



**Australian Government**

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**Department of the Environment  
and Water Resources**

Assessment of the  
**South Australian Scallop and Turbo Fisheries**

SEPTEMBER 2007

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## **Disclaimer**

This document is an assessment carried out by the Department of the Environment and Water Resources of a commercial fishery against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. It forms part of the advice provided to the Minister for the Environment and Water Resources on the fishery in relation to decisions under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999*. The views expressed do not necessarily reflect those of the Minister for the Environment and Water Resources or the Australian Government.

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# Assessment of the ecological sustainability of management arrangements for the South Australian Scallop and Turbo Fisheries

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## EXECUTIVE SUMMARY

### Background

The Fisheries Division of the Department of Primary Industries and Resources South Australia (PIRSA Fisheries) has submitted a document for assessment under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The draft document *Ecological Assessment of the South Australian Scallop and Turbo Fisheries* (the submission) was received by the Department of the Environment and Water Resources (DEW) in May 2006. The submission was released for a thirty-day public comment period that expired on 23 June 2006. Two public comments were received. PIRSA Fisheries provided a response to the issues raised and made appropriate additions to the submission.

The submission reports on the South Australian Scallop and Turbo Fisheries (STF) against the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*. The DEW assessment considers the submission, associated documents, public comments and PIRSA Fisheries' response to the comments.

**Table 1: Summary of the South Australian Scallop and Turbo Fisheries**

<b>Area</b>	STF operators are licensed to operate in all coastal waters of South Australia (State waters only) including gulfs, bays and estuaries (excluding the Coorong Estuary and Coffin Bay [for scallops only]), from the Western Australian border (129°E Longitude) to the Victorian border (141 °E Longitude).
<b>Fishery status</b>	Little information is available however the stock is considered under-fished.
<b>Target Species</b>	The <b>Scallop Fishery</b> is based on two species, the king scallop ( <i>Pecten fumatus</i> ) (also known as the commercial or southern scallop) and the queen scallop ( <i>Chlamys bifrons</i> ) (also known as the Coffin Bay scallop). The <b>Turbo Fishery's</b> target species is the turbo shell - <i>Turbo undulates</i> (turbo).
<b>By-product Species</b>	Scallop licence holders are permitted to take sea urchin, however none have been landed since 2001.
<b>Gear</b>	Dive-only Fisheries. Taken by hand using hookah or Self Contained Underwater Breathing Apparatus (SCUBA).
<b>Season</b>	<b>Scallop</b> - The South Australian commercial scallop harvest is concentrated between May and October on the west coast and between September and March (depending on spawning) in the eastern Spencer Gulf. The commercial harvest for the one scallop licence holder who is permitted to harvest scallops from the waters of Coffin Bay, is concentrated between May and November. <b>Turbo</b> – are currently harvested all year round.

<b>Commercial harvest</b>	<p><b>Scallops</b> – approximately 175.8 tonnes harvested between 1 July 2001 and 30 June 2005 (averages at ~44 tonnes per year).</p> <p><b>Turbo</b> – 25.9 tonnes total landed weight harvested between 1 July 2001 and 30 June 2005 (averages at ~6.5 tonnes per year).</p>
<b>Value of commercial harvest 2005</b>	<p>Estimated at \$76,000</p> <p>Scallop - \$47,000</p> <p>Turbo - \$29,000</p>
<b>Recreational harvest</b>	<p><b>Scallop</b> - The recreational fishing of scallops in South Australia is managed using a minimum legal length, a bag limit and a boat limit. The estimated recreational harvest of scallops in South Australian waters in 2000/01 was approximately 5.5 tonnes.</p> <p><b>Turbo</b> – PIRSA Fisheries are currently unsure whether recreational fishers are actively targeting turbo and if so, what the catch levels are.</p>
<b>Commercial licences issued</b>	<p><b>Scallop</b> – There are five Miscellaneous licence holders, who have access to harvest scallops by diving.</p> <p><b>Turbo</b> – There are currently three Ministerial Exemptions issued for the harvesting of turbo in South Australian waters.</p>
<b>Management arrangements</b>	<p><b>Scallop</b> – the Scallop Fishery is primarily regulated through input controls including:</p> <ul style="list-style-type: none"> <li>• limited entry (5 licences);</li> <li>• limited effort (currently 1 boat per licence with 2 agents);</li> <li>• spatial restrictions; and</li> <li>• gear restrictions (hand harvest only).</li> </ul> <p><b>Turbo</b></p> <ul style="list-style-type: none"> <li>• limited entry (3 Ministerial Exemptions);</li> <li>• gear restrictions (hand collection only); and</li> <li>• a Total Allowable Catch (TAC), with a different quota for each fisher.</li> </ul>
<b>Export</b>	<p>Export opportunities exist in the European Union for scallops and in the Asian region for turbo.</p>
<b>Bycatch</b>	<p>None.</p>
<b>Interaction with Threatened Species</b>	<p>Negligible.</p>

The area of the STF includes all State waters off the coast of South Australia, including gulfs, bays and estuaries (excluding the Coorong Estuary and Coffin Bay [for scallops only]), from the Western Australian border (129°E Longitude) to the Victorian border (141 °E Longitude).

## **Scallops**

The South Australian Scallop Fishery is based on two species, the king scallop (*Pecten fumatus*) and the queen scallop (*Chlamys bifrons*). The five Miscellaneous (Scallop) license holders are permitted to take sea urchins; however, no sea urchins have been landed by these fishers since July 2001. This assessment does not address sea urchin harvest.

## **Turbo**

The Turbo Fishery's target species is the turban shell - *Turbo undulates* (hereafter called turbo).

The STF are target specific through hand collection harvesting, therefore there is no bycatch in either of these Fisheries.

## **Biology of scallops**

Scallops are bivalve molluscs that lie unattached on the seabed and feed by filtering plankton and detritus from the water. They can swim actively, however adults are generally sedentary.

King scallops (*P. fumatus*) are distributed throughout southern Australia from Tuncurry on the New South Wales (NSW) coast, south through Bass Strait, along the east and north coasts of Tasmania to South Australia, across the south coast and along the west coast of Western Australia as far north as Shark Bay (Joll, 1989; in Kailola *et al.*, 1993). King scallops occur in a range of habitats from enclosed embayments to exposed oceanic conditions and are found to depths of at least 120m over bare, soft sand or mud (Kailola *et al.*, 1993; Young *et al.*, 1999; Young *et al.*, 1992). Queen scallops (*C. bifrons*) are a moderate sized scallop, up to 130mm shell length (Wolf and White, 1995; in Styan and Butler, 2003), and are found free-living on soft sediments in depths of 2-50 metres.

