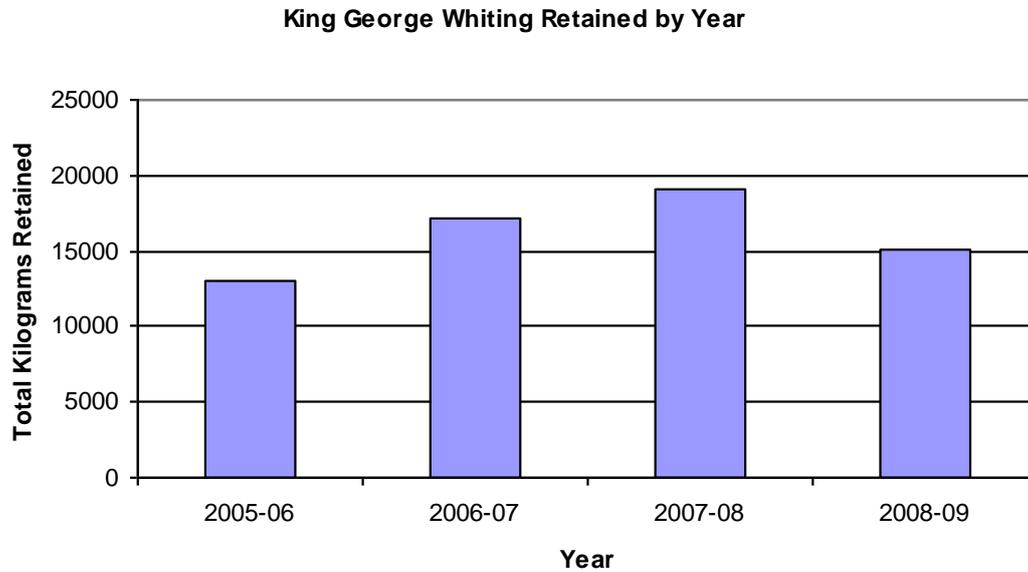


Figure 9. King George Whiting Harvest by Year (SARDI Aquatic Sciences, 2009).

There have been a number of new management measures introduced for King George Whiting in recent years. The changing of the state size limits into two distinct areas and the reduction of bag and boat limits are aimed in protecting breeding stocks of King George Whiting. Additional measures like the net buyback scheme have also removed a significant portion of effort from the MS fishery. No new management changes have been proposed.

The workshop considered that the proposed desalination plant in Spencer Gulf may negatively impact on juvenile fish nursery areas and potentially reproduction of key species in the gulf.

It was considered that the fishery is currently sustainably harvesting South Australian King George Whiting resource at its full exploitation rate, having a **moderate (C2)** impact on the stocks. It was agreed that the fishery was **likely (L6)** to remain at this full exploitation rate over at least the next 5 years. This resulted in a risk rating of **MODERATE (12)**.

Indicator

- Total catch
- Total effort
- Catch per unit effort

The robustness of these indicators are considered to be low at the present time as there is only limited historical information on the charter fishing sector

due to the relatively short reporting period. Catch return logbooks have provided information on catch from this sector from 1 July 2005 until present, but longer term historical information on the species is mainly based around the commercial marine scalefish sector.

Performance measure

- Increasing trend over a period of 3 years exceeding 10% of current level.

4.1.2. Regional Target Species

Bight Redfish (Nannygai)

Bight Redfish (*Centroberyx affinis*) is taken by both the Charter Boat Fishery and the broader recreational sector. The Charter Boat Fishery's catch of Bight Redfish in 2006/07 totalled 14.26t (estimated weight).

ERA Risk Rating: Impact on breeding stocks of Bight Redfish (Nannygai) (LOW)

This is an offshore, deepwater species. This species is relatively slow growing and reaches maturity at approximately 4 years of age and lengths of 20-25 cm (Kailola *et al.*1993). Key factors considered in the risk rating were:

- Species targeted in specific areas throughout the state;
- Not a permitted species for commercial MSF fishers.
- In 2005 and 2006 catch of this species for charter sector was 8.39 and 14.26 tonnes respectively. This catch is considered to be relatively small relative to the total catch for the stock. The monthly catch of this species is summarised in Figure 8 below.
- Total numbers of Bight Redfish retained for each year can be seen in Figure 11.
- Recreational catch is estimated to be larger than the charter sector catch with Jones & Doonan (2005) estimating the catch to be approximately 40 tonnes.
- Commonwealth fishery harvest has historically taken a large quantity of this species in the GAB trawl. Between 1995 and 2002 the catch fluctuated between approximately 200 – 800 tonnes (Lynch & Garvey., 2003).

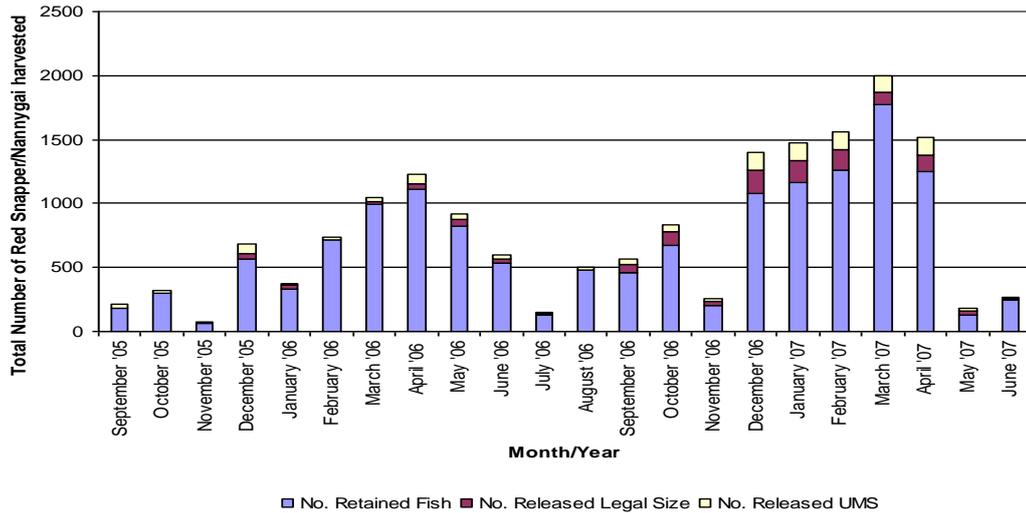


Figure 10. Bight Redfish harvest by month (Knight *et al.*, 2007)

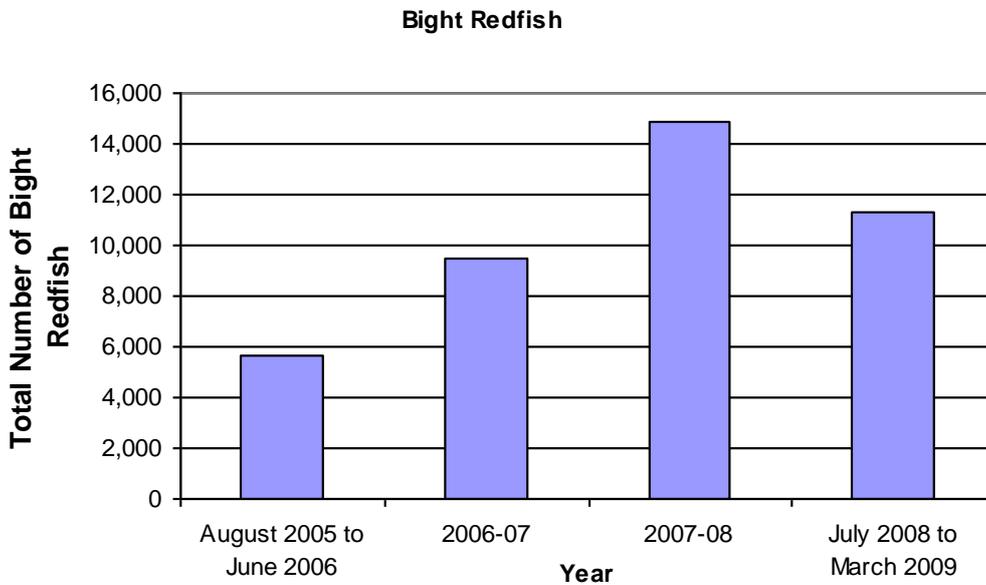


Figure 11. Total Number Bight Redfish Retained by Year (SARDI Aquatic Sciences, 2009)

There is no direct information and currently no studies being conducted on this species. No management issues have been identified.

The workshop considered that the greatest consequence of the Charter Boat Fishery fishing the Bight Redfish stock at current levels was that it may be fully fished. The fishery was therefore considered to be having a **moderate (C2)** impact on the stock. However it is **unlikely (L3)** that these fishing activities are unsustainable, given the low level of harvest across all state fisheries and compared to sectors such as the commonwealth fishery. This resulted in a risk rating of **LOW (6)**.

Other regional target species

These species have been included in the risk assessment process as they are specifically targeted by the charter fishing sector in specific locations around the state. As the overall risk rating from charter fishing is considered negligible due to the low numbers taken, the species have been grouped together for this report.

ERA Risk Rating: Impact on breeding stocks (NEGLIGIBLE)

- Specific bag and boat limits apply to these regional target species for the charter fishing sector.
- It was acknowledged that the take of these species was approximately <1% of the total state catch.
- There were no specific management issues with the species.

