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# **South Australian Fisheries Management Series**

## **Ecological Assessment of the South Australian Sardines (*Sardinops sagax*) Fishery**

### **Reassessment Report**

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

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

July 2009

**Prepared by the Fisheries Division of Primary Industries and  
Resources South Australia**

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2. South Australian Sardine (*Sardinops sagax*) Fishery. Fishery Assessment Report for PIRSA 2008.

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### **3. Purpose**

This report has been prepared by the Fisheries Division of the Department of Primary Industries and Resources, South Australia (PIRSA).

The purpose of this report is to provide a revised assessment of the management arrangements in place for the South Australian Sardine Fishery (SASF). This report updates information provided to DEWHA in 2004 for assessment against the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The report has been prepared in accordance with the *Guidelines for the Ecologically Sustainable Management of Fisheries, 2<sup>nd</sup> Edition*, and particularly addresses the level of change that occurred in the fishery since the 2004 assessment.

### **4. Background**

The regulations that govern the management of the South Australian Sardine Fishery are; The *Fisheries Management Act (2007)* the *Fisheries Management (General) Regulations 2007*, *Fisheries Management (Marine Scalefish Fisheries) Regulations 2006*, and the *Management Plan for South Australian Pilchard Fishery, 2005*. Note the Australian fish names standard revised the common name for pilchards to Australian sardines in 2007.

The Management Plan provides a broad policy framework, a harvest strategy, performance indicators, and clear decision rules employed to ensure the ecologically sustainable management and development of the SASF. The management plans operate for five years (2004-09), subject to annual review and amendments as considered necessary by the Fisheries Council, the Director of Fisheries or the Minister for Agriculture, Food and Fisheries. The plan can be found at PIRSA's website: [www.pir.sa.gov.au](http://www.pir.sa.gov.au).

The area of jurisdiction of the commercial South Australian Sardine Fishery includes all the waters adjacent to the State of South Australia out to the 200 nautical mile Australian Fishing Zone (AFZ), with the exception of aquatic reserves and (netting closure areas). Sardine fishers are provided exemptions to operate in areas where netting closures occur as the netting closures are not intended to refer to nets utilised by sardine fishers (purse seine nets). This is evidenced by exemptions for the area of waters of Coffin Bay northerly of geodesic 34'31'' (Point Longnose) and waters adjacent to Port Lincoln contained within the geodesic from Point Bolingbroke (lat 34'32.51''S ; long 136'05.33''E) to Cape Donington (lat 34'43.73''S ; long 135'59.63''E) – excluding the waters adjacent to Port Lincoln from the high water mark at the shore end on the North Shields jetty, then SE to Maria Point (on Boston Is.) then following the highwater mark in a southerly direction to the light at

Fanny Point, then in a direction of 249' to the most northerly part of Billy lights, then following the highwater mark to the point of commencement.

The legislative instrument defining the area of jurisdiction of the SASF is the 1996 Offshore Constitutional Settlement (OCS) arrangements for scalefish species between South Australia and the Commonwealth. Under the OCS arrangements, South Australia has jurisdiction for sardines in the Australian AFZ adjacent to South Australia. As part of these agreements the Commonwealth has retained access to sardines for live bait purposes in the Southern Bluefin Tuna Fishery (SBTF).

## 5. Level of Assessment

The South Australian Sardine Fishery was assessed and exempted for a period of five years. Since last assessment there have not been significant changes in most areas of interest or particular issues as outlined in page 5 of the *Guidelines for the Ecologically Sustainable Management of Fisheries –second edition*.