The submission states that the major difference between *Pecten* and *Chlamys* species of scallop is that the former genus is hermaphroditic and the latter dioecious. Spawning of king scallops is thought to be initiated by a sudden rise in water temperature. Spawning occurs over an extended period during winter and spring, with peaks in activity varying between locations (Kailola *et al.*, 1993). The submission states that the scallop species occurring in Coffin Bay and the West Coast tend to spawn in November. A study by Styan and Butler (2003) in South Australia, found that queen scallops were reproductively active over a large part of the year, from September to near the end of April.

Many scallop fisheries throughout the world have shown large fluctuations in both recruitment and commercial catches from year to year (Young, 1991). While it is expected that environmental conditions such as water temperature, salinity, dissolved oxygen and ocean currents can influence scallop abundance, it has often been assumed that areas of low scallop density can still produce sufficient recruits to sustain a viable fishery. Therefore, it has often been assumed that areas that have been heavily harvested can be replenished through oceanic conditions that bring through a new pulse of recruits (Young, 1991). These assumptions on scallop recruitment have been questioned, and Young (1991) raises the management issue of ensuring that scallop populations are not depleted to levels that are too small or too dispersed to produce significant recruitment. In the management of scallop stocks, Young *et al.* (1992) raise the consideration of the preservation of minimum spawning stocks to avoid the collapse of a scallop fishery.

King scallops mature after 1 year, but do not spawn until the second year (Australian Fisheries Service, 1991; in Kailola *et al.*, 1993), however fecundity is relatively low at this age (Zacharin, 1994). Reports from Victoria suggest that scallops grow to marketable size in approximately 18 months, however they may take longer in offshore locations in the Bass Strait. The submission

documents that a study of Tasmanian scallop beds estimated the life span of *P. fumatus* to be up to 16 years, with the majority of the population between 5 to 12 years old.

Scallops are preyed upon by a number of species including starfish, whelk and octopus (Kailola *et al.*, 1993). The submission reports on a scallop study in the D'Entrecasteaux Channel, southern Tasmania, where starfish were reputedly responsible for the death of as much as 80% of the population over a 4 year period.

### **Biology of turbo shells**

*Turbo undulatus* (turbo) are gastropod snails that inhabit rocky reefs and boulder habitats in Australia's southern temperate waters. *T. undulatus* is distributed from NSW, south to Tasmania and west to Hopetown in Western Australia (Kailola *et al.*, 1993). They are currently harvested in waters 2-20 m deep by commercial divers collecting over intertidal zone and subtidal reefs and platforms (Kailola *et al.*, 1993).

*T. undulatus* are essentially opportunistic feeders that appear to eat a wide range of algae, depending on their availability (Worthington and Fairweather, 1989). A study in South Australia by Clarkson and Shepherd (1985) found that *T. undulatus* live on the upper sides of boulders and graze mostly on macrophytes and coralline algae. Turbo are associated with various algal species including the kelp *Eklonia radiata* (Clarkson & Shepherd, 1985) and the foliose coralline alga *Corallina officinalis* (Underwood & Chapman, 1995). Studies by Worthington and Fairweather (1989) show that *T. undulatus* not only utilise the algae as a food source but that it also provides important habitat.

Whilst biological information on turbo is scarce, data available from NSW suggest that broadcast spawning occurs from October through to March. Further knowledge of the reproductive cycle of turbo is needed to identify the vulnerability of a species to overexploitation and the implementation of control measures such as the timing of fishing closures (Ward and Davis, 2002).

The main predators of turbo are wrasse species (including blue groper). Wrasses only take juveniles, however groper can take larger specimens. Another identified predator of turbo is the whelk *Thais orbita*. Whelks are large marine gastropods that use their file-like radula to bore holes through the shells of their prey.

Localised and serial depletion is recognised as a potential problem in the STF due to the scallop and turbo species' limited dispersal abilities, patchy distribution, ease of collection, slow recovery from overfishing and limited information on biological and spatial distribution available for management.

### **Economic importance**

Data collected from the Scallop Fishery indicates that a total weight of 175,785kg was harvested (both king and queen scallops) between 1 July 2001 and 30 June 2005. Over the four years, this averages to approximately 44 tonnes of scallops per year for all fishers.

In the submission, PIRSA Fisheries report that 25.9 tonnes landed weight of turbo was harvested between 1 July 2001 and 30 June 2005. Over the four years, this averages to approximately 6.5 tonnes of turbo per year for all fishers. The turbo are sold live to processors, who will then export the product to both interstate and overseas markets.

## **History**

### **Scallops**

The South Australian Scallop Fishery has been in operation since the 1970s with varying catch levels during its development. The Scallop Fishery is a dive-only fishery, however two operators were dredging in the early years of the Scallop Fishery. A formal fishery was not operational until 1985 when six experimental licences were issued following a tender process outlined in the *Miscellaneous Fishery Regulations (1984)*. In 1991, a minimum legal size of 65mm for scallop was introduced for both commercial and recreational fishers as a precautionary measure. In March 1995, a toxic algal bloom led to the mortality of many scallops in the Coffin Bay area and the Scallop Fishery was closed to commercial and recreational fishing in July 1995. Scallop populations were surveyed in February 1997 and the Scallop Fishery was subsequently re-opened. In 1997, a review of the Scallop Fishery was initiated with a discussion paper released for public comment in September 1998. The revised management arrangements were finalised in 1999.

### **Turbo**

Commercial fishing for turbo in South Australian waters has been sporadic and as a result, management arrangements have developed on an *ad hoc* basis. Exemptions have been granted under section 59 of the *Fisheries Act 1982* for the commercial harvest of turbo since 1997. Since that time, a maximum of four exemptions have been granted at any one time.