Therefore, it was considered **likely (C6)** that the fishery will have a **negligible (L0)** impact on the populations of these species. This resulted in a risk rating of **NEGLIGIBLE (0)**.

4.1.3. Other Retained Species

Other retained species have been identified through the stakeholder workshops. These species are taken when targeting the primary species and may or may not be retained by passengers, or are targeted to a much lesser extent than the primary target species. This set of species include the 'species of interest group' where the species may be more vulnerable to fishing pressure due to its life history characteristics, there are management or stock concerns, or there may be particular community or conservation interests.

A full list of retained species is shown in Table 4.

The second group collates all other species kept while conducting charter fishing operations. This could include marine scalefish, crustaceans, molluscs or any other species taken. The reasoning for the distinct groupings is discussed further in this assessment report.

4.1.4. Species of Interest

Western Blue Groper

The Western Blue Groper (*Achoerodus gouldii*) is shown to be a temperate protogynous hermaphrodite (both male and female sexual organs), which spawns between early winter and mid-spring. Because the Western Blue Groper changes body colour at about the time of sex change, its colour can be used as a proxy for sex for estimating the size and age at sex change and for estimating growth.

The following characteristics make the Western Blue Groper highly susceptible to overfishing: 1) exceptional longevity, with a maximum age (70 years); 2) slow growth for the first 15 years and little subsequent growth by females; 3) late maturation at a large total length and old age (~17 years); and 4) late sex change at an even greater total length and age (~35 years).

Many of these characteristics are found in certain deep-water fishes that are likewise considered susceptible to overfishing (Coulson *et al.* 2009).

These characteristics increase the sustainability risks to the Western Blue Groper stock and hence it was considered a 'species of interest' in this assessment.

Objective

Minimise fishery impacts on populations of Western Blue Groper.

ERA Risk Rating: Impact on breeding stocks of Western Blue Groper (MODERATE)

Currently there is a total closure for the taking of this species in both gulfs including Backstairs Passage and Investigator Strait. The species is allowed to be taken by recreational fishers and charter boat fishers outside of this closure area.

The species is common in offshore areas fished by the charter sector and as such, there is a higher chance of capture. Relevant sustainability considerations included:

- Take of this species was agreed to be low <100 fish kept per year.
- Logbook data recorded 36 caught, 19 released = 55 fish state-wide in (2006/07).
- Summary logbook data indicated 101 fish were caught in 2007/08 licensing year. For 2008/09 less than five fishers have taken WBG (<5 fishers subject to confidentiality).
- Issues with local depletion of large breeding fish.
- Barotrauma issues when fish taken out of deep water >20m and there are concerns about the survival of these fish after release.
- Under Commonwealth OCS arrangements, all Commonwealth fishers which operate in Commonwealth waters off South Australia are able to take 50kg possession of WBG per fishing trip.
- There are concerns regarding localised depletion of large fish.
- There are concerns for this species at a stock level.
- Not a permitted species in the MSF.
- Risk of concern by community is reasonably high, therefore there needs to be mechanisms in place to show that the species is being managed sustainably.
- Should ensure take of Western Blue Groper by each sector doesn't increase.

Therefore, it was considered **possible (L4)** that the Charter Boat Fishery will have a **moderate (C3)** impact on populations of Western Blue Groper over its distribution. This resulted in a risk rating of **MODERATE (12)**.

Indicator

- Total catch

Performance measure

- Take of Western Blue Groper remains below 100 fish per year.

Other species of interest

The Charter Boat Fishery has access to these species. The catch is <5% of all sectors, with some species e.g. pipis and cockles not recorded as been taken by fishers. As some species have management issues (i.e. SBT), inclusion was necessary.

Other species included in this group were;

- Sharks
- Razorfish
- Giant Cuttlefish
- Pipis
- Mud Cockles
- Southern Sea Garfish

ERA Risk Rating: Impact on breeding stocks (NEGLIGIBLE)

- Very small catch of sharks, Razorfish and Giant Cuttlefish in the fishery.
- No take of Pipi and Mud Cockles has been recorded. SCBOOA indicated no take of these species occurs.
- Some of the species identified were used as bait, which was in most cases purchased prior to the trip.
- SBT bag and boat limits apply, with no multi day possession limits currently allowed under the OCS arrangements.
- The charter catch of SBT is 10 tonnes - this is negligible compared with the total global or Australian catch, recognising that the stock is heavily depleted. The fishery is operating consistently with national SBT management agreements.

Therefore, it was considered **likely (L6)** that the Charter Boat Fishery would have a **negligible (C0)** impact on the populations of these species. This resulted in a risk rating of **NEGLIGIBLE (0)**.

4.1.5. Other species

There are a large number of species retained as bycatch in the fishery (i.e. species caught in addition to those listed above as primary target species, or regional target species and species of interest). These other bycatch species

are caught in much lower numbers. A full list of species retained by the Charter Boat Fishery can be seen in table 4.

ERA Risk Rating: Impact on breeding stocks of other species (NEGLIGIBLE)

As reported by Knight *et al.* (2007), there are a number of by-catch species in the Charter Boat Fishery which are kept while targeting specific species.

Relevant considerations included:

- Catch of these species is considered to be very low.
- No specific management issues identified with these species.

SCBOOA identified that information on these species is collected through their logbook returns.

Therefore, it was considered **likely (L6)** that the fishery will have a **negligible (C0)** impact on the populations of 'other species'. This resulted in a risk rating of **NEGLIGIBLE (0)**.

4.2. Non-Retained Species

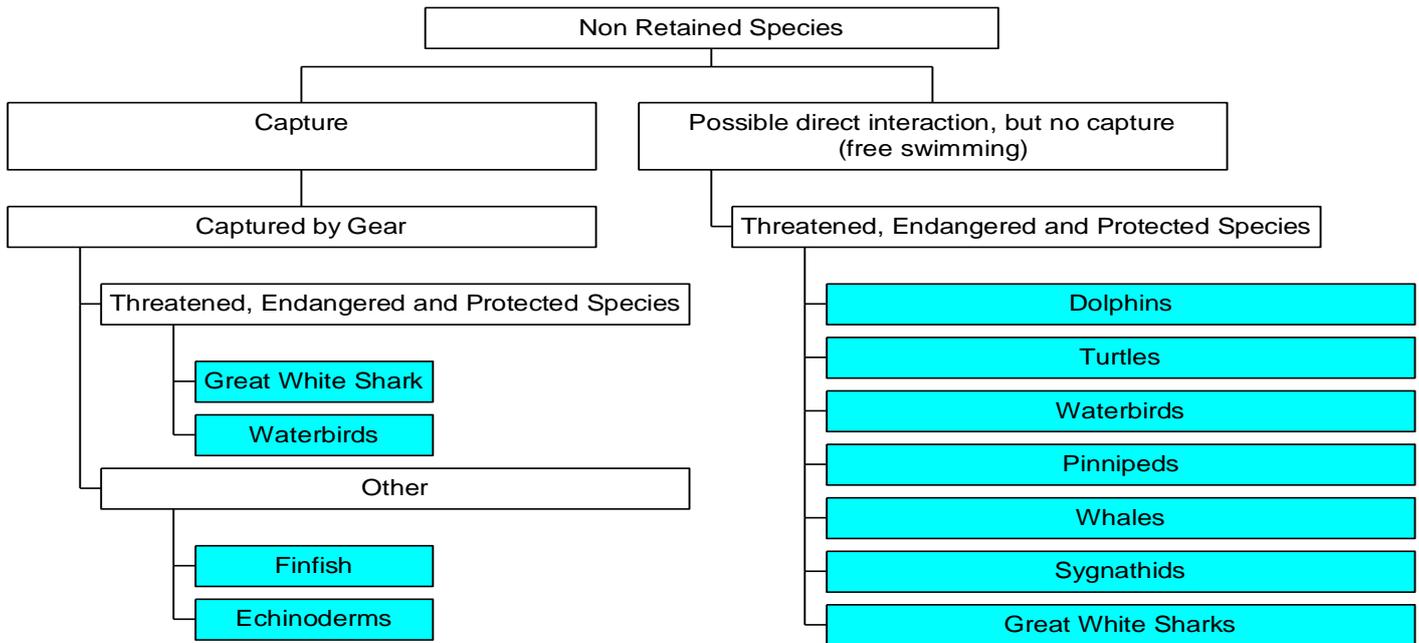


Figure 12. Component Tree for Non-Retained Species

A blue box indicates that the issue was considered a negligible risk, with no specific management required, and only a justification is presented.

4.2.1. Captured by Gear

Threatened, endangered and protected species

On occasions the sector interacts with threatened, endangered and protected species (TEPS) which may be caught by registered gear. It is a requirement under the *Fisheries Management Act 2007* and the *Environment Protection and Biodiversity Act 1999* (EPBC Act) to record any interactions with TEP species.

ERA Risk Rating: Impact on TEPS species captured in gear (NEGLIGIBLE)

Current management arrangements require Charter Boat Fishery licence holders to complete TEPS interaction logbooks if an interaction occurs with a TEPS species and provide the returns to SARDI Aquatic Sciences with their monthly catch logbook returns.

The SBCOOA indicated there is minimal capture of these species. Great White Shark captures result in release in a live and vigorous state once the animal is identified as a protected species.