**Table 1:** Level of assessment required by the South Australian Sardine Fishery

Issue	Area of Interest	Yes	No
Fishery	Has there been any change to management arrangements, and/ or fishing practice?	<b>X</b>	
External Influences	Has there been any change in the target stock status? i.e. Increase or decrease in number of overfished or uncertain stock, limit reference points or performance indicators have been triggered.		<b>X</b>
Interaction with protected species	Has there been any change in the nature, scale, intensity of impact, and/or management response?	<b>X</b>	
Ecosystem impact	Has there been any change to an environmental issue/influence outside of the fishery management agencies control?		<b>X</b>
Target Stock Status	Has there been any change to management arrangements, and/ or fishing practice?		<b>X</b>
By-product/ bycatch status.	Has there been any change in the by-product and/or by-catch stock status? eg. Performance indicators triggered or risk assessment outcomes show risk levels have changed.		<b>X</b>

Considering the above, the level of submission requirement for the South Australian Sardine Fishery is standard plus ancillary.

However, it is important to note that all changes and progress concerning DEWHA's recommendations or conditions have been communicated through annual reports provided for all South Australian managed fisheries.

## 6. Fishery

*S. sagax* is found in waters of Australia, Japan, North and South America, Africa and New Zealand. In Australia sardines are found throughout temperate waters between Rockhampton (Queensland) and Shark Bay (Western Australia), including northern Tasmania (Gomon *et. al*, 1994)

Sardines are caught over 12 months of the year using a small (14 to 22mm) mesh purse seine or sardine net. Commercial fishing activities in South Australia are predominantly undertaken at night, although some fish are captured in daylight. Schools of sardines are located by sonar, and then the net is deployed around the school. The net is then pursed and encircled into a small area adjacent to the vessel. The fish are then removed from the net with a pump that extracts the catch from the water, removing the water before placing the catch in the hold of the boat (Shanks, 2005).

The South Australian Sardine Fishery is South Australia's largest volume single species fishery. In 2008/09 26,692 tonnes of sardines, with a value of \$16,331,000 were harvested (Knight, *et al.*, 2009), with a total of 211 full time employees (directly and indirectly) in the same period.

Currently, the fishery is managed primarily by an individual transferable quota (ITQ) management regime, with complementary input controls.

The Sardine Fishery is currently managed by the *Fisheries Management (Marine Scalefish Fisheries) Regulations 2006*, *Fisheries Management (General) Regulations 2007* and the *Fisheries Management Act, 2007*. To operate in the fishery, a Marine Scalefish Licence is required with sardine net endorsement and sardine quota entitlements. Management measures are outlined in the South Australian Sardine Fishery Management Plan and include; entry limitations, gear restrictions, VMS, onboard observer coverage and a Total Allowable Commercial Catch (TACC) with individual transferable quotas. Table 2 provides a summary of the management arrangements for the fishery.

The Daily Egg Production Model (DEPM) has been used to estimate the spawning biomass of sardine in SA since 1995. Estimates of spawning biomass are the key biological indicator in the management plan for the SASF.

The spawning biomass is determined bi-annually additionally, a catch sampling program is conducted annually which determines the age and size composition of catches. All the data collected and the respective analysis is presented in the sardine Spawning Biomass Report and Fishery Assessment Report available at PIRSA's website, and attached to this assessment.

The TAC is set bi-annually for the fishery and divided equally amongst the 14 licence holders. The determination of the TACC uses a precautionary harvest strategy provided as an addendum to the current management plan. The baseline TACC is set at 30,000 tonnes, for the 2008 and 2009 quota years, with bi-annual DEPM surveys commencing in March/April 2009 to determine the spawning biomass for setting the TACC for the 2010 and 2011 quota years. The baseline TACC is set provided the spawning biomass estimate is greater than or equal to 150,000t and less than or equal to 300,000t, which equates to exploitation rates of 20% and 10% respectively.

PIRSA monitors the take of quota through the 'Catch Disposal Records' (CDR) form that enables the compliance fisheries group to track, monitor and verify all landings of sardines. Licence holders are required to complete and forward the CDR form to PIRSA Fisheries, on a per trip basis.

Each licence holder is also required to complete a research logbook, with one form per net set. Information collected is used for research purposes by South Australian Research and Development Institute (SARDI) Aquatic Sciences. The accurate completion and submission of these forms is required in legislated timeframes to maintain the integrity of management arrangements in the fishery and research upon which management is based.