Exemptions were originally granted as part of a trial that was scheduled to end in June 2001, which was intended to inform a review of the Turbo Fishery using catch and effort data collected as a condition of the exemption. Funding arrangements for the current management of fisheries under the *Fisheries Act 1982* have prevented any further research being conducted by either PIRSA Fisheries or the South Australian Research and Development Institute (SARDI) Aquatic Sciences. The proposed new legislation that will replace the *Fisheries Act 1982* will contain a mechanism for issuing permits for exploratory and developmental fisheries. The submission details that these permits will have the advantage of providing more secure access to a developing fishery than a Ministerial Exemption, but have more flexibility than a fully-fledged licence. The legislation will also allow fees to be collected in relation to applications for a permit and ongoing administration costs so that necessary scientific work for new fisheries can be funded. A policy for managing exploratory and developmental fishing in South Australia will also be developed to guide decision making under the new legislation.

### **Export markets**

The submission reports that there have only been local and domestic markets for South Australian scallops, with occasional export enquiries from overseas processors. PIRSA Fisheries believe there is potential for the development of a niche market for dive-caught scallops, given the environmental impacts associated with dredge fisheries are far greater than that of dive fisheries. The submission states that recently, the Australian Quarantine and Inspection Service (AQIS) have been seeking collection of scallop samples for chemical assessment to be provided to European Union (EU) authorities in order to facilitate export opportunities.

Supply of South Australian turbo to various markets has fluctuated. PIRSA Fisheries report that currently, most of the harvested product is sold live to the Sydney and Melbourne fish markets with prices averaging between \$3 - \$6 a kilogram. Overseas markets, particularly in the Asian region, are being investigated by at least one exemption holder. There is still quite a considerable amount of work required to identify optimum transportation methods for shipping turbo overseas, and this is an area that at least one exemption holder is researching further.

## Management

The STF are managed together due to their similar harvest methods, their similar management arrangements and the development of a Management Plan for the Miscellaneous Dive Fishery.

## Scallops

There are currently five miscellaneous licence holders in South Australia who have access to scallops by diving. The *Fisheries (General) Regulations 2000* prohibit the commercial use of scallop dredges to take scallops in South Australian waters. Miscellaneous licences are not transferable and four of the five scallop licence holders are subject to the following conditions:

- allow them to take scallops (family Pectinidae) and sea urchins (*Heliocidaris erythrogramma*);
- use only a maximum of two persons to engage in fishing activities from the registered boat at any one time and these two people are to be a combination of the licence holder, a registered master other than the licence holder, and an agent of the licence holder;
- no scallops are permitted to be taken from the waters of Coffin Bay southerly of the parallel of latitude 34° 30.3'S;
- the licence holder may only use one registered boat at any one time; and
- fish may only be taken by hand and only by diving from the registered boat.

The fifth licence holder is also bound by the conditions relating to the permitted species, the number of participants and gear restrictions; however, is permitted to harvest scallops from the waters of Coffin Bay under the following conditions:

- The license holder may only take scallops from the waters of Coffin Bay in the period between 1 April and 30 November in any year;
- The license holder must not take scallops in Coffin Bay that are less than 80 mm in size, measured in accordance with the defined method of measurement set out in Clause 8 of Schedule 6 of the *Fisheries (General) Regulations 2000*;
- The license holder must not take more than 500 kilograms of scallops whole weight from the waters of Coffin Bay in a day; and
- The license holder must not take scallops from the waters of Coffin Bay for more than 2 days in any week.
- In these conditions:  
"Coffin Bay" means the waters of Coffin Bay southerly of the parallel of latitude 34.30.3' S;  
"day" means a 24 hour period commencing at 0000 hrs; and  
"week" means 7 consecutive days starting on a Monday and ending on a Sunday.

South Australia's commercial scallop harvest is concentrated between May and November in the Coffin Bay region, between May and October on the west coast and between September and March (depending on spawning) in the eastern Spencer Gulf.

## Turbo

The conditions of the turbo exemptions are, or relate to:

- may only take turbo (*Turbo undulatus*) by diving and by collection by hand;
- a TAC over a specified time period (with a different quota for each fisher);
- completion of catch and effort data in the form of a daily log as provided by the Director; and
- various conditions relating to reporting and notification of fishing activity.

Given confidentiality agreements, individual catch limits have not been reported. However, PIRSA Fisheries report that if all exemption holders fished their total allowable catch, the maximum annual catch would be less than 34 tonnes. PIRSA Fisheries note that although turbo are currently harvested all year round, weather conditions can greatly influence harvesting operations and can affect the fishers' ability to reach the specified total allowable catch.

The commercial harvesting of turbo in South Australia is regarded as experimental and therefore, occurs through Ministerial Exemptions granted under section 59 of the *Fisheries Act 1982*. There are currently three exemptions granted that allow access to turbo for commercial purposes. Exemptions are reviewed and issued on an annual basis and commercial harvesting is conducted under strict conditions detailed in these exemptions. New turbo licences can be granted under the *Fisheries (Scheme of Management – Miscellaneous Fishery) Regulations 2000*, however an extensive tender process is involved. For both the STF, all information collected in catch returns is entered and stored with PIRSA Fisheries. There are currently no annual stock assessments or reports produced by PIRSA Fisheries for scallop or turbo.

### **Bycatch and Protected Species**

The STF are target specific fisheries, which are conducted by divers who hand collect individual target species. As a result, there is little or no bycatch in the STF. There is no current estimate of the numbers of fish returned due to size limits or other reasons, however it is thought to be quite low. The submission states that the animals are returned either underwater or within close proximity to the dive site.

PIRSA Fisheries reports that the STF have no apparent direct or indirect effects on any endangered, threatened or protected species or threatened ecological communities. The submission states that there is minimal direct disturbance to the substrate due to the highly selective nature of the STF. PIRSA Fisheries report that there is a limited risk of interactions between vessels or divers and cetaceans. The risk of interactions is assessed under Principle Two of this report.

### **Indigenous and Recreational harvest**

According to PIRSA Fisheries, scallops are most probably the least popular of the species dived for recreationally but they are still taken by recreational divers. The recreational fishery for scallops (*Pecten fumatus* and *Chlamys bifrons*) is regulated using a minimum legal length of 65mm, bag limit of 100 and boat limit of 300. The submission states that the estimated recreational harvest of scallops in South Australian waters in 2000/01 was 59,321 scallops ( $\pm 21,874$ ) or 5,469 kg, live weight.

The recreational and Indigenous harvest of turbo for human consumption in South Australia is currently not studied and there is no size, bag or boat limits set for any species of turbo. However, it is considered to be minimal due to the low demand for turbo products on the local domestic market with a corresponding low interest in recreational harvest.

