Australian Government
Australian Fisheries Management Authority

ANNUAL STATUS REPORT

Southern Squid Jig Fishery

JULY 2009

This report has been prepared by AFMA for consideration by the Department of the Environment Water Heritage and the Arts in relation to the exemption of the Southern Squid Jig Fishery from export controls under the *Environment Protection and Biodiversity Conservation Act 1999.*

Box 7051, Canberra Business Centre, ACT 2610 Tel (02) 6225 5555 Fax (02) 6225 5500 AFMA Direct 1300 723 621

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Introduction

The Southern Squid Jig Fishery (SSJF) has been operating under a 5 year exemption from the export control provisions of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) since November 2004. The current exemption is due to expire on 1 December 2009. This accreditation was subject to a number of recommendations, the outcomes of which are discussed in Table 6.

This report details how the current management arrangements address the *Guidelines for Assessing the Ecological Sustainability of Commercial Fisheries* (the Guidelines). The Guidelines form part of the generic *Terms of Reference – Environmental Assessment of Commonwealth Fisheries* and are a central component of the *Terms of Reference for the Southern Squid Jig Fishery*.

1. Description of the Fishery

The main species targeted by the Southern Squid Jig Fishery (SSJF) is Arrow Squid (*Notodarus gouldi*), which is also taken as bycatch in two sectors of the Southern and Eastern Scalefish and Shark Fishery (SESSF): Commonwealth South East Trawl and Great Australian Bight Trawl sectors.

The SSJF includes Commonwealth waters adjacent to NSW, Victoria, South Australia, Tasmania and Queensland up to Sandy Cape (adjacent to Fraser Island) (Figure 1). The major fishing grounds of the SSJF are off the south east corner of Australia.