The SASF has invested \$445,948 and \$255,364 in 2008/09 and 2009/10 in research projects. Including the DEPM, catch sampling program (used to determine size composition of catch) and other discretionary projects. Additionally, the SASF has invested significant funds towards research and observers to mitigate interactions with Threatened, Protected and Endangered Species (TEPS). For the years 2004, 05 and 06 the industry contributed a total of \$930,000 in cash contribution to FRDC Project No. 2003/072 '*Establishing ecosystem-based management for the South Australian sardine fishery: Developing ecological performance indicators and reference points to assess the need for ecological allocations*'. The project aimed to assess the extent of ecological impacts in the fishery and develop ecological performance indicators in the fishery if suitable indicators could be identified, the results of this project will be published in the near future.

## 6.1 The Commercial Fishery

**Table 2.** Summary of management measures for the Commercial South Australian Sardine Fishery.

Management tool	
Limited entry	14
TACC	30,000 t (2,142 t for each licence holder)
Maximum number of	1 per vessel

sardine nets	
Maximum number of vessels	2 per licence
Sardine net Maximum dimensions	1,000 m in length, 200 m <sup>1</sup> (at stretched mesh and measured on land)with meshes of 14 to 22 mm
Catch and effort data (research)	Daily logbook, submitted monthly
Catch Disposal Record (CDR) forms	Trip records submitted upon landing to verify catch and decrement quota
Wildlife Interaction Logbook	Record form submitted upon landing only after interactions occurred with protected, threatened and endangered species
Prior landing reports to PIRSA	1 hour prior
Vessel Monitoring System (VMS)	Yes
Onboard independent observers	30 % coverage (this level of coverage is reviewed by the Minister for Fisheries, Food and Agriculture).

## 6.2 Recreational Fishery

Take of sardines by the recreational sector is negligible, due to their method of capture. Sardines are purchased by the recreational sector for use as bait.

## 7. External Influences

It is thought that upwelling events influence production and distribution of sardine (*S. Sagax*), anchovies (*E. australiss*) and southern blue fin tuna (*Thummus maccoyii*) in the Great Australian Bight (GAB).

Mass mortality events in 1995 and 1998/99, spread throughout the entire Australian range of *S. Sagax*, and are thought to have killed over 70% of the spawning biomass in South Australian waters. Characteristics of the mass mortalities, such as focal origin, rapid spread throughout the entire

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<sup>1</sup> The biggest net used in the fishery is 720m by 120m. Net measurements are taken when the mesh diamonds (in the net) are stretched on land and measured point to point. The net is significantly less than this at a resting state or in the water column. The net is set to target fish in the upper part of the water column and the vessel must move quickly to encircle the fish and begin pursing. This makes the net fish at about 10 to 20m depth (depending on setting speed). The fishers avoid bottom contact with the net because the material used in the net can foul the bottom which causes the net to tear. Torn nets cost money in repairs and fishing time so bottom contact is avoided.

geographical range of the population and high mortality rates suggest both were caused by an exotic pathogen to which Australian sardines were not previously exposed. Recovery of the population following these events has been monitored using the DEPM.

## **8. Interaction with Protected Species**

Issues regarding the operational interactions of the SASF with Threatened, Endangered and Protected Species (TEPS) are considered in the document '*Operational interactions of the South Australian Sardine Fishery with the Common Dolphin: July 2004 to March 2009*' this report has been attached to this document.

There is a range of information collected on dolphin interactions in the fishery. Information is collected through: 1) the independent observer program undertaken by a PIRSA Fisheries contractor- Protec Marine Pty Ltd; 2) the '*Wildlife Interaction identification and logbook*'; and 3) the *SARDI SA Sardine Fishery Research Logbook* (the catch and effort logbook).

The current level of observer coverage in the fishery is 30% of net-sets. A contractor, Protec Marine, undertakes the observer coverage on behalf of PIRSA Fisheries. The coverage provides independent information on the rates of interactions. The cost of the observer program is fully cost recovered from industry.