The submission reports that Aboriginal communities fished the coastal waters of South Australia for at least 6,000 years before European settlement (Nance & Spence, 1986 in the submission). Archaeological evidence collected from campsites on the Yorke Peninsula suggests that a variety of gastropods were collected including turbo, periwinkles and abalone (<http://www.yorke.sa.gov.au>).

Public comment received highlighted that the South Australian Government, the South Australian Fishing Industry Council, the Seafood Council of South Australia, the Aboriginal Legal Rights Movement Native Title Unit and Native Title Claimant groups are currently involved in the negotiation of Indigenous Land Use Agreements (ILUAs) concerning access to and involvement in the management of marine areas and resources by Native Title Claimants. The public comment

states that at present, the rights of Narungga people to take and use aquatic resources are the subject of negotiation in the form of a draft ILUA covering the area around the Yorke Peninsula from Port Broughton to Port Wakefield. This would include the right to take and use turbo and scallops in accordance with traditional law and custom.

PIRSA Fisheries states in the submission that the current level of Indigenous fishing is unknown, but is thought to be quite low.

### **Formal management documents**

The STF are small scale, low volume, dive fisheries. Consequently, there is little research and monitoring being undertaken.

The regulations that govern the management of the Scallop Fishery are the *Fisheries (Scheme of Management – Miscellaneous) Regulations 2000* and the *Fisheries (General) Regulations 2000*.

The regulations that govern the management of the Turbo Fishery are the *Fisheries (General) Regulations 2000*.

The Miscellaneous Fishery is constituted to pick up all commercial fishing activities that do not fall within other commercial fisheries and that are encompassed under the *Fisheries (Scheme of Management – Miscellaneous) Regulations 2000*. A Management Plan for the Miscellaneous Dive Fishery is currently being developed, which will include a strategic research and monitoring plan. The Management Plan will be a strategic document, containing objectives and performance criteria by which to assess the effectiveness of the management arrangements for both the STF. For the purposes of the Management Plan for the Miscellaneous Dive Fishery, only the purple sea urchin (*Heliocidaris erythrogramma*), scallops (*Pecten fumatus* and *Chlamys bifrons*), specimen shells and turbo shells (*Turbo undulatus*) will be included, given their common method of harvest.

The primary forum for the co-management of both the Scallop and Turbo shell Fisheries is the Marine Scalefish Fisheries Management Committee (MSFMC).

### **Overall assessment**

The material submitted by PIRSA Fisheries demonstrates that the management arrangements for the STF meet the requirements of the Australian Government *Guidelines for the Ecologically Sustainable Management of Fisheries*.

While the STF are relatively well managed, DEW has identified a number of risks that must be managed to ensure that their impacts are minimised:

- the lack of a management plan or formal performance measures to trigger management actions for either the Scallop or Turbo Fisheries;
- the lack of research on which to base ecologically sustainable harvests of scallop or turbo;
- the lack of data on recreational and Indigenous take of scallop and turbo; and
- the lack of annual reporting on harvests of scallop and turbo.

Recommendations to address these issues have been developed to ensure that the risk of impact is minimised in the longer term. Through the implementation of the recommendations and the continuation of a responsible attitude to the management of the STF, management arrangements are likely to be sufficiently precautionary and capable of controlling, monitoring and enforcing the level of take from the STF while ensuring the stocks are fished sustainably.

The STF are in a developmental stage, however with the development of a Management Plan for the Miscellaneous Dive Fishery, this will help to ensure fishing is conducted in a manner that does not lead to over-fishing and for fishing operations to be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem. On balance, the STF are being managed in an ecologically sustainable manner and is working to address existing problems and minimise environmental risks.

The operation of the STF is consistent with the objects of Part 13A of the EPBC Act. DEW considers that the STF will not be detrimental to the survival or conservation status of the taxon to which it relates in the short term. Similarly, it is not likely to threaten any relevant ecosystem in the short term. DEW therefore, recommends that the STF be declared an approved Wildlife Trade Operation (WTO) with the actions specified in the recommendations to be undertaken by PIRSA Fisheries to contain the environmental risks in the long term. DEW considers that these Fisheries, as managed in accordance with the South Australian *Fisheries Act 1982*, the *Fisheries (Scheme of Management – Miscellaneous) Regulations 2000* and the *Fisheries (General) Regulations 2000*, are not likely to cause serious or irreversible ecological damage over the period of the export decision. Specifically, the WTO declaration would allow the export of product from the STF for a period of 3 years. The WTO declaration will require annual reporting on the progress of implementing the recommendations of this report and other managerial commitments. The implementation of the recommendations will be monitored and reviewed as part of the next DEW review of the STF in 3 years time.

## **Recommendations**

1. PIRSA Fisheries to advise DEW of any material change to the STF's management arrangements that could affect the criteria on which EPBC decisions are based, within three (3) months of that change being made.
2. Within two (2) years, PIRSA Fisheries to complete the Management Plan for the Miscellaneous Dive Fishery. This document is to include precautionary fishery specific objectives linked to performance indicators and performance measures for the target species and impacts on the ecosystem.
3. Within two (2) years, PIRSA Fisheries to develop and implement a system to validate commercial logbook reporting of catch and effort in the STF.
4. Within two (2) years, PIRSA Fisheries to develop a process to improve estimates of recreational and Indigenous take and factor these into management arrangements to ensure overall catch levels are sustainable.
5. Within two (2) years, PIRSA Fisheries to develop and implement a research strategy to gather further information on the biology and ecology of scallop and turbo. PIRSA Fisheries to develop and implement management strategies to address any key risks identified as a result of this process and to use the outcomes of the research strategy to inform the performance indicators and performance measures in the Management Plan.

## PART I - MANAGEMENT ARRANGEMENTS

The STF are managed by PIRSA Fisheries.

The management regime is described in the following documents, all of which are, or will be publicly available:

- South Australian *Fisheries Act 1982*;
- **Scallop** - South Australian *Fisheries (Scheme of Management – Miscellaneous) Regulations 2000* and the *Fisheries (General) Regulations 2000*
- **Turbo** - *Fisheries (General) Regulations 2000*;
- a Management Plan for the Miscellaneous Dive Fishery (which includes purple sea urchin, scallops, specimen shells and turbo) is currently being developed, which will include a strategic research and monitoring plan; and
- relevant gazetted notices and permit/licence conditions.