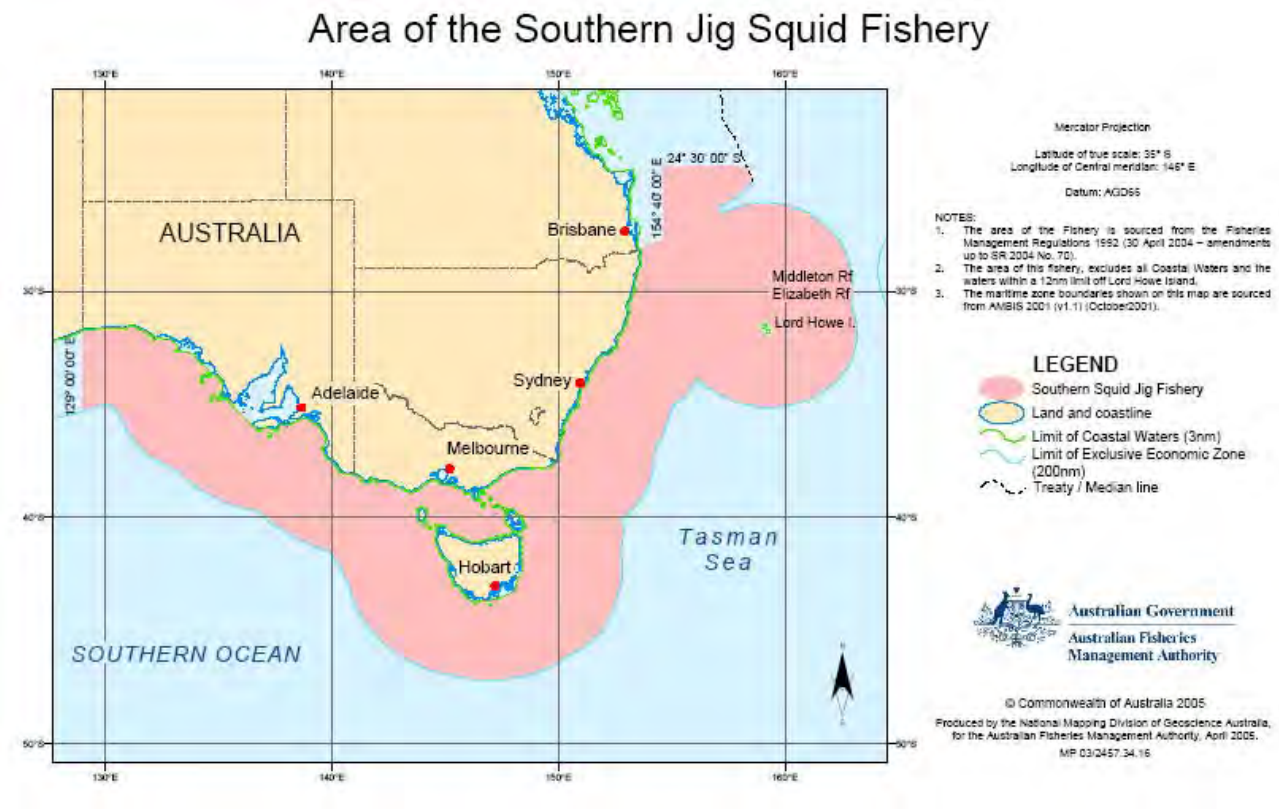

Figure 1: **The area of the Southern Squid Jig Fishery in Australia**.

Squid jig catches are mainly taken between Queenscliff and Portland, off the Victorian coastline, and south of Kangaroo Island off the South Australian coast. Some historical activity has been reported from the waters around Tasmania. Most of the jig catch is taken between January and June each year, with the highest catches concentrated in March and April. Trawl catches of squid follow a similar pattern with the majority of squid bycatch taken across the first six months of the year.

1.1. Status of export approval/accreditation under *Environment Protection and biodiversity Conservation Act 1999*

The SSJF was granted a 5 year exemption from the export control provisions of the EPBC Act in November 2004. The current exemption is due to expire on 1 December 2009. This accreditation was subject to a number of recommendations, the outcomes of which are discussed in Table 6.

2. Management

2.1. Changes to management arrangements

The SSJF is managed by AFMA in accordance with the *Fisheries Management Act 1991* under the *Southern Squid Jig Fishery Management Plan 2005* (the Plan). The Fishery was managed under a system of fishing permits until 2006 when these were replaced by Statutory Fishing Rights (SFRs). The SSJF is managed by input controls with a Total Allowable Effort determined each year. The Plan specifies effort controls based on a set number of standard squid jigging machines allocated to a gear statutory fishing right (SFR). The management arrangements took effect on 1 January 2006 following the granting of SFRs in late 2005 to all eligible operators in the fishery.

The SSJF is also subject to management arrangements specified in the Arrow Squid Harvest Strategy (the Harvest Strategy) which was implemented in January 2008. The Harvest Strategy specifies processes for monitoring and conducting assessments of the biological and economic conditions of the fishery. The Harvest Strategy covers the SSJF as well as sectors of the SESSF and other fisheries that may take Arrow Squid in the Australian Fishing Zone.

2.2. Performance of the fishery

A statement of the performance of the SSJF Fishery against its objectives, performance indicators and performance measures is made annually in AFMA's annual report. A copy of the current statement can be found at:
http://www.afma.gov.au/information/publications/corporate/annual/ar07_08/default.htm

2.3. Compliance risks present in the fishery and actions taken to reduce these risks

AFMA has compliance plans in place for all major Commonwealth fisheries. Due to generally low levels of effort in the SSJF and low levels of bycatch and TEP species interactions, there is currently a relatively small level of compliance risk. AFMA currently monitors catches in the Southern Squid Jig fishery through logbooks and Catch Disposal Records (CDRs). Compliance operations are undertaken as required.