The study of the operational interactions between SASF and dolphins commenced in November 2004; to address recommendation #4 included in the last Ecological Assessment (2004) by DEWHA to the SASF.

The independent observer program has enabled the assessment of interactions with TEPS other than dolphins, with interactions with seals, sea-lions and sharks part of the reporting format. It has been established that while interactions with other TEPS species do occur, the incidental mortality rate is extremely low to non-existent.

Together the SA Sardine Industry Association (SASIA), PIRSA Fisheries and the South Australian Minister for Agriculture, Food and Fisheries have been both responsive and pro-active to the identification management and mitigation of dolphin interactions in this fishery. A timeline of the Sardine Fishery's identification of dolphin interactions and subsequent management responses is provided in Attachment 7.

Part of the response was the establishment of TEPs Working Group by the SA Sardine Industry Association. The TEPS Working Group is a Sardine Industry Association sub committee with representatives from PIRSA

Fisheries Policy and Compliance, SA Department of Environment and Heritage protected species program, SARDI and the industry (representative owners and skippers). The group monitors the implementation of the Code of Practice and considers refinements to existing practices. The group meets four times a year and more frequently if required.

The '*Code of Practice for the Mitigation of Interactions of the South Australian Sardine Fishery, with Threatened, Endangered and Protected Species*' (CoP) was first developed by the SASIA in 2005 and has recently been reviewed and refined (Attachment 2). The CoP aims to mitigate operational interactions of the South Australian Sardine Fishery with TEPS. It details the processes and actions that have been established to reduce interactions. The Code has been endorsed by the two relevant SA Ministers – Minister for Agriculture, Food and Fisheries, and the Minister for Environment and Conservation. The code is understood and supported by all the licence holders and fishers in the SASF. The observer program has shown that the code is fully implemented on board boats in the fishery as a part of standard fishing practices.

All Commercial fishers must report any wildlife interaction to PIRSA Fisheries and the DEWHA. Interactions include: collision or capture (hooked, encircled or entangled), all interactions as well as those that relate to a species actually being landed onboard a vessel during a fishing operation must be reported. To assist fishers in this task, PIRSA and SARDI have produced a '*Wildlife interaction identification and logbook*', widely distributed amongst all fishers. Results are collated by SARDI aquatic sciences and will be reported in future stock status reports.

An annual published report on interactions and implementation of the Code is prepared by SARDI in addition a summary of quarterly statistics are made available for PIRSA Fisheries, the Minister and the TEPS Working Group for regular review. These reports/summaries include performance indicators which have been identified to assess the progress of the fishery in minimising interactions. These PIs are:

1. encirclement rate;
2. mortality rate; and
3. difference between observer and logbook encirclements and mortalities.

The latest '*Operational interactions of the South Australian Sardine Fishery with the Common Dolphin: July 2004 to March 2009*' summarises observer and logbook data collected from July 2004 to March 2009 and focuses on data collected during 2007-08 and July 2008 – March 2009. It compares the data collected over previously reported periods, to evaluate the effectiveness of the CoP in mitigating interactions of the SASF with the common dolphin (Hammer *et al.*, 2009).

The interaction rates calculated from observer data were significantly lower in 2007-08 compared to 2006-07 (encirclement rate down 40% and the mortality rate decreasing by 30.8% per net set) . The interaction rate was lower again in the July 2008-March 2009 period, with the encirclement rate decreasing by a further 23.0% to 0.3043 dolphin per net set, and the mortality rate by 68.4% to 0.0175 dolphins per net set (Hammer *et al.*, 2009).