DEW considers it important that management arrangements remain flexible to ensure timely and appropriate managerial decisions. An amendment to the management regime could change the outcomes of the assessment and decisions stemming from it. Decisions resulting from this assessment relate to the arrangements in force at the time of the decision. In order to ensure that these decisions remain valid, DEW needs to be advised of any changes that are made to the management regime and make an assessment that the new arrangements are equivalent or better, in terms of ecological sustainability, than those in place at the time of the original decision.

**Recommendation 1:** *PIRSA Fisheries to advise DEW of any material change to the STF's management arrangements that could affect the criteria on which EPBC decisions are based, within three (3) months of that change being made.*

Management of the STF incorporates a sound range of consultative mechanisms and a clear commitment to effective consultation with a variety of stakeholders. DEW considers the level of consultation to be adequate and is confident that the management agency will continue to ensure interested parties are consulted appropriately.

The primary forum for the co-management of both the STF is the Marine Scalefish Fisheries Management Committee (MSFMC). A Miscellaneous licence holder sits on the MSFMC as an observer, but does not hold voting rights. In 2005, a Miscellaneous Fishery Working Group was formed to progress the issues raised at the MSFMC and to provide a forum at which issues relating to the Miscellaneous Fishery could be dealt with more efficiently.

As a matter of policy, PIRSA Fisheries endeavours to consult with affected stakeholders and the broader community when significant management changes or developments are being considered. As such, stakeholder consultation and input will be sought when developing the Management Plan. Following completion, the document will be publicly available on the PIRSA website [www.pir.sa.gov.au](http://www.pir.sa.gov.au). DEW considers that PIRSA Fisheries will ensure that all interested parties are consulted appropriately at this time.

Currently there are no formal reference points to trigger management actions for either the Scallop or Turbo Fisheries. Management arrangements to date have incorporated a precautionary approach through limiting access to the STF and in the case of turbo, incorporating catch limits for individual fishers.

DEW considers that fishery specific objectives and indicators need to be developed to ensure that the performance of the STF can be monitored and management action taken as required,

particularly given the limited knowledge on biological characteristics of the species and the possible vulnerability of the species to localised and serial depletion. Performance measures (which may include review events and reference points) should be capable of detecting and responding to changes in the status of the STF.

A Management Plan for the Miscellaneous Dive Fishery is currently being developed (which is to cover both the STF), and a strategic research and monitoring plan will be developed as part of the Management Plan. The Management Plan will be a strategic document, containing objectives and performance criteria by which to assess the effectiveness of the management arrangements. Once developed, the objectives, performance indicators and performance measures should be regularly reviewed.

**Recommendation 2:** *Within two (2) years, PIRSA Fisheries to complete the Management Plan for the Miscellaneous Dive Fishery. This document is to include precautionary fishery specific objectives linked to performance indicators and performance measures for the target species and impacts on the ecosystem.*

Fishing effort in the Scallop Fishery is primarily regulated through input controls, limited entry being the primary management tool. PIRSA Fisheries is confident that at the current levels of harvest the Scallop Fishery is being conducted in a sustainable manner.

There are currently five miscellaneous licence holders in South Australia who have access to scallops by diving. The *Fisheries (General) Regulations 2000* prohibit the commercial use of scallop dredges to take scallops in South Australian waters. Miscellaneous licences are not transferable and four of the five scallop licence holders are subject to conditions including gear restrictions (hand harvest only), a maximum of two persons to be engaged in fishing activities from the registered boat at any one time, only one registered boat allowed to be used by the licence holder at any one time, and no scallops are permitted to be taken from the waters of Coffin Bay southerly of the parallel of latitude 34° 30.3'S.

The fifth licence holder is permitted to harvest scallops from the waters of Coffin Bay under spatial and temporal conditions, as well as size limits and a daily catch limit.

There are currently three Ministerial Exemptions to the South Australian *Fisheries Act 1982*, which allow access to turbo for commercial purposes. The Turbo Fishery is regarded as experimental and exemptions are reviewed and issued on an annual basis. Conditions of these exemptions include gear restrictions (hand harvest only), a total allowable catch over a specified time period (which differs for each fisher) and various conditions relating to reporting and notification of fishing activity. PIRSA Fisheries believes the individual quota for each of the three fishers has been set at a precautionary level, given the absence of sound scientific data relating to this species. When granting Ministerial Exemptions, PIRSA Fisheries took geographical locations into account to reduce the potential for localised depletion. Furthermore, PIRSA Fisheries have in the past acted to control the level of take within the Coffin Bay area following the mortalities associated with the algal bloom of March 1995.

Whilst localised and serial depletion is recognised as a potential problem in the STF, given current harvest strategies and the spatial structure of the Fisheries, PIRSA Fisheries does not consider this to be a significant risk at present.

In light of the difficulties in quantifying the amount of turbo and scallops available to harvest, PIRSA Fisheries feel the most appropriate approach is to apply the precautionary principle and ensure the level of harvest is contained by limiting the numbers of entitlements to the STF and restricting the harvest through input (and output controls in the case of turbo). As PIRSA Fisheries moves the management of the Turbo Fishery toward a miscellaneous licence, they believe there will be greater scope to actively manage the Turbo Fishery. The Management Plan currently being developed will explore research strategies and develop means to assess the STF in terms of its productivity, and sustainable harvest strategies and other biological factors.

DEW considers that the current management arrangements in place, along with the development of the Management Plan are capable of controlling the level of take.

PIRSA Fisheries report that the level of illegal harvest of both scallops and turbo is unknown; however, there is no evidence that illegal harvest of these species occurs. The compliance of all fisheries regulations is monitored by PIRSA FISHWATCH. PIRSA FISHWATCH provide PIRSA Fisheries with all information relating to offences and compliance issues as they arise. Furthermore, PIRSA FISHWATCH provides all Fishery Management Committees with quarterly reports summarizing the activities associated with that particular fishery. This process ensures PIRSA Fisheries are informed regarding compliance issues across the STF.

PIRSA Fisheries note that the STF are going through a developmental phase and as such, no structured management arrangements have been developed since the STF first opened. Current licensing arrangements and catch limits are deemed adequate by PIRSA Fisheries to ensure that past and current fishing effort has not reached a point where the stock should not be taken. PIRSA Fisheries believe that these management arrangements will continue until sufficient information is obtained through monitoring of fisheries dependent data, and the collection of fisheries independent data is available to make an informed decision on the STF's future management regime.