2.4. Consultation Processes

Management of the fishery incorporates a range of consultative mechanisms and a clear commitment to effective consultation with a variety of stakeholders. Advice on management of the SSJF is provided by the Southern Squid Jig Fishery Management Advisory Committee (SquidMAC), which consists of an independent chair, AFMA representatives, a research scientist, commercial fishers, a State government member, and an environment/conservation member. Members of SquidMAC are appointed by the AFMA Chief Executive Officer and the Executive Officer is provided by AFMA. The Southern Squid Jig Resource Assessment Group (SquidRAG), has been formed to provide advice to SquidMAC and AFMA on stock, environmental and economic assessments.

AFMA is in the process of restructuring its Management Advisory Committees (MACs) and it is anticipated that SquidMAC will merge with Southeast MAC by January 2012.

2.5. Description of cross-jurisdictional management arrangements

A series of arrangements under the Offshore Constitutional Settlement (OCS) have been negotiated with the South Australia and Victoria for squid resources in inshore waters to be managed by the Commonwealth. There is no such arrangement with Tasmania.

2.6. Demonstration of compliance with TAPs, recovery plans, etc and also relevant domestic and international agreements

As squid jigging has a very high, target-specific catch rate, there have been negligible levels of bycatch documented to date in the SSJF (Table 1). Since 2001 AFMA logbook records have reported only small quantities of Blue Shark, Garfish and Barracouta being taken. These species constitute less than 1 per cent of the total catch for the fishery. Occasionally Blue Sharks and Barracouta are attracted by the schooling squid causing loss of jigs and lines. Operators usually move onto another area when this occurs. Since 2006 there has been zero bycatch recorded, the blue shark component can be explained by the fact that fishermen used to catch blue shark on handlines but incorrectly record it as bycatch. This practice has changed and squid jig fishers are now aware they need to have appropriate line endorsements for the take of any other species. In relation to barracouta, this species is caught on jig lines but encounter rates with squid jiggers can be highly variable from year to year.

Management measures have been developed to avoid and/or reduce the capture and mortality of bycatch species in the SSJF including a Bycatch and Discard Workplan. There are no TAPs, recovery plans, domestic or international agreements in place.

Table 1: Record of bycatch in the Southern Squid Jig Fishery since 2000

Species Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Grand Total
Barracouta	100	2		20	119	25	55				321
Blue Shark	3			3	213	388	35				642
Fish (mixed)	10	1									11
Garfish unspecified	30	48									78
Mirror Dory					1						1
Octopoda				5	10						15
Squids									4536		4536
Grand Total	143	51	0	28	343	413	90	0	4536	0	5604

3. Research and monitoring

3.1. Research completed within the SSJF

Most of the data used to monitor the SSJF comes from daily catch and effort logbooks. Table 2 outlines recent research that is either recently completed or being conducted in the SSJF.

Table 2. Key research projects on Arrow squid in Australia

Research Project	Status	Principal investigator
Use of Depletion Analysis in the Southern Squid Jig Fishery of Australia	Completed in August 2008	Dr Lianos Triantafillos
The temporal and spatial population structure in south east Australian squid *Nototodarus gouldi*	PhD research – commenced in 2007.	Corey Green
Arrow Squid – stock variability, fishing techniques, trophic linkages - facing the challenges'	Commenced in 2006, expected to be completed in 2010.	Dr George Jackson

The Depletion Analysis was presented to the Squid Management Advisory Committee in October 2008. The study found that, based on historical fishing effort, the resource was under-exploited in the South, East and West zones of the SSJF. In contrast, historical effort in the Central Zone had been high and if heavy fishing pressure corresponded with low availability of squid, localised depletions were possible unless in-season management arrangements were implemented to restrain fishing effort. The study also showed that performing a depletion regression on groomed catch and effort data is a viable way of estimating the start of season biomass, both quickly and easily. To implement in-season triggers, the report recommended that the timeliness and quality of current reporting within the SSJF needed to be improved.