In 2008 to reduce the discrepancy in reporting interactions in the logbooks when observers are onboard compared to when they are not, the SA Minister for Agriculture, Food and Fisheries increased the observer coverage from 10% to 30%. The total target for 30% observer coverage is 200 nights, which represents approximately 30% of the total nights (and net sets) fished by the sardine fleet. The level of reporting of interactions in logbooks has improved considerably over time since the observer program commenced in 1994 (see page 22 of the report) with the encirclement and mortality rates recorded in observer data and the logbook data now very similar. The observed rate of encirclement was similar to logbook rate in July 2008-March 2009 period. PIRSA Fisheries expects this trend to continue. Further, the SARDI report has shown that the CoP has been successful in reducing interactions in the fishery.

Analysis of data collected through logbook records and the independent scientific observer program indicates that seal and sea-lion interactions with the purse seine gear are common. However, it is extremely rare for these interactions to result in injury or mortality (only one mortality ever reported from extensive observer program). For this reason, the impact of the SASF on seals and sea-lions is considered negligible and interactions will continue to be monitored through the observer program for any changes.

Interactions with sharks have been recorded but the incidence of interaction is extremely low.

Ongoing work in the fishery on TEPS interactions includes:

- Implementation and continual review of the Code of Practice, including:
  - Regular skippers meetings conducted by the SASIA;
  - Induction and training of crews by SASIA; and
  - Quarterly TEPS working group meetings to continually revise and update the Code.
- Observer coverage;
- Annual published reports and quarterly SARDI data summaries on dolphin interactions, which are provided to the TEPs working group and PIRSA Fisheries.

## **9. Ecosystem impact**

Small pelagic fish convert energy produced by phytoplankton into a form that is available to higher vertebrates, and therefore are an important food source for predatory fish. Predators fluctuate in response to changes in productivity in the regions where they feed. Aspects of the reproductive and feeding ecology of predators have been used to monitor the health of marine ecosystems, and to monitor the effectiveness of fishery management regimes.

Currently, the SARDI project “Establishing ecosystem-based management for the South Australian sardine fishery; developing ecological performance indicators and reference points to assess the need for ecological allocations” is being conducted to:

1. Identify species of key marine predators that consume significant quantities of sardines and could potentially be used to assess the need for ecological and/or spatial allocations in the SA pilchard fishery.
2. Identify population parameters for these key marine predators such as measures of foraging and/or reproductive success, that are likely to be affected by changes in the distribution and abundance of sardines, and which could potentially act as ecological performance indicators for the fishery.
3. Examine the spatial and temporal scales at which these performance indicators vary in order to develop reference points that could be used to assess the need (if any) to establish ecological allocations in the fishery.
4. Use the results of this study to revise the management plan and establish cost effective systems for ongoing monitoring and assessment of the ecological effects of the SA Sardine Fishery.

Also, the South Australian Sardine Management Plan was updated in 2005 to include a harvest strategy consistent with the following goals:

1. Sustainability of the resource
2. Greater certainty and stability; and
3. Optimal productivity and profitability.

The harvest strategy sets out clear decision rules, where the maximum exploitation rate is 20% of the spawning biomass, which is conservative when compared to other small pelagic fisheries. This lower level of exploitation aims to ensure sufficient sardine biomass for healthy ecosystem function.

In 2008 and 2009 the fishery harvested at a rate of 11.3% of the sardine spawning biomass. This is considered a very conservative rate of exploitation for this species type.

## 10. Target Stock Status

There are currently two biological performance indicators for the SASF which are: 1. estimate of spawning biomass which reflects the number of individuals within the population that are estimated to be spawning on a particular day, and 2. the presence of age classes which reflect the percentage of different age classes present when sampling is undertaken.

The latest Fishery Assessment Report was published in January 2008 and has been attached to this document. This document includes analysis of data collected through a catch sampling program which is conducted annually to determine the age and size composition of catches; this is in addition to the DEPM data collected for determining the spawning biomass which is published bi-annually in the Spawning Biomass Report (the latest from 2008 and the next report due in October 2009).