A Management Plan for the Miscellaneous Dive Fishery is currently being developed, which is to cover both the STF. The Management Plan will be a strategic document, containing objectives and performance criteria by which to assess the effectiveness of the management arrangements. Once developed, DEW considers that the objectives, performance indicators and performance measures should be regularly reviewed.

The continued monitoring and assessment of these STF as they develop, and the continued use of management controls, including input controls supported by licensing and exemptions, will ensure that these STF remain sustainable in the long-term. Uncertainties in the biomass available for harvesting give reason to be particularly cautious at this early stage of development. Thus, PIRSA Fisheries will continue to adopt a 'precautionary approach' to the harvesting of scallops and turbo by maintaining the current exemption conditions until sufficient evidence is available to determine the future of the STF and their management regime, or until catch and effort levels alter considerably, raising concerns of over exploitation.

Fishery-dependent data relating to the target species is collected on a regular basis in the STF. Each scallop fisher, in accordance with their licence conditions, currently records and submits regular, detailed catch and effort data to PIRSA Fisheries. Similarly, turbo fishers, in accordance with their exemption conditions, currently record and submit regular, detailed catch and effort data. Discussion of the information collection system can be found in Part II of this report.

An analysis of the STF's capacity for assessing, monitoring and avoiding, remedying or mitigating any adverse impacts on the wider marine ecosystem in which the target species live and the STF operates is contained under Principle Two.

It is unlikely that the impact of harvesting scallops and turbo in South Australia would have a significant impact on scallop and turbo populations in other jurisdictions due to the small scale of the STF and the limited dispersal ability of scallop and turbo. The spatial management of scallop and turbo stocks is discussed further in Part II of this report.

DEW considers that the current management arrangements for the STF comply with all relevant threat abatement plans, recovery plans, the National Policy on Fisheries Bycatch, and bycatch action strategies developed under that policy. DEW expects that PIRSA Fisheries will also ensure compliance with any future plans or policies as they are developed.

No regional or international management regimes, to which Australia is a party, are of direct relevance to the STF. The prime international regime affecting the STF is the United Nations Convention on the Law of the Sea (UNCLOS). The management regime essentially complies with this. Other international regimes are applicable to the STF's management, but do not explicitly involve these Fisheries, for example the 1992 Convention on Biological Diversity and in particular the 1995 Jakarta Mandate requiring that, in relation to the sustainable use of marine and coastal biological diversity, the precautionary principle should apply in efforts to address threats to biodiversity. While these agreements are not specifically addressed in the submission, the STF's compliance with their requirements can be assessed by examination of Part II of this report. DEW considers it is incumbent on all authorities to develop a thorough understanding of the framework of national, regional and international agreements and their applicability to export-based fisheries for which they are responsible.

### **Conclusion**

DEW considers that the STF's management regime is documented and is developed through a process suitable to the current developmental status of the Fisheries. Given the potential for expansion of scallop and turbo harvesting in the medium to longer term, DEW has made a number of recommendations to ensure that the management regime for the STF is further developed and documented.

There are currently no performance measures to trigger management actions for either the Scallop or Turbo Fisheries. Therefore, DEW considers that the development of a Management Plan that contains precautionary fishery specific objectives linked to performance indicators and performance measures (**Recommendation 2**) will help ensure the performance of the STF can be monitored and management action taken as required.

The management regime adheres to arrangements established under Australian laws and international agreements. DEW considers that there is scope to further refine the management arrangements and has provided a number of recommendations for improvements in the longer term.

## **PART II – GUIDELINES FOR THE ECOLOGICALLY SUSTAINABLE MANAGEMENT OF FISHERIES**

### **Stock Status and Recovery**

Principle 1: *‘A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover’*

### **Maintain ecologically viable stocks**

Objective 1: *‘The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability’*

### **Information requirements**

Section 46 of the South Australian *Fisheries Act 1982* requires the five scallop harvesters and the three exemption holders harvesting turbo, to submit monthly catch and effort return information. The scallop harvesters submit this information to SARDI Aquatic Sciences while the turbo harvesters submit the catch returns to the Executive Director, Fisheries. The following information is requested from the licence holder:

- the date the fishing activity took place;
- the main port the fisher operates from;
- the statistical area fished;
- the species targeted;
- the numbers and total weight of each species taken;
- searching and diving time fishing for species\*;
- dive location in GPS co-ordinates to three decimal places\*;
- the fish processor(s) harvest sold to; and
- any other comments.

\* Information not required for scallop fishers

Fishery dependent information must be submitted every month of the duration of the licence/permit. If the scallop Miscellaneous Fishery licence holder fails to submit monthly catch and effort information, the Director of Fisheries may recommend the imposition of a substantial fine or term of imprisonment under Section 46 of the *Fisheries Act 1982*. This information is available to PIRSA Fisheries on request, for the monitoring of commercial harvest levels.

Currently, there is no ongoing independent monitoring of either the Turbo or the Scallop Fishery. However, the Management Plan for the Miscellaneous Dive Fishery is currently being developed, and a strategic research and monitoring plan will be developed as part of the Management Plan.

Due to the lack of fishery independent data available, fishery dependent data for the STF is currently the best source of fishery information. Since the management of the STF relies heavily on the fishery dependent data being accurate, there is a need for the data to be validated. DEW therefore recommends that PIRSA Fisheries develop and implement a system to validate commercial logbook data.

**Recommendation 3:** *Within two (2) years, PIRSA Fisheries to develop and implement a system to validate commercial logbook reporting of catch and effort in the STF.*

The submission states that scallops are taken by recreational divers; however, they are probably the least popular of the species dived for recreationally. The recreational fishery for scallops (*Pecten*

*fumatus* and *Chlamys bifrons*) is regulated using a minimum legal length of 65mm, bag limit of 100 and boat limit of 300. According to Jones and Doonan (2005), the estimated recreational harvest of scallops in South Australian waters in 2000/01 was 59,321 scallops ( $\pm 21,874$ ) or 5,469 kg, live weight.

The recreational and Indigenous harvest of turbo for human consumption in South Australia is currently not studied and there is no size, bag or boat limits set for any species of turbo for recreational or Indigenous take. The submission states that it is considered to be quite low due to the low demand for turbo products on the local domestic market with a corresponding low interest in recreational harvest.