The Fisheries Resources Development Corporation (FRDC) is currently funding the research project submitted by Dr George Jackson from the University of Tasmania on *Arrow Squid – stock variability, fishing techniques, trophic linkages.*

This project will:

- investigate the influence of environmental and oceanographic variables on Arrow Squid growth and recruitment
- investigate the ecology, population dynamics of squid in the newly proposed mid-water trawl GAB fishery
- compare the biological composition of jig and trawl-caught squid
- describe the key components, spatial and temporal variability and environmental influences on the diet of Arrow Squid
- assess the use of light traps as samplers of juvenile squid recruitment
- develop an ecosystem model based on squid predator-prey relationships for squid stock assessment
- provide SquidMAC with better information on environmental influences on stock fluctuations to assist in determining trigger points for the fishery.

Both studies by Dr George Jackson and Corey Green have not been funded by AFMA and thus there is limited understanding of the progress or timing of the outcomes of these projects. However once these results are published, they will be fed into the research and management processes of the SSJF.

3.2. Current monitoring programs within the SSJF

Existing data collection tools employed by AFMA to monitor catch rates and the impact of the SSJF and other fisheries on the marine environment include:

a) Daily catch and effort logbooks:

Logbooks provide a continuous record of the day to day fishing operations undertaken by SSJF concession holders. The data collected from logbooks provides information for research into the management of the SSJF.

b) Catch disposal records:

Catch disposal records (CDR) have been designed to record verifier information about fish catches. The information gathered from these CDR will be used as a tool for fisheries management purposes.

c) Independent observer coverage:

Observer coverage provides a real time account of commercial catches, discards and gear interactions with other species as well as species data including length and weight. Due to negligible recorded bycatch, no reported interactions with TEP species in the SSJF and no requirement for length/weight data, there has been limited observer coverage in the fishery (Table 3).

Table 3: Observer coverage of the SSJF across years in relation to total days fished.

Year	Method	Total days fished (logbooks)	Total days fished (observed)	**Observed effort (% total days fished)**
2005	Jig	851	20	2.4
2006	Jig	422	0	0
2007	Jig	376	6	1.6
2008	Jig	90	0	0
2009	Jig	97	0	0

4. Catch data

4.1. Total catch of target species

Recent catches of Arrow Squid in the SSJF have been low and are significantly below catch triggers set out in the Harvest Strategy. Over the last 3 years, the Commonwealth Trawl Sector has caught more squid (as bycatch) than the SSJF (Table 4). The bycatch of squid in the Great Australian Bight Trawl sector is proportionate to effort and/or the scalefish species being targeted i.e. Blue Grenadier and Western Gemfish.

Table 4: AFMA Catch Disposal Records (kilogram) of Arrow Squid by Fishery across years.

Fishery	2004	2005	2006	2007	2008	2009 (June YTD)
Southern Squid Jig Fishery	1,567,207*	1,569,308	620,120	802,280	179,491	307,596
Commonwealth Trawl Sector	594,303	628,066	686,719	861,507	641,422	417,938
Great Aust. Bight Trawl Sector	157,430	111,611	261,789	120,596	62,483	22,810
Victorian Inshore Trawl	692	55		2,490	79	53
Gillnet Hook and Trap Fishery	1	21		33	14	3
East Coast Deepwater Trawl				513		
Grand Total	2,379,633	2,309,060	1,568,628	1,787,419	883,489	748,400

* Logbook data as Catch Disposal Records (CDR) were not collected in the SSJF until 2005

5. Status of target stock

Arrow squid are a short-lived species with their lifespan estimated to be less than one year. Stocks of arrow squid are highly variable across years and localities and are strongly influenced by environmental conditions such as upwellings and nutrient loads as well as primary production blooms. Consequently the standard stock assessment used for fish such as teleosts or chondrichthyans, or requirements for monitoring are not appropriate for squid.