Because catch levels are believed to be extremely low capturing one of these species is **likely (L5)** but with a **negligible (C0)** impact on populations. This results in a risk rating of **NEGLIGIBLE (0)**.

Other species

Several other species are caught on gear by the Charter Boat Fishery (Table 8). These may be species caught during closed seasons or areas, or possible unwanted or unpalatable species encountered in different regions. These species are usually quickly returned to the water by operators.

Table 8. Species captured and released that were legal size (Knight, *et al.* 2007).

Species Name	September 2005 to June 2006	July 2006 to June 2007
Albacore	20	62
Australian Herring	315	473
Australian Salmon	282	290
Barracouta	318	250
Blue Crab	122	44
Blue Groper	12	19
Blue Mackerel	7	3
Blue Morwong	-	5
Bronze Whaler Shark	11	3
Cuttlefish	12	3
Flathead	96	66
Garfish	8	55
Gummy Shark	25	8
Jackass Morwong	1	1
King George Whiting	1,538	1,237
Ling	110	68
Leather Jacket	535	979
Other or Mixed Species	245	129
Parrotfish/Wrasse	2,403	2,826
Red Mullet	467	462
Bight Redfish (Nannygai)	239	1,015
Rock Lobster	53	-
Sampson Fish	55	44
School Shark	14	4
School Whiting	89	35
Snapper	1,792	2,009
Snook	51	121
Southern Bluefin Tuna	401	1,095
Southern Calamary	11	7
Striped Perch	16	13
Swallowtail	55	74
Sweep	50	168
Trevally	300	408
Weedy Whiting	253	56
Yellowtail Kingfish	1	6
Totals	9,907	4,040

In addition to adhering to area and seasonal closures, operators also advised that they avoid fishing areas where prohibited species occur (e.g. Snapper on offshore reefs during November). This is an initiative by the industry to avoid interacting with species like Snapper during closures. .

ERA Risk Rating: Impact on other species captured in gear (NEGLIGIBLE)

Therefore, it was considered that the impact of the Charter Boat Fishery on breeding populations of these other species was **likely (L6)** to be **negligible (C0)**. This results in a risk rating of **NEGLIGIBLE (0)**.

Indicator

- Number of Interactions

4.2.2. Possible direct interaction but no capture

Threatened, Endangered and Protected Species

There are a number of TEPS identified under both state and commonwealth legislation. These species are not allowed to be taken and must be released immediately if an interaction occurs. South Australia requires any interaction with these TEP species by commercial fishers to be recorded and provided to SARDI Aquatic Sciences.

Logbook recordings of TEPS interactions have changed since charter logbooks were introduced in 2005. Previous interactions were recorded as sightings and not just contact with gear or vessel. With the introduction of a specific TEPS interaction logbook the definition of an interaction is more clearly understood and the quality of reporting has improved substantially.

Operators understand that if a serious interaction occurs there may be a strong adverse community and or media reaction and have a strong incentive to manage these risks proactively in the interests of sustainability. .

ERA Risk Rating: Impact on TEPS through interaction but no capture (NEGLIGIBLE)

Interactions do occur in the fishery and is **likely (L6)** to have a **negligible (C0)** impact on species identified. This results in a risk rating of **NEGLIGIBLE (0)**.

Indicator

- Number of Interactions

4.3. General Ecosystem Impacts of Fishing

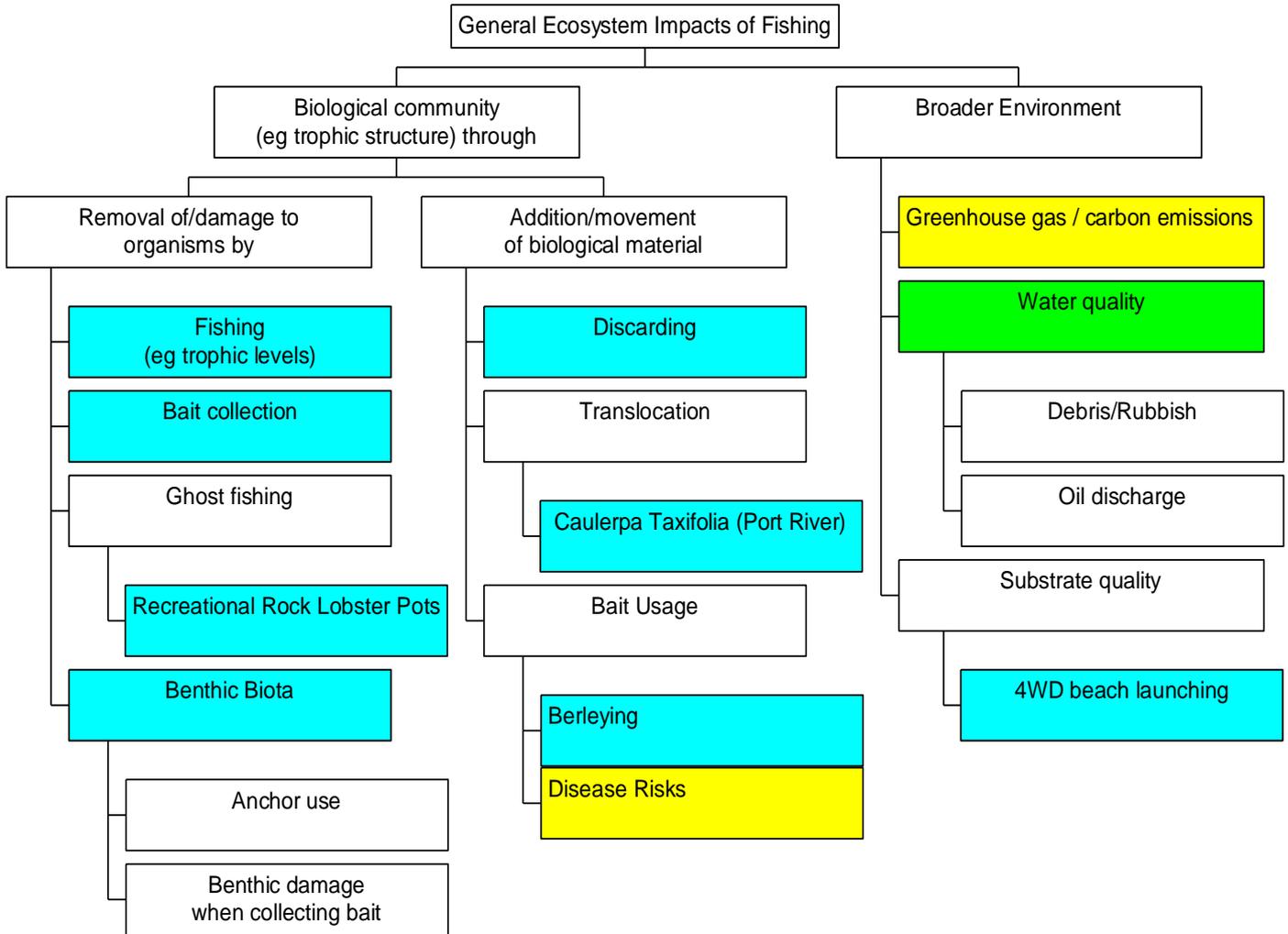


Figure 13. Component Tree for General Ecosystem Impacts of Fishing

A yellow box indicates that the issue was considered a high enough risk to warrant a full performance report. A green box indicates that a full justification is needed for why the issue was considered low risk. A blue box indicates that the issue was considered a negligible risk, with no specific management required, and only a justification is presented.

4.3.1. Removal of / damage to organisms

Trophic impacts of fishing

In some high catch fisheries there may be significant trophic impacts as a result of species removal. The total state catch of species in the Charter Boat Fishery is considered to be less than 10% of state sector catch and so the impacts from the fishery are substantially less than for other sectors.

ERA Risk Rating: Impact on the environment through fishing (NEGLIGIBLE)

Therefore, it was considered that the trophic impact of total removals from the Charter Boat Fishery was **likely (L6)** but with a **negligible (C0)** impact, resulting in a risk rating of **NEGLIGIBLE (0)**.

Bait collection

Bait collection is not a major part of the fishery's operation. In most cases the operators purchase bait prior to fishing trips. On occasions that bait is collected the activity can only be conducted by passengers, as operators are not allowed to undertake fishing during trips. Take for bait use would include small marine scalefish, cephalopods and mollusc species.

Through discussion with the industry it is understood that most bait is purchased from fish processors rather than collected during the fishing charter. Although incidental catch of potential bait species does occur during charter fishing trips.

ERA Risk Rating: Impact on the environment through bait collection (NEGLIGIBLE)

Therefore, it was considered that the impact of bait collection by the Charter Boat Fishery could have **occasional (L5) minor (C0)** impact, resulting in a risk rating of **NEGLIGIBLE (0)**.

Recreational Rocklobster pots

There is a possibility that recreational rock lobster pots brought on board the boats may be lost once set.

SCBOOA indicated that a loss has not occurred in the fishery although it may be possible. Most operators prefer not to have passengers bringing pots on trips due to logistics in setting and retrieving the gear.

ERA Risk Rating: Impact of ghost fishing (NEGLIGIBLE)

The loss of these pots is considered to occur on **rare (L2)** occasions and would have a **negligible (C0)** effect in the worst instance, resulting in a risk rating of **NEGLIGIBLE (0)**.