The submission states that it is not known whether the illegal harvest of both scallops and turbo is being undertaken in the STF and if so, to what extent.

### **Assessment**

Public comment received, stated that the lack of fishing effort for given periods throughout the 20 year history of the Scallop Fishery highlights the minimal extraction and impact on the total population. The comment stressed that due to the small scale and low value of the Scallop Fishery, there is limited capacity to conduct rigorous scientific research.

No formal stock assessment has been undertaken and there have been no other studies to quantify the amount of scallops and turbo available for harvest in South Australia. The submission states that one of the objectives of proposed monitoring programs by PIRSA Fisheries is the establishment of a database to determine an ecologically sustainable turbo harvest. DEW encourages PIRSA Fisheries to pursue methods to obtain more reliable estimates of stock abundance of both turbo and scallop in the near future.

There is currently very little information available on the spatial distribution and population dynamics of South Australian scallop and turbo stocks, apart from data collected through monthly logbooks. PIRSA Fisheries report that due to the small scale and short existence of both Scallop and (particularly) Turbo Fisheries, detailed information on the distribution and spatial structure of the stocks have not been conducted. Public comment received states that due to the low effort and physical limitations of the fishers (diving to harvest scallops), the level of take would have a negligible impact on the total population.

Potential removals from the STF include direct harvest, as well as recreational and Indigenous harvest. Given the highly selective nature of the harvesting method, there is little or no discarding in the STF. PIRSA Fisheries report that there is no current estimate of the numbers of fish returned (due to size limits or other reasons), however it is thought to be quite low.

The recreational and Indigenous harvest of scallop and turbo is currently not studied by PIRSA Fisheries. The recreational take of scallops is regulated using a minimum legal length and bag limit, however there are no size, bag or boat limits set for any species of turbo for recreational or Indigenous take.

DEW is concerned that recreational and Indigenous take is currently not being taken into account in the management of the STF and considers that take from all sectors should be considered when determining sustainable harvest levels.

**Recommendation 4:** *Within two (2) years, PIRSA Fisheries to develop a process to improve estimates of recreational and Indigenous take and factor these into management arrangements to ensure overall catch levels are sustainable.*

### **Management response**

The submission notes that there is currently no research from which to determine ecologically sustainable scallop or turbo fishing catch or effort. Due to the infancy, and experimental nature in the case of the Turbo Fishery, there are also limited historical records of catch and effort data for the STF.

Many scallop fisheries throughout the world have shown large fluctuations in both recruitment and commercial catches from year to year (Young, 1991). It has often been assumed that areas that have been heavily harvested can be replenished through oceanic conditions that bring through a new pulse of recruits (Young, 1991). These assumptions on scallop recruitment have been questioned, and Young (1991) raises the management issue of ensuring that scallop populations are not depleted to levels that are too small or too dispersed to produce significant recruitment. In the management of scallop stocks, Young *et al.* (1992) raise the consideration of the preservation of minimum spawning stocks to avoid the collapse of a Scallop Fishery.

Given the lack of a formal stock assessment or the lack of quantitative scientific data from which to establish a sustainable harvest level, PIRSA Fisheries feel the most appropriate approach is to apply a precautionary approach and to ensure the harvest is contained at a conservative level until there is sufficient evidence to support a sustainable increase in harvest. PIRSA Fisheries considers it appropriate to avoid a rapid development of the Turbo Fishery before the wider and more long-term impacts of this activity on dependent coastal ecosystem processes have been further investigated. DEW commends PIRSA Fisheries for employing a precautionary approach to the Turbo Fishery in the absence of information regarding sustainable harvest levels.

PIRSA Fisheries' management approach to regulating the STF is through the use of input controls, such as limiting the number of entrants (currently five licences for scallop and three Ministerial Exemptions for turbo), their harvesting operations (target-specific through hand selected harvesting, with no retention of byproduct) and to some degree, the area they can fish. PIRSA Fisheries is confident that the current levels of harvest are sustainable. The Turbo Fishery has an individual quota for each of the three Ministerial Exemption fishers, however there is no quota for the Scallop Fishery. The submission reports that whilst localised and serial depletion is recognised as a problem in the STF, given the current harvest methods and limited entry, this is not considered to be a significant issue at present. The submission highlights PIRSA Fisheries' action to protect the scallop population in the Coffin Bay area following the scallop mortalities associated with the algal bloom of March 1995.

PIRSA Fisheries state that as they move the management of the Turbo Fishery towards a miscellaneous licence, there will be greater scope to actively manage the Fishery. The Management Plan currently being developed will explore research strategies and develop means to assess the STF in terms of their productivity, and sustainable harvest strategies and other biological factors. DEW considers this strategic approach to future research and the continuation of existing data collection systems will be important for the future management of the STF.

Whilst biological information on turbo is scarce, data available from NSW suggest that broadcast spawning occurs from October through to March. Knowledge of the reproductive cycle of turbo is needed to identify the vulnerability of a species to overexploitation and the implementation of control measures such as the timing of fishing closures (Ward and Davis, 2002).

Localised and serial depletion is recognised as a potential problem in the STF due to scallop and turbo's limited dispersal ability, ease of collection, slow recovery from overfishing and limited information on biological and spatial distribution available for management.

DEW is concerned that no formal management strategies are in place to address the key gaps in the knowledge of scallop and turbo biology and ecology or to ensure that the current level of take is sustainable. DEW considers that the management of the STF would be improved through the development and implementation of a research strategy to address these knowledge gaps. DEW believe that the key risks identified as a result of the research into the biology and ecology of scallop and turbo, should then be addressed through the development and implementation of management strategies. The outcomes of the research strategy should also be used to inform the performance indicators and performance measures in the Management Plan.

**Recommendation 5:** *Within two (2) years, PIRSA Fisheries to develop and implement a research strategy to gather further information on the biology and ecology of scallop and turbo. PIRSA Fisheries to develop and implement management strategies to address any key risks identified as a result of this process and to use the outcomes of the research strategy to inform the performance indicators and performance measures in the Management Plan.*

No byproduct is permitted to be taken in the STF, therefore no information, assessment or management response regarding byproduct is required.

### **Conclusion**

DEW considers that under the small scale of operations to date, the management regimes in the STF have been appropriate and provide for the STF to be conducted in a manner that has not lead to over-fishing. DEW considers that there is scope to further refine some of the existing information collection, assessment and management responses and has provided a number of recommendations for improvements in the longer term.