The annual patterns from fishery independent sampling suggest that size distributions were unimodal in most years between 1998 and 2007 due to the presence of juveniles. There is uncertainty in estimates of sardine age; this issue has been partially overcome by using age-otolith weight relationships developed from a subset of the best otoliths to determine age structures. Catches from southern Spencer Gulf were mostly comprised of 1 to 4 year olds, and with the exception of 2003, the age structure of the fishery independent samples was mostly comprised of 2 to 6 year olds. Size and age structure information suggests that there is demographic structure in the South Australian sardine population (Ward *et al.*, 2008).

According to the report, the estimates of spawning biomass obtained using DEPM increased from ~36,000t in 1999 following the second mass mortality event to reach 263,000t in 2007. The baseline TACC of 30,000 t is approximately 11.3% of the 2007 spawning biomass. Therefore it can be concluded that the sardine stock on which the SASF is based is in a strong position (Ward *et al.*, 2008).

Under the harvest strategy, rather than setting the TACC as a percentage of the estimate of spawning biomass, a baseline TACC of 30,000 t has now been set for the fishery. The baseline is established as the effective TACC while the latest annual/biannual estimate of spawning biomass remains between 150,000 t and 300,000 t which correspond to exploitation rates of 20% and 10% respectively (Ward *et al.*, 2008).

The harvest strategy provides for reductions or increases in the TACC based on spawning biomass increasing or decreasing above and below the upper and lower baseline parameters, and well defined decision rules. This framework addresses the high potential for large inter-annual variations in

the TACC resulting from both fluctuations in estimates of spawning biomass and the application of different exploitation rates at different biomass levels.

## **11. By-product and by-catch stock status**

The principal target species in the SASF is Australian sardines (*Sardinops sagax*). There is no provision under the fisher's license conditions to retain any other species. Logbook data and observations by SARDI staff suggest that bycatch in the fishery is low, the composition of catches occasionally includes marine scalefish species such as crustaceans, mackerel, sprat, molluscs and sharks.

Analysis of data collected through logbook records and the independent scientific observer program indicates that shark interactions with the purse seine gear are rare. For this reason the impact of the SASF on sharks is considered negligible.

Common dolphins are identified as the species with which the fishery has the most interactions with. Section 8 highlights the management arrangements in place to address this.

## **12. Additional Information**

**South Australian Wild Fisheries Information and Statistics Report, May 2008:** Provides an estimate of catch, effort and landed beach price of the commercial fish catch in South Australian waters up to the financial year ending June 2006. It also provides statistical overview highlighting key information and points of interest.

**Economic Indicators for the South Australian Sardine Fishery, Econsearch Pty Ltd:** There is a series seven reports from 2001/02 to 2007/08 that present a set of economic performance indicators for the fishery as well as to develop a consistent time series of economic information to aid management of the fishery in future years.

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

## **13. Recommendations**

PIRSA Fisheries in conjunction with the South Australian Sardine Industry have implemented the majority of the recommendations from the previous assessment and made substantial progress on others. The fishery is well managed and has addressed issues as they have arisen. The 2005 recommendations have been addressed throughout the report, and are further summarised in the following tables.

### 13.1. Recommendations by DEWHA, Progress Summary.

**Table 3. SARDINE - Recommendation Summary**

No	Recommendation	Progress	Target
1*	That PIRSA advise DEH of any material change to the South Australian Pilchard Fishery's management arrangements that could affect the criteria on which EPBC decisions are based, within 3 months of that change being made.		Ongoing
2	Within 3 months of becoming aware of the breaching of a performance measure, PIRSA to finalise a clear timeframe for the implementation of appropriate management responses.		Ongoing
3	That PIRSA develop within 2 years a performance indicator and performance measure to ensure that bycatch is minimised in the South Australian Pilchard Fishery.	Significant	September 2005
4*	That PIRSA provide a mechanism, which allows fishers to record interactions with protected/listed species at a species level. PIRSA to implement an education program to ensure that industry has the capacity to make these reports at an appropriate level of accuracy.	Complete	December 2006
5	Should new information determine that the fishery is having significant interactions with any endangered, threatened or protected species, PIRSA will develop appropriate measures to mitigate those interactions. Measures should be implemented within 12 months of the information becoming available.	Complete	Ongoing
6	Should the ecological effects survey determine that the fishery is having significant ecosystem impacts, PIRSA will develop and implement appropriate measures to mitigate those impacts in a timely manner.	Significant	Ongoing