Benthic biota

Small localised areas may be impacted by the operations of charter boat fishing.

ERA Risk Rating: Impact on benthos (NEGLIGIBLE)

The number of charter fishing vessels in operation and the number of operators collecting bait is small compared to the recreational sector. It is therefore considered that the impact of these operations is minor.

According to Jones and Doonan (2005), there were more than 30,000 recreational fishing vessels used in South Australia. This compares to 108 charter licence holders, the majority of whom use one vessel.

Therefore, the Charter Boat Fishery was considered **unlikely (L3)** to have an impact on the benthos with a **negligible (C0)** consequence for the impact currently occurring. This results in a risk rating of **NEGLIGIBLE (0)**.

4.3.2. Addition / Movement of Biological Material

Discarding

The discarding of fish, as non-retained catch, by the fishery results in a food source that would not normally be available to other organisms.

In discussion with Charter Boat Fishery operators, it is understood there is a general agreement among operators not to allow high grading of fish during fishing trips.

ERA Risk Rating: Impact on general environment (NEGLIGIBLE)

Therefore, it was considered that the impact of discarding of biological material by the fishery was **possible (L4)** but with a **negligible (C0)** impact. This results in a risk rating of **NEGLIGIBLE (0)**.

Translocation – *Caulerpa taxifolia*

Vessels used in the Charter Boat Fishery travel between regions and could potentially translocate exotic plants such as *Caulerpa taxifolia*.

Caulerpa taxifolia is a marine alga that has been associated with biological invasions with negative environmental and economic effects. *Caulerpa taxifolia* was first detected in South Australia in 2002 and is now considered ineradicable in the Port River system, of which it infests approximately 5.5km². The distribution of the algae has changed little over the past 3 years, with the exception of a new outbreak in North Haven marina in 2008. High densities are associated with thermal and nutrient rich effluent sources in the Port River (Deveney *et al.* 2008).

No charter boat vessels operate from the Port River and there is currently an anchoring ban in place for the entire river. Most operations occur on offshore grounds. The only reason identified by operators that a vessel would be travelling into the Port River would be to conduct maintenance (e.g. out of water survey inspections).

ERA Risk Rating: Impact on the general environment (NEGLIGIBLE)

Therefore, it is **unlikely (L3)** that the exotic weed would be translocated by charter operations and it would have a **negligible (C0)** impact if it occurred noting current understanding about the risk of survival outside the Port River environment. This results in a risk rating of **NEGLIGIBLE (0)**.

Berleying

The Charter Boat Fishery uses berley as a tool to attract fish to the location.

ERA Risk Rating: Impact on the environment (NEGLIGIBLE)

Mostly local bait mixed with fish oil is used to berley up fish. Stakeholders indicated that the sector would berley only lightly and indicated that the recreational sector seems to use berley far more.

It is considered that the berleying would have **occasional (L5)** impact on the environment with the consequence being **negligible (C0)**. This results in a risk rating of **NEGLIGIBLE (0)**.

Disease risks

Objective

Minimise disease risks associated with imported bait usage.

ERA Risk Rating: Impact on the environment (MODERATE)

Imported bait must meet AQIS standards, however some charter operators considered that use of these imported species should be banned. Most operators in South Australia prefer to use local bait.

It is exceptionally difficult to trace the source of most disease outbreaks in the marine environment. Consequently it would be difficult to directly link disease outbreaks with the use of specific baits in most cases. Monitoring of any disease outbreaks will be undertaken by Biosecurity SA.

Therefore, although the impact of translocation of exotic pests or diseases via bait could be **severe (L3)**, it is **unlikely (C3)** to have a significant impact within the charter sector due to the volumes of bait used. This results in a risk rating of **MODERATE (9)**.

Indicator

- Number of recorded disease outbreaks.

4.3.3. Broader Environment

Greenhouse gas / carbon emissions

Objective

Minimise impact of green house emissions from the Charter Boat Fishery.

ERA Risk Rating: Impact on general environment (MODERATE)

There are 108 licences in the fishery with not all licences being used at the same time. Although the number of vessels is minimal compared to the recreational sector, greenhouse emissions will become more of an issue with the commonwealth governments introducing the carbon trading scheme. Therefore it was noted that the issue of greenhouse gas and carbon emissions warranted a higher risk rating.

The impact of greenhouse emissions released by the fishery may have an **occasional (L5)** impact on the environment with a consequence of **moderate (C2)**. This results in a risk rating of **MODERATE (10)**.

Indicator

- Code of conduct developed to address risks of greenhouse emissions

Water quality

Fishing operations produce small quantities of plastic and paper debris and on occasion oil spillage.

ERA Risk Rating: Impact on general environment (LOW)

Operators have a strong view that all rubbish brought on board should be disposed of appropriately. Oil spillage is kept to a minimum as operators do not change oil at sea.

There is an **occasional (L5) minor (C1)** impact on the environment. This results in a risk rating of **LOW (5)**.

4WD beach launching

Some operators in more remote areas launch vessels from the beach.

ERA Risk Rating: Impact on general environment (NEGLIGIBLE)

Very few operators beach launch as most relevant ports have fully developed boat launching sites.

Whilst beach launching does occur in the fishery - i.e. it's **likely (L5)**, the consequences are **negligible (C0)**. This results in a risk rating of **NEGLIGIBLE (0)**.

4.4. Governance

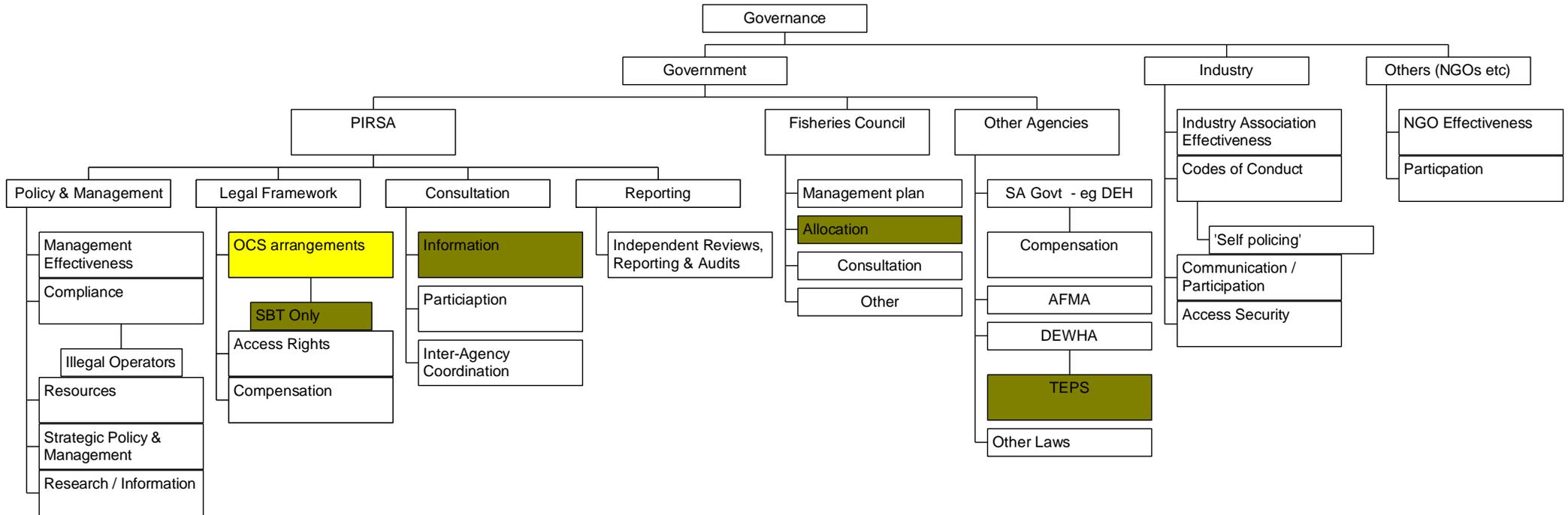


Figure 14. Component Tree for Governance

*No generic components have been removed from the tree but only those boxes that are highlighted yellow and orange will be reported on.

A yellow and pink box indicates that the issue was considered a high enough risk to warrant a full performance report.

The governance section is not assessed for risks as per the other sections in this report. Issues identified by stakeholders for either further action or identified current issues are reported on below.

4.4.1. Department of Primary Industries and Resources South Australia

Offshore Constitutional Settlement (OCS) arrangements – Southern Bluefin Tuna management

There are issues with bag and boat limits of Southern Bluefin Tuna (SBT), which have been raised by Charter Boat Fishery operators. These issue mainly effect operators which carry more than 6 passengers per trip or operators which undertake multiday trips.

Some operators conduct multi day trips with on occasion large numbers of passengers. The current limit of 6 SBT per trip (which applies even when staying out for more than 1 day) means only 6 fish can be kept and need to be 'distributed' among passengers.

As the allocation of this species is an Offshore Constitutional Settlement (OCS) arrangement there needs to be a jurisdictional agreement between the state government and the Commonwealth government before changes are able to be made.