DEW believes the development of formal management strategies, addressing the key gaps in the knowledge of scallop and turbo biology and ecology, the development of a system to validate commercial logbook and taking into account the recreational and Indigenous take will help to ensure adequate protection of the target stocks.

### **Promote recovery to ecologically viable stock levels**

Objective 2: *'Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes'*

This objective is not applicable to the STF at present. Without established performance indicators and measures, the point at which scallop and turbo are considered overfished is not defined. The Turbo Fishery is currently in a developmental phase and both the STF have a low number of operators and a low level of take and effort. Performance measures, including reference points will be developed as part of the Management Plan for the STF, and a recommendation supporting this process has been made (see **Recommendation 2**).

### **Conclusion**

DEW considers that the South Australian Scallop and Turbo stocks are not below a defined reference point, but should that occur in the future, PIRSA Fisheries would manage the STF to promote recovery to ecologically viable stock levels within nominated timeframes.

## **Ecosystem impacts**

Principle 2: *'Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem'*

### **Bycatch protection**

Objective 1: *'The fishery is conducted in a manner that does not threaten bycatch species'*

### **Information requirements**

The scallop and turbo harvesters are not required to record bycatch on logbooks, as such a requirement is unnecessary due to the highly selective nature of the harvesting technique employed (hand-harvesting) that eliminates the potential for bycatch. DEW does not consider that studies to gather information on the potential for the South Australian STFs to impact on bycatch species are necessary.

### **Assessment and Management Response**

No formal bycatch risk assessment has been completed for the STF and is not required due to the highly selective fishing techniques employed by fishers. The limited scale of the STF within a large area and the small number of operators also helps to avoid bycatch. For these reasons, there are no threat abatement plans, recovery plans or bycatch reduction strategies relevant to the STF. DEW does not consider that specific bycatch minimisation measures are necessary for the STF.

### **Conclusion**

DEW considers that there is a high likelihood the STF are conducted in a manner that does not threaten bycatch species. Should this situation change, or a risk assessment process indicate otherwise, DEW expects PIRSA Fisheries would undertake appropriate actions to ensure that bycatch species are not threatened by the STF.

## **Protected species and threatened ecological community protection**

Objective 2: *'The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities'*

### **Information requirements**

Information on protected species interaction is not recorded in the logbooks used in the STF. As with bycatch, this is due to the limited opportunity for the STF to impact on non target species. DEW recognises that interactions with protected species are unlikely to occur in the STF, and as such, does not consider that a formal recommendation regarding reporting of protected species interaction is appropriate.

### **Assessment and Management Response**

The STF have no apparent direct effects on any threatened or protected species or threatened ecological communities and no known indirect effects. DEW considers that the current small number of fishing vessels, restricted number of divers and target specific harvesting methods are likely to have a low impact on endangered, threatened and protected species. As fishing effort to date has been minimal, benthic damage and interaction is considered to have been at a minimum. PIRSA Fisheries is not aware of any information that has been collected on the interaction between commercial turbo and scallop fishing and its effects on endangered, threatened or protected species and threatened ecological communities. No threatened ecological communities have been identified as occurring in the area of the STF.

Public comment received highlights that whilst most scallop fisheries are dredge fisheries, the South Australian Scallop Fishery is a dive fishery and therefore, the potential impact of scallop and

turbo harvest on protected species or habitats and the ecosystem generally are considered negligible. DEW concurs with this conclusion.

### **Conclusion**

DEW notes that there are negligible interactions with protected species in the STF and considers that these Fisheries are conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species. Should this situation change, or a risk assessment process indicate otherwise, DEW expects that appropriate actions will be undertaken to ensure the STF avoid mortality or injury to these species and avoids or minimises impacts on threatened ecological communities.

### **Minimising ecological impacts of fishing operations**

Objective 3: *'The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally'*

### **Information requirements**

Due to the nature and infancy of the STF, no studies have been undertaken to quantify and document the impacts of activities associated with the STF on the ecosystem. The submission acknowledges that currently little or no information is collected on the effects of commercial scallop and turbo fishing on the general ecosystem. While DEW is aware of the lack of information collection and research covering the STF's impact on the ecosystem and environment generally, DEW considers that the amount of information available at present is appropriate to the size and scale of the STF.

### **Assessment**

DEW recognises that the potential for the STF to impact unacceptably and unsustainably on the environment is considered to be low. Physical impacts are considered to be very low due to the harvest method used. The impact of removing scallop and turbo from the ecosystem is not understood; however, due to the current low level of harvest this is not considered to be a significant impact.

The submission reports that the draft Management Plan and management responses will be structured such that there is a low risk of the STF overexploiting scallop and turbo stocks and causing any serious negative impacts to the broader ecosystem. The extent to which the Management Plan achieves the range of established management objectives will be assessed using a combination of performance indicators, designed to measure the performance of the STF, the status of individual key species and the impacts of the Fisheries on the ecosystem.

### **Management response**

The STF are subject to limited entry, gear restrictions and fishing area allocations. These measures contribute to limiting the risk presented by the Fisheries to the overall marine ecosystem. DEW considers that the nature and scale of the STF are likely to cause little impact to the physical environment.

As the STF develop and biological information becomes available, a formalisation of management responses when impacts are detected can be developed. Management response will utilise the precautionary approach in such circumstances.

The precautionary nature of the existing input controls and level of access granted to the STF aim to prevent development beyond sustainable limits and any potential serious ecological impacts.

**Conclusion**

DEW considers that the STF are conducted in a sufficiently precautionary manner to minimise the impact of fishing operations on the ecosystem generally. Recommendations have been developed to ensure that the risk of significant impact by the STF on the marine environment generally is minimised in the longer term.

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## LIST OF ACRONYMS

AQIS	Australian Quarantine and Inspection Service
DEW	Department of Environment and Water Resources
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EU	European Union
GPS	Global Positioning System
ILUA	Indigenous Land Use Agreement
MSFMC	Marine Scalefish Fisheries Management Committee
PIRSA Fisheries	Department of Primary Industries and Resources South Australia
SARDI	South Australian Research and Development Institute
SCUBA	Self Contained Underwater Breathing Apparatus
STF	Scallop and Turbo Fisheries
TAC	Total Allowable Catch
UNCLOS	United Nations Convention on the Law of the Sea
WTO	Wildlife Trade Operation