## 13.2. Recommendations by DEWHA, South Australia's Strategies and Actions.

**Table 4. SARDINE – Strategies and Actions**

No	Proposed Strategies	Actions	Target
2	<p>PIRSA and the South Australian Sardine Industry Association to finalise the communication protocol.</p> <p>Formalise management response in new management plan prior to September 2009</p>	<p>Joint efforts are currently being undertaken to update communication protocols regarding new fisheries co-management arrangements under the new Act – these include meeting schedules, and TACC setting consultation processes.</p> <p>The management response for breaches of performance indicators is being finalised across all of South Australia's commercial fisheries. The procedure and timeframe for responses will be documented in each new Management Plan developed under the new Act.</p> <p>A harvest strategy with performance indicators and timeframes for responses was incorporated into the management plan in 2007.</p> <p>The current management plan includes a revised harvest strategy which manages the stock within conservative limits this is considered to reflect world's best practise. Further, the fishery;</p> <ul style="list-style-type: none"> <li>▪ is addressing TEPs interactions (see section 8),</li> <li>▪ has no resource sharing concerns; and</li> <li>▪ the sardine stock is considered to be well managed.</li> </ul> <p>There are resourcing limitations in PIRSA Fisheries and the requirements for management plans (including allocations between sectors and ESD risk assessments) under new <i>Fisheries Management Act 2007</i> takes time, consideration, consultation and resources. As such revision/development of management plans for SA managed fisheries are being prioritised. The SA Sardine Fishery management plan will be reviewed when resources become available and/or as deemed necessary.</p>	June 2006
3	Review logbooks and modify where appropriate, to enable fishers to accurately record bycatch	<p><i>'Wildlife interaction' identification and logbook</i> developed, distributed, used, monitored and data reported on for the fishery.</p> <p>Independent observer program commenced in 2004.</p>	September 2006

	<p>Develop fishery-dependent monitoring of bycatch</p> <p>Verify fishery-dependent monitoring through use of independent observer program</p> <p>SARDI to produce regional bycatch report for Spencer Gulf in 2008/09</p> <p>Performance indicator/measure to be developed based upon results of above actions</p>	<p>Observer data and logbook data being assessed by TEPS working group on a quarterly basis.</p> <p>SARDI has prepared 3 reports that examine the interaction rate with dolphins as reporting in logbooks compared to when observers are onboard, as well as looking at the implementation of the Code of Practice. Data summaries are provided on a quarterly basis to the TEPS Working Group for consideration and action. The next full SARDI report will be provided in April 2010 with analysis of data for the period up to 30 December 2009.</p> <p>Further PIRSA has:</p> <ul style="list-style-type: none"> <li>• Assisted the SA Sardine Industry Association in revising its Code of Practice;</li> <li>• Participated on the TEPs working group; and</li> <li>• In February 2008, the observer coverage in the fishery was increased from 10% to 30% subject to review by the Minister of Agriculture, Food and Fisheries.</li> <li>• A performance indicator/measure will be considered in the development of the new Management Plan.</li> </ul>	
4	<p>TEPS recording being undertaken across all of SA fisheries (section 1.1)</p> <p>Distribute information on identification of TEPS</p>	<p>PIRSA Fisheries have distributed an endangered and protected species guide to all licence holders in the fishery and educated them on how to use the guide.</p> <p>PIRSA and the SA Sardine Industry Association has undertaken a number of actions to minimise bycatch of TEPS in the Sardine Fishery, these are:</p> <ul style="list-style-type: none"> <li>• Independent observer program in place, with the data frequently being assessed;</li> <li>• TEPS logbook in place for all fisheries;</li> <li>• SARDI has prepared 3 reports that examine the interaction rate with dolphins as reporting in logbooks compared to when observers are onboard, as well as looking at the success of implementation and effectiveness of the code of practice. The most recent report '<i>Operational Interactions of the South Australian Sardine Fishery with the Common Dolphin: July 2004 to March 2009</i>' is attached – April 2009;</li> <li>• Collaboratively with industry produced a revised Code of Practice for the Sardine Industry;</li> <li>• Skipper and crew induction sessions conducted onboard all vessels in the</li> </ul>	December 2006