Indicator

- Bag and trip limits

Performance measure

- Catches not exceeding limits

Information

Reports are regularly produced by PIRSA and SARDI Aquatic Sciences. Reports addressing stock assessment and fishery sector performance are a key management tool for fisheries in South Australia. There is an importance in providing these reports to stakeholders who utilise the resources.

There is room to improve the level of information sharing between the department and the industry. One possibility is the inclusion of specific information sharing timeframes within the existing communication protocol between PIRSA and the SCBOOA. This would then address the issue by clearly stating specific requirements in providing reports to the industry once they are available for the public.

Indicator

- Timely provision of information to SCBOOA

Performance measure

- Reports provided to SCBOOA as available

Allocation

PIRSA Fisheries is in the process of finalising the allocation policy which will affect all sectors. As a result there is some uncertainty for sector including the Charter Boat Fishery on issues like increase in passenger numbers and the effect this will have on bag, boat and trip limits for passengers if initial sector allocations are exceeded.

The SCBOOA raised the issue as it is concerned that if tourism increases, the charter component of the recreational sector's allocation may be reduced, especially if the historical catch increases past that of the formal allocation in the management plan.

Indicator

- Delivery of management plan

Performance measure

- To be determined

Threatened, endangered and protected species

Reporting of interactions with TEPS species is yet to be collated into a report. PIRSA Fisheries is currently in discussion with SARDI to progress a general report for all commercial fisheries within South Australia.

SCBOOA indicated that they would like to see summary reporting on the information being provided to SARDI in relation to TEPS interactions. This information is available in the annual summary report.

Indicator

- Timely provision of information to SCBOOA

Performance measure

- Reports provided to SCBOOA as available

4.5. Community

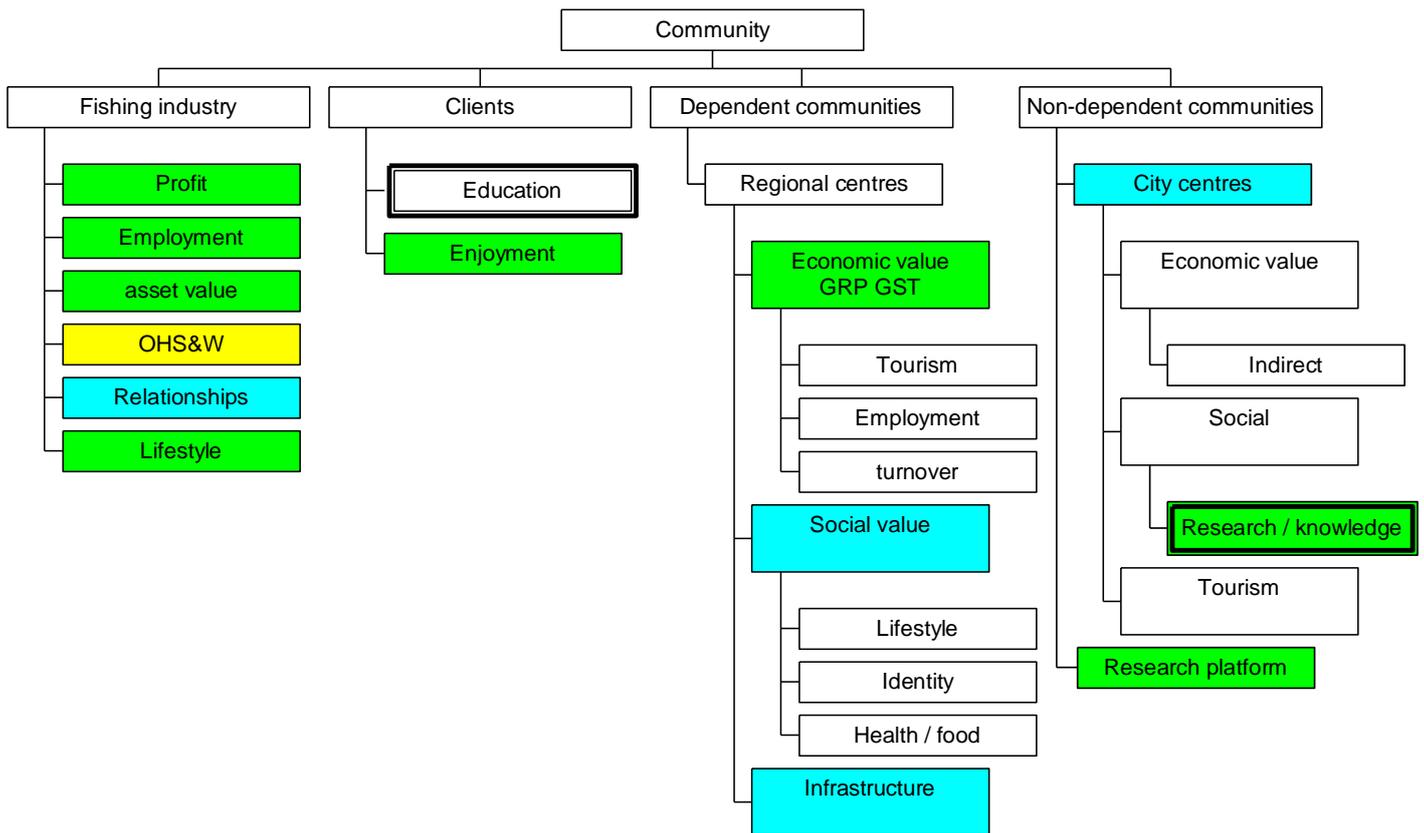


Figure 15. Component Tree for Community

A yellow box indicates that the issue was considered a high enough risk to warrant a full performance report. A green box indicates that a full justification is needed for why the issue was considered low risk. A blue box indicates that the issue was considered a negligible risk, with no specific management required, and only a justification is presented.

4.5.1. Fishing Industry Community

Profit

The ability to operate in the fishery directly impacts profit margins for licence holders. Access security to aquatic resources and opportunity to expand with increased demand by passengers is a key issue raised by the industry and one that could directly impact on the industry's profitability.

PIRSA Fisheries and the industry need to work closely to ensure that management arrangements minimise the negative impacts of the licence holders in a way that makes their operations unviable.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

A secure licence and ongoing access to a productive fishery are key aspects of a charter fishing business. These factors are a key determinant of ongoing viability and hence profit.

Internet research conducted by Knight et al (2007) shows costs for individual charter trips vary depending on the type of activity requested. For example an inshore scalefishing trip may cost between \$120 and \$180 per day per client, an offshore/deepwater scalefishing trip between \$200 and \$650 per day per client depending on the originating port and destination, a diving tour between \$150 and \$230, and an eco/passenger tour between \$100 and \$180 per day per client. On the basis of these figures the economic value of the Charter Boat Fishery can be estimated to be between \$3 and \$4.7 million (Table 9).

Table 9: Simplified economic cost model for the 2006/07 financial year for the most popular activities

Activity Types	No. of clients	Minimum Fee	Maximum Fee	Est. min forecast	Est. max forecast
Diving	36	150	230	5,400	8,280
Deepwater Scalefishing	17	200	650	3,400	11,050
Game Fishing	407	80	150	32,560	61,050
Inshore Scalefishing	16,553	120	180	1,986,360	2,979,540
Offshore Scalefishing	2,107	400	650	842,800	1,369,550
Eco/_Passenger Tour	2,405	50	100	120,250	240,500
Totals	21,726			\$2,990,770	\$4,669,970

This simple cost model does not really illustrate the true value of the industry. A full economic analysis would take into account the benefits the Charter Boat Fishery generates in a community in regards to tourism dollars, and would include the charter operator's maintenance and operating costs, and any associated employment stimulation (Knight *et al.*, 2007).

It was considered that the industry was viable and hence **likely (L6)** to continue to operate sustainably at current levels, and there would be **minor (C1)** negative financial consequences to communities if the fishery was not viable, resulting in a risk rating of **LOW (6)**.

Employment

Charter boat operations provide direct employment to licence holders and deck hands for larger operations.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

Most operators use smaller vessels and therefore in many cases the operation is an owner operator run business. In some cases vessels are trailered from other locations and the staff brought from other localities therefore employment may not be from the local community.

It was considered that the industry would **likely (L6)** continue to provide employment at current levels and **minor (C1)** impacts would result if employment decreased, resulting in a risk rating of **LOW (6)**.

Asset value

Charter Boat Fishery asset value is heavily reliant on the value of the fishing licence and vessels owned by the operator. It is an important part of the business value.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

The current limited entry policy is considered to be adequate based on catches. This means that licence values should remain stable.

Therefore, it was considered that there would be a **likely L6)** chance that any change in asset values would have a **minor (C1)** effect on operators, resulting in a risk rating of **LOW (6)**.

Occupational health, safety and welfare

Occupational health, safety and welfare (OHS&W) is a managed part of all businesses in South Australia. Legislative requirements are intended to ensure that work places (including charter boats) are safe.

ERA Risk Rating: Impact on the community from charter boat fishing (MODERATE)

All businesses in South Australia operate under the *Occupational Health, Safety and Welfare Act 1986*. This legislation and its regulations outline responsibilities of employers and employees when it comes to their work place (on this occasion being charter vessels). As such there are management steps that need to be taken by licence holders to ensure there is a safe working environment for the people running the charters and the passengers which utilise their services.

Therefore, it was considered that any change to current management would **likely (L6)** have a **moderate (C2)** effect as operators will need to meet all safety requirements, resulting in a risk rating of **MODERATE (12)**.

Indicator

- Number of workplace injuries (Monitored by SafeWork SA),

Relationships

The Charter Boat Fishery relies on good relationships with customers and the community to generate business. Although many of the passengers going on

charter fishing trips do not necessarily reside in the town where operators live, it is seen as a benefit to the community to build good relationships for the benefit of the community.

ERA Risk Rating: Impact on the community from charter boat fishing (NEGLIGIBLE)

It was considered that any negative relationships towards the Charter Boat Fishery would **likely (L6)** have a **negligible (C0)** impact on operations as in many cases passengers travel to a specific area to fish, resulting in a risk rating of **NEGLIGIBLE (0)**.

Lifestyle

In some cases the running of a charter fishing business is a lifestyle choice for operators as well as profit making business.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

Some operators choose to work as a part time operation on weekends to substitute income or for other reasons. Most operators strive to ensure that their business is profitable as well as a lifestyle choice.

Therefore if this lifestyle choice was impacted it would **likely (L6)** have a **minor (C1)** effect on the industry, resulting in a risk rating of **LOW (6)**.

4.5.2. Clients

Education

Operators in many cases get first time clients from all walks of life. Some passengers are unaware of regulations and fishing techniques so operators act as educators, this in turn benefits the community and the resource.

Rather than a risk this is more of a benefit to the clients/community

Enjoyment

Important avenue for passengers who may not own a vessel or have access to knowledge of fishing locations.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

It was considered that a if the fishery decrease it would **likely (L6)** have a **minor (C1)** impact on the community as there were other prospects for clients such as shore based fishing, resulting in a risk rating of **LOW (6)**.

4.5.3. Dependent Communities

Economic value

The economic value of having charter boat operations in dependant communities can have an impact on the areas of operation.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

The value to the community may change in some circumstances whether multi day trips are conducted (where passengers stays on vessel) or a single day trip where passenger may spend some time in the regional location and spend further money.

Table 9 below outlines the number of clients taken out by Charter Boat Fishery operators in different regions of the state.

Table 10. Number of clients by region (Knight *et al.* 2007)

Region	Sep 2005 to June 2006	July 2006 to June 2007
West Coast	2,618	2,501
Spencer Gulf/Coffin Bay	6,794	7,873
Gulf St. Vincent/KI	9,018	10,438
Victor Harbor/South East	914	872
Unknown region	-	45
Total	19,344	21,729

There was a clear value to the dependant communities of having these operations occur in the area although it was considered **likely (L6)** that it would only have a **minor (C1)** effect on most areas if the Charter Boat Fishery ceased to function communities are generally not built around charter fishing, resulting in a risk rating of **LOW (6)**.

Social value

There is a clear social value in having charter boat fishing within the state.

ERA Risk Rating: Impact on the community from charter boat fishing (NEGLIGIBLE)

Impact on social value if the fishery did not exist in a dependant community was **likely (L6)** to be **minor (C0)**, resulting in a risk rating of **NEGLIGIBLE (0)**.

Infrastructure

Charter boat fishing operations may require infrastructure in some dependant towns.

ERA Risk Rating: Impact on the community from charter boat fishing (NEGLIGIBLE)

There requirement of infrastructure is not as significant as in some commercial fisheries where marinas and loading docks have been specifically built to accommodate the sector. Many operators use existing recreational boat launching facilities for their operations.

It is **likely (L6)** that there is only a **negligible (C0)** consequence on infrastructure of not having a Charter Boat Fishery operating in a dependant community, resulting in a risk rating of **NEGLIGIBLE (0)**.

4.5.4. Non-Dependent Communities

City centres

There is a value of the Charter Boat Fishery to non-dependent communities like Adelaide.

ERA Risk Rating: Impact on the community from charter boat fishing (NEGLIGIBLE)

The community value in non-dependant communities would mostly focus on the availability of the sector for leisure purposes.

Therefore, it was considered **likely (L6)** that only a **negligible (C0)** impact to the community would result if the Charter Boat Fishery did not exist, resulting in a risk rating of **NEGLIGIBLE (0)**.

Research / knowledge

There is value in the information collected by the Charter Boat Fishery, which no other sector regularly provides. This is in the form of catch and effort data on species where current scientific knowledge is currently limited or not available; for example catch information on unusual species and passenger origin information.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

There is a benefit on the research and knowledge gained from this sector, although it is considered that if this information was not collected it would be **likely (L6)** that it would only result in a **minor (C1)** impact to the community, resulting in a risk rating of **LOW (6)**.

Research platform

In addition to charter boat fishing, the vessels used by the sector are utilised as research platforms on some occasions.

ERA Risk Rating: Impact on the community from charter boat fishing (LOW)

There is a benefit to fisheries research agencies through the use of these vessels although it is **likely (L6)** that it would only result in a **minor (C1)** impact if these platforms were not available alternatives may be located, resulting in a risk rating of **LOW (6)**.

4.6. Aboriginal Community

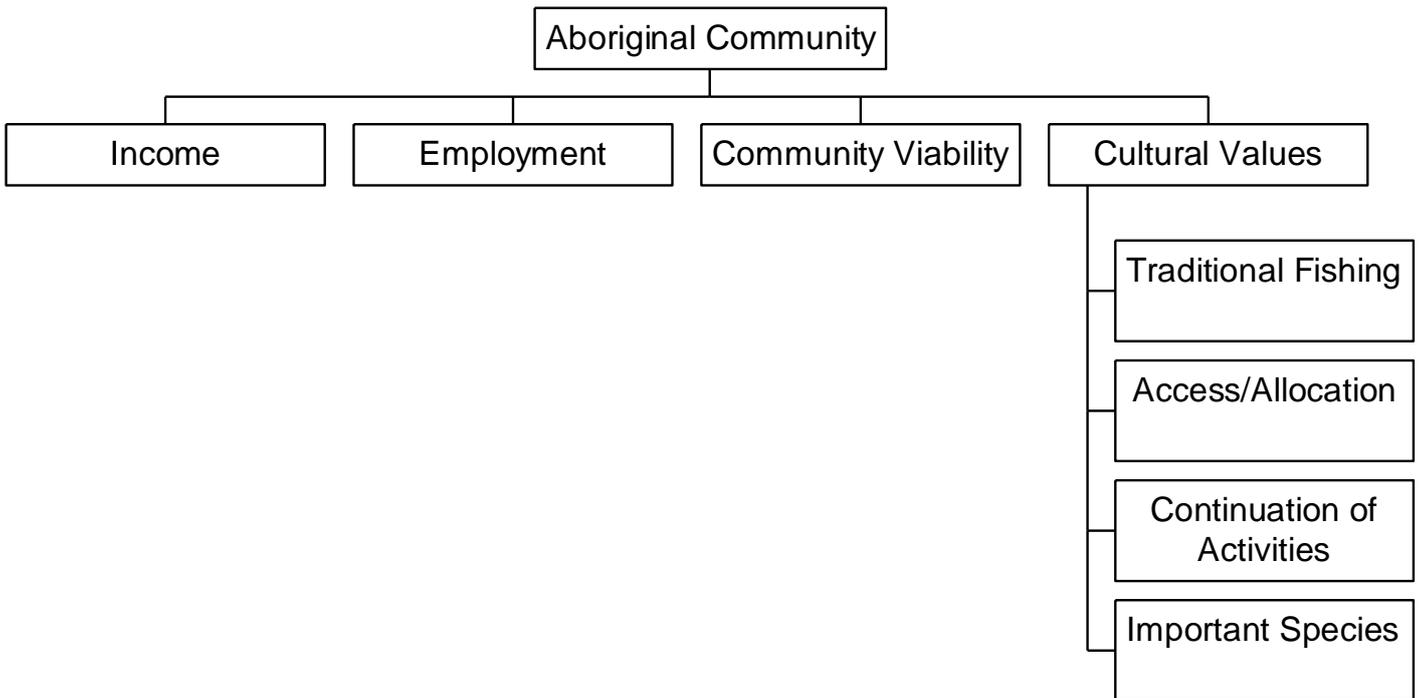


Figure 16. Component Tree for Aboriginal Community

The Aboriginal traditional component of the ESD Risk Assessment was not undertaken during this process, and a separate ESD Risk Assessment will be conducted under the Aboriginal Traditional Fishing Management Plan.