		<p>fishery prior to fishing as per the requirement of the Code of Practice.</p> <ul style="list-style-type: none"> <li>• Code of practice is on board every boat in the fishery in addition to TEPs identification guides;</li> <li>• Participate on the TEPs working group;</li> <li>• In February 2008, the observer coverage in the fishery was increased from 10% to 30%;</li> <li>• FISHWATCH (1800 number 24 hr phone number) was modified so that mortalities with TEPS could be immediately reported and investigated; and</li> <li>• TEPs mortalities have been reported to FISHWATCH (1800 number) and they are investigated by PIRSA Compliance on each occasion.</li> <li>• SARDI reports and independent observer program has show that the Code of Practice has been very successful in mitigating interactions with TEPS.</li> </ul>	
5	<p>Based on actions from recommendation 4, implement appropriate mitigation measures</p> <p>Investigate opportunities to further improve effectiveness of Code of Practice</p>	<p>An industry Code of Practice was first developed and implemented in 2005 to mitigate interactions with TEPS.</p> <p>In 2008, the Industry with the TEPS Working Group (including consultation with SA DEH and Commonwealth DEWHA, SARDI and PIRSA Fisheries) the initial 2005 Code of Practise was revised and updated into the <i>Code of Practice for Mitigation of Interactions between the South Australian Sardine Fishery and Threatened, Endangered and Protected Species</i> Jan 2009. The key changes to the revised code included incorporating the onboard at sea communication, articulating the existing training program and skippers meetings, formalising the TEPS Working Group role, identifying each parties roles, and modifications and streamlining the release procedure based on industry and SARDI advice of what actions where most successful.</p> <p>Effectiveness of the Code of Practice is assessed in an SARDI annual report, which informs ongoing development and improvement.</p> <p>The Code of Practice is continually reviewed and revised by the Sardine Association’s TEPs Working Group (membership includes the SA Sardine Industry Association, sardine vessel skippers, State DEH, PIRSA Fisheries management and compliance).</p> <p>The Code of Practice will be used in conjunction with any new policies on TEPS</p>	Ongoing

		<p>recording requirements.</p> <p>A FRDC research project 2007/065 – <i>Assessment of the acoustic ability of the common dolphin (Delphinus delphis) and the development of acoustic mitigation measures to minimise their interaction with purse seine fisheries</i> was funded in 2008 to investigate acoustic technologies to minimise dolphin interactions in the fishery.</p> <p>The due date for completion was 31 August 2008. The assessment of the acoustic ability of common dolphin has been completed. The development of acoustic mitigation measures is complex. A range of devices have been tested however there is still some work to be undertaken to complete the project – The final stage of the project in expected to be completed by November 2009.</p> <p>In February 2008, the observer coverage in the fishery was increased from 10% to 30%.</p>	
6	SARDI to continue the ongoing research to develop methods for measuring ecosystem impacts and quantify ecological impacts.	<p>The FRDC research project 2005/031 ‘<i>Establishing ecosystem-based management for the South Australian sardine fishery: Developing ecological performance indicators and reference points to assess the need for ecological allocations</i>’ the <b>draft final report is due to be submitted to FRDC 31 December 2009, with the final report due 31 March 2010. The timing for the project was extended in agreement with FRDC, for a range of mutually-beneficial reasons and will ensure that the report is of the highest possible quality.</b> SARDI has been providing milestone reports to SA Sardine Industry Association (SASIA) on the status of research and progress results.</p>	Ongoing

## 14. References:

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