4.7. External Factors Affecting Performance of the Fishery

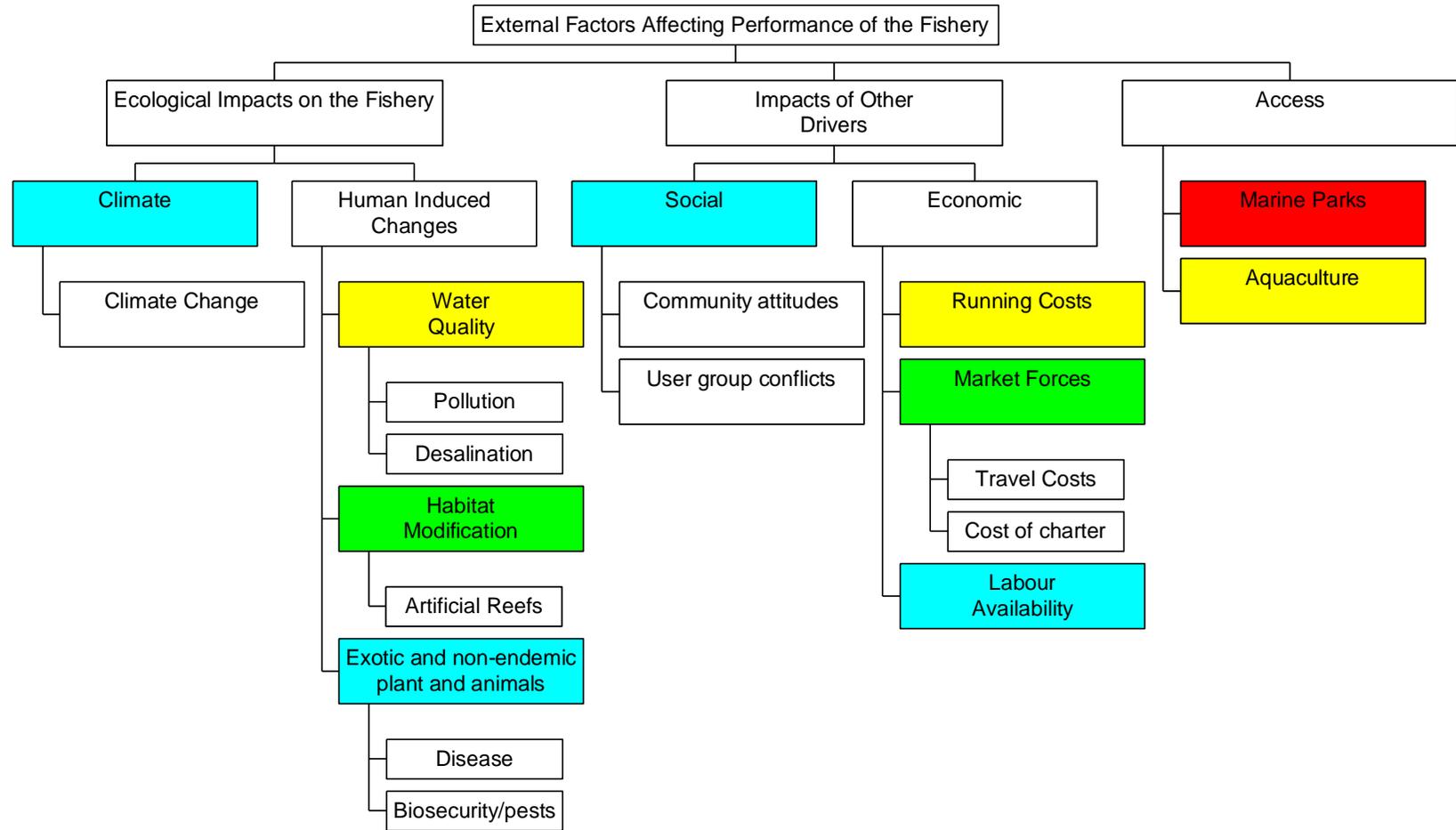


Figure 17. Component Tree for External Factors Affecting Performance of the Fishery

A red or yellow box indicates that the issue was considered a high enough risk to warrant a full performance report. A green box indicates that a full justification is needed for why the issue was considered low risk. A blue box indicates that the issue was considered a negligible risk, with no specific management required, and only a justification is presented.

4.7.1. Ecological Impacts on the Fishery - Climate

Climate change

With the increasing risk of climate change, there is a possibility that these impacts could have a negative affect on the fishery.

ERA Risk Rating: External Impact on the fishery (NEGLIGIBLE)

In the life of the management plan, which this report is a component of, it is considered that the effects of climate change will not be severe enough to make any significant management changes.

Therefore, it was considered that the impact of climate change over the next 5 years would be **likely (L6)** to have a **minor (C0)** impact, resulting in a risk rating of **NEGLIGIBLE (0)**.

4.7.2. Ecological Impacts on the Fishery – Human Induced Changes

Water quality

There is a risk that impacts from human induced changes to water quality could have negative impacts on the Charter Boat Fishery.

ERA Risk Rating: External Impact on the fishery (MODERATE)

With the development of the desalination plant in Spencer Gulf and other pollutants entering the gulf systems there is a possibility of negative impacts on aquatic resources. Further research is required on these issues to indentify impact son the natural marine system.

There was a general concern that the desalination plant could have severe impacts on the gulf system and that the impact assessments conducted were inadequate.

Keeping in mind that not all information on effects of poor water quality are know it is considered that the impact would **likely (L6)** have a moderate **(C2)** impact on the Charter Boat Fishery, resulting in a risk rating of **MODERATE (12)**.

Indicator

- Collecting water quality data in fishery areas as per EPA water quality guidelines.

DRAFT

Performance measure

- Monitoring water quality data in fishery areas as per EPA water quality guidelines.

Habitat modification

Artificial reef systems can have both a positive and negative effect on the Charter Boat Fishery.

ERA Risk Rating: External Impact on the fishery (LOW)

There is a clear short term benefit to the introduction of artificial reefs and fish congregate around these structures in larger numbers. This also allows easier targeting of these species by people with knowledge of where these structures exist.

Therefore the impact of these artificial reefs could provide **occasional (L5) minor (C1)** benefits to the Charter Boat Fishery, resulting in a risk rating of **LOW (5)**.

Exotic and non-endemic plants and animals

There is a potential threat that exotic and non-endemic species could have a detrimental impact on the Charter Boat Fishery.

ERA Risk Rating: External Impact on the fishery (NEGLIGIBLE)

Potential impacts could include habitat loss for juvenile species, disease risks and other impacts. Noting the above it is unlikely that any impacts of these species would cover all habitats utilised by this sector.

Therefore, it was considered that the impact of these species would **likely (L6)** only have a **negligible (C0)** impact on the Charter Boat Fishery, resulting in a risk rating of **NEGLIGIBLE (0)**.

Indicator

- New species appearing in SA marine habitats

Performance measure

- New species appearing in SA marine habitats, changes in habitat diversity

4.7.3. Impacts of Other Drivers

Social

Social issues including community attitudes to the sector and conflict with other fishing sectors have an impact on the Charter Boat Fishery.

ERA Risk Rating: External Impact on the fishery (NEGLIGIBLE)

The SCBOOA indicated that some conflict will always exist with other fishing sectors, although operators are keen to avoid it as there are no benefits from conflict.

It was considered that the social impacts on the fishery are **likely (L6)** to be **minor (C0)**, resulting in a risk rating of **NEGLIGIBLE (0)**.

Running costs

The cost associated with the running of a Charter Boat Fishery business may have potential risks to the sustainability of individual operators, especially if costs exceed that of profitability.

ERA Risk Rating: External Impact on the fishery (MODERATE)

Operations will heavily rely upon keeping overheads at a minimum, this includes things like petrol costs, maintenance costs and equipment costs, to name a few.

It is therefore to the benefit of the operator and the profit margin in minimising these costs. Some cost can be passed onto the passengers although there is a limit to what can be reasonably passed on.

Stakeholders considered that the impact of running costs on the fishery would **likely (L6)** have a **moderate (C2)** impact on the operators, resulting in a risk rating of **MODERATE (12)**.

Indicator

- . Annual monitoring and reporting in an economic assessment

Market forces

Market forces play a significant role in the operation of a business; charter boat fishing is no different.

ERA Risk Rating: External Impact on the fishery (LOW)

In many ways the charter fishing experience is a luxury leisure item, especially since people go on charters to catch a trophy fish. If the reason was for food etc a simpler and cheaper method would be to visit a fish monger.

In light of this it is **likely (L6)** that if market forces change the risk to the fishery of a negative impact would only be **minor (C1)**, resulting in a risk rating of **LOW (6)**.

Labour availability

Labour availability is a major issue in some sectors, commercial fishing operations suffered in the recent years with the boom in the mining sector. For larger operations where the licence owner may not be the operator this could have an impact.

ERA Risk Rating: External Impact on the fishery (NEGLIGIBLE)

PIRSA Fisheries has kept this in mind and as a result licence holders are allowed to have 5 registered masters on their charter licence. For multi vessel licences the operators are allowed to have 3 registered masters on each vessel. The SCBOOA did not feel there was an issue with the current setup.

These measures are aimed to reduce the risk to the operators and therefore it is considered that the impact is **likely (L6)** to be **negligible (C0)**, resulting in a risk rating of **NEGLIGIBLE (0)**.

4.7.4. Access

Marine parks

ERA Risk Rating: External Impact on the fishery (EXTREME)

The South Australian Government has committed to establishing 19 new marine parks by 2010, under the South Australian Representative System of Marine Protected Areas (SARSMPA).

Other Australian States, as well as the Australian Government, are also developing systems of marine protected areas that are representative of marine life in other parts of Australia. Collectively, this Australia-wide effort will contribute to the National Representative System of Marine Protected Areas.

All 19 marine parks proposed by the South Australian Government will be located within the State's waters, generally within 3 nautical miles from the coast and including the gulfs and offshore islands.

South Australian marine parks will be zoned for multiple-uses. They will be sectioned into four zones, with varying levels of use and conservation. Most activities, such as recreational and commercial fishing, will still be allowed within a marine park. There will, however, be particular zones or periods of time, where some activities will not be permitted.

Following the introduction of the *Marine Parks Act 2007*, the outer boundaries of the marine parks have been released for public consultation but the zones have not yet been determined. Management plans with zoning for each marine park will be developed in consultation with the Charter Boat Fishery, PIRSA Fisheries, the community and broader fishing industry by about mid-2011.

The potential impacts of proposed marine parks in South Australian waters on the fishery's access to existing fishing areas are not yet known.

Stakeholders considered that the impact of these marine parks without information on the proposed zoning arrangements could have **occasional (L5) major (C4)** impact on some aspects of charter fishing within South Australia, resulting in a risk rating of **EXTREME (20)**.

The Charter Boat Fishery and PIRSA Fisheries will participate in Marine Parks planning process.

Indicator

- To be determined

Performance measure

- To be determined

Aquaculture

Aquaculture sites were identified as a risk to access for the commercial fishing sector.

ERA Risk Rating: External Impact on the fishery (MODERATE)

Potential expansion of aquaculture sites were raised as a risk to access for the charter fishing sector.

The areas where aquaculture sites are being established include harbours and offshore areas e.g. Port Lincoln. These in turn restrict access to other sectors from entering those areas. PIRSA Fisheries have an opportunity to comments in the Aquaculture planning process.

Therefore, it was considered that the access restrictions due to aquaculture sites could have a **possible (L4) moderate (C2)** impact on the Charter Boat Fishery, resulting in a risk rating of **MODERATE (8)**.

PIRSA Fisheries have an opportunity to comments in the Aquaculture planning process

Indicator

- To be determined

Performance measure

- To be determined

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6. APPENDICIES

Appendix 1 – Aggregated Species List

Table 11: Other – aggregated species list

<u>Species List</u>
Blue-Eye Trevalla
Dolphin Fish
Dusky Morwong
Elephant Shark
Gemfish, Hake
Greenlip Abalone
Gurnard Perch
Hammerhead Shark
Knifejaw
Luderick
Mulloway
Port Jackson Shark
Rays and Skates
Razorfish
Red Gurnard
Southern Rock Cod
Warehou
Whiskery Shark
Yellowfin Whiting

Appendix 2: Likelihood and Consequence Tables

Table 12. Likelihood Definitions

Level	Descriptor
Likely (6)	It is expected to occur
Occasional (5)	May occur
Possible (4)	Some evidence to suggest this is possible here
Unlikely (3)	Uncommon, but has been known to occur elsewhere
Rare (2)	May occur in exceptional circumstances
Remote (1)	Never heard of, but not impossible

(Source: Fletcher *et al.*, 2002)

Table 13. Consequence categories for the Major Retained/Non-Retained Species

Level	Ecological (Retained: target/Non-retained: major)
Negligible (0)	Insignificant impacts to populations. Unlikely to be measurable against background variability for this population.
Minor (1)	Possibly detectable, but minimal impact on population size and none on dynamics.
Moderate (2)	Full exploitation rate, but long-term recruitment/dynamics not adversely impacted.
Severe (3)	Affecting recruitment levels of stocks/or their capacity to increase.
Major (4)	Likely to cause local extinctions, if continued in longer term (i.e. probably requiring listing of species in an appropriate category of the endangered species list (e.g. IUCN category).
Catastrophic (5)	Local extinctions are imminent/immediate

(Source: Fletcher *et al.*, 2002)

Table 14. Consequence categories for the By-Product Species/Minor Non-retained species

Level	Ecological (RETAINED: By-product/Non-retained: other)
Negligible (0)	The area where fishing occurs is negligible compared to where the relevant stock of the species resides (< 1%).
Minor (1)	Take in this fishery is small (< 10%), compared to total take by all fisheries and these species are covered explicitly elsewhere. Take and area of capture by this fishery is small, compared to known area of distribution (< 20%).
Moderate (2)	Relative area of, or susceptibility to capture is suspected to be less than 50% and species do not have vulnerable life history traits.
Severe (3)	No information is available on the relative area or susceptibility to capture or on the vulnerability of life history traits of this type of species. Relative levels of capture/susceptibility suspected/known to be greater than 50% and species should be examined explicitly.
Major (4)	N/A Once a consequence reaches this point it should be examined (see Table 13).
Catastrophic (5)	N/A (See Table 13).

(Source: Fletcher *et al.*, 2002)

Table 15. Consequence levels for the impact of a fishery on Protected species

Level	Ecological
Negligible (0)	Almost none are impacted
Minor (1)	Some are impacted but there is no impact on stock
Moderate (2)	Levels of impact are at the maximum acceptable level
Severe (3)	Same as target species
Major (4)	Same as target species
Catastrophic (5)	Same as target species

(Source: Fletcher *et al.*, 2002)

Table 16. Consequence levels for the impacts of a fishery on habitats

Level	Ecological (HABITAT)
Negligible (0)	<p>Insignificant impacts to habitat or populations of species making up the habitat – probably not measurable levels of impact. Activity only occurs in very small areas of the habitat, or if larger area is used, the impact on the habitats from the activity is unlikely to be measurable against background variability.</p> <p><i>(Suggestion- these could be activities that affect < 1% of original area of habitat or if operating on a larger area, have virtually no direct impact)</i></p>
Minor (1)	<p>Measurable impacts on habitat(s) but these are very localised compared to total habitat area.</p> <p><i>(Suggestion – these impacts could be < 5% of the original area of habitat)</i></p>
Moderate (2)	<p>There are likely to be more widespread impacts on the habitat but the levels are still considerable acceptable given the % of area affected, the types of impact occurring and the recovery capacity of the habitat.</p> <p><i>(Suggestion – for impact on non-fragile habitats this may be up to 50% [similar to population dynamics theory] - but for more fragile habitats, to stay in this category the percentage area affected may need to be smaller, e.g. 20%)</i></p>
Severe (3)	<p>The level of impact on habitats may be larger than is sensible to ensure that the habitat will not be able to recover adequately, or it will cause strong downstream effects from loss of function.</p> <p><i>(Suggestion - Where the activity makes a significant impact in the area affected and the area > 25 - 50% [based on recovery rates] of habitat is being removed)</i></p>
Major (4)	<p>Substantially too much of the habitat is being affected, which may endanger its long-term survival and result in severe changes to ecosystem function.</p> <p><i>(Suggestion this may equate to 70 - 90% of the habitat being affected or removed by the activity)</i></p>
Catastrophic (5)	<p>Effectively the entire habitat is in danger of being affected in a major way/removed.</p> <p><i>(Suggestion: this is likely to be in range of > 90% of the original habitat area being affected).</i></p>

(Source: Fletcher *et al.*, 2002)

Table 17. Consequence levels for the impact of a fishery on the general ecosystem/trophic levels

Level	Ecological (ECOSYSTEM)
Negligible (0)	General - Insignificant impacts to habitat or populations, Unlikely to be measurable against background variability. Ecosystem: Interactions may be occurring but it is unlikely that there would be any change outside of natural variation.
Minor (1)	Ecosystem: Captured species do not play a keystone role – only minor changes in relative abundance of other constituents.
Moderate (2)	Ecosystem: measurable changes to the ecosystem components without there being a major change in function. (no loss of components).
Severe (3)	Ecosystem: Ecosystem function altered measurably and some function or components are locally missing/declining/increasing outside of historical range &/or allowed/facilitated new species to appear. Recovery measured in years.
Major (4)	Ecosystem: A major change to ecosystem structure and function (different dynamics now occur with different species/groups now the major targets of capture). Recovery period measured in years to decades.
Catastrophic (5)	Ecosystem: Total collapse of ecosystem processes. Long-term recovery period may be greater than decades.

(Source: Fletcher *et al.*, 2002)

Table 18. Consequence levels for impacts of management of a fishery at a political level

Level	SOCIAL - POLITICAL
Negligible (0)	No impact - would not have any flow-on impacts to the local community. No fisheries department staff would need to make a statement.
Minor (1)	May have minor negative impact on the community (for example, small number of job losses) but these impacts would be easily absorbed.
Moderate (2)	Some increase in unemployment and decrease in overall income to which the community will adjust over time. Some community concern, which may translate to some political action or other forms of protest.
Severe (4)	Significant reductions in employment and income associated with the fishery. Significant employment and income flow-on effects to other community businesses, as reduced income and increased unemployment in fishing works its way through the local economy. Significant levels of community concern over the future of the community, which may translate to political action or other forms of protest.
Major (6)	High level of community impacts which the community could not successfully adapt to without external assistance. Significant level of protest and political lobbying likely. Large-scale employment and income losses in the fishing sector of the local economy. Significant flow-on effects in terms of increasing unemployment and income reductions as a consequence of changes to the fishery. Decline in population and expenditure-based services (e.g. schools, supermarkets, bank). Population declines as families leave the region looking for work.
Catastrophic (8)	Large-scale impacts well beyond the capacity of the community to absorb and adjust to. Likely to lead to large-scale rapid decline in community income and increase in unemployment in areas directly and indirectly related to fishing. May lead to large-scale and rapid reduction in population as families leave the region. Likely to lead to high levels of political action, protest and conflict. Significant reduction in access to private and public sector services, as businesses become unviable and target populations needed to attract government and commercial services decline below threshold levels.

(Source: Fletcher *et al.*, 2002)