5.1. Stock Assessments

No formal stock assessment has been undertaken in the SSJF. In the absence of an agreed stock assessment, the Australian Government's Bureau of Rural Sciences Fishery Status Reports have rated Arrow Squid stocks as **uncertain** since 1994. Current knowledge of the southern squid resource is insufficient to allow biomass or suitable proxies for reference points to be estimated.

The Harvest Strategy uses a system of within-season monitoring against catch triggers for the jig and trawl sectors that signal the need for formal assessment (Table 5). Due to relatively low effort in the last few years, these triggers have far exceeded the catch and effort in the fishery. In addition, trawl bycatch of arrow squid has been relatively consistent over the years indicating that the squid stocks are stable.

Table 5: The harvest strategy control rules for Arrow Squid

Fishery	Trigger	Control rule - Management response
Jig fishery	3000t catch or 30 active vessels	Fishing continues. Requires a depletion analysis and increased investment in fishery monitoring and biological data collection. If there is no indication of impact (depletion) fishing may continue to the next trigger limit.
	5000t catch or 45 active vessels	Further catches are suspended pending another depletion analysis. If there is no indication of depletion a further, higher trigger may be considered. If there is impact, catch or effort may be capped. Fishing beyond this trigger will require more rapid realtime monitoring of the fishery.
Combined trawl sector	2000t	Fishing continues. Decision rules require depletion analyses equivalent to those required for the jig fishery rules. Catch limits may be set depending on the outcome of the analyses.
Combined jig fishery and trawl sector	4000t	The combined jig and trawl catch triggers the decision rules at this level are equivalent to those applying to the 3000t intermediate jig catch trigger however assessment would involve depletion analysis for both fisheries.
	6000t	Decision rules are equivalent to the 5000t jig catch trigger however assessment will involve depletion analysis using data for both fisheries and any changes to catch triggers will require agreement from both the SSJF and the SESSF resource assessment groups.

The recent Depletion Analysis (Triantafillos 2008) found that while historical fishing effort had under-exploited squid stocks in the South, East and West zones of the SSJF, the more concentrated effort in the Central Zone, even at its peak in 2001, had only depleted the stock to 50%. The Depletion Analysis found that in the future, if heavy fishing pressure corresponded with low availability of squid, localised depletions were possible.

5.2. Resource Concerns

There are currently no concerns with respect to the squid resource in Commonwealth waters. The reduced effort in the SSJF is due to market forces rather than the availability of squid. Despite being considered to have been only lightly fished in recent years, the highly variable pattern of Arrow Squid abundance across years and localities has underpinned the rationale for a precautionary approach to be taken in setting the rules for the Harvest Strategy.

6. Interactions with Threatened, Endangered and Protected species (TEPs)

6.1. Frequency and nature of interactions

The SSJF is not known to interact with any TEP species. Australian Fur Seals commonly forage for squid near operating jig vessels. Research in 2004 investigated the potential for harmful interactions between Australian Fur Seals and squid-jigging operations and found that there was no evidence of jigging operations having a negative impact on seals (Arnould *et al.* 2003).

7. Impacts of the fishery on the ecosystem in which it operates

7.1. Results of any Ecological risk Assessments

AFMA initiated the development of Ecological Risk Assessments (ERAs) for Commonwealth managed fisheries in 2001 to assist in prioritising and guiding research, data collection, monitoring and management. ERAs assess the impact, both direct and indirect, a fishery's or sub-fishery's activities have on five ecological components of the marine ecosystem – target species; byproduct and bycatch species; threatened, endangered and protected (TEP) species; habitats and ecological communities. The assessments categorise species, habitats and communities into high, medium or low risk on the basis of their susceptibility to fishing activities and their ability to recover from fishing impacts. ERAs proceed through a scoping stage and three progressive levels of analysis. This hierarchical approach is a cost and time efficient way of screening activities and identifying key ecological priorities for fisheries management. The approach is considered precautionary with risks scored high in the absence of information or evidence to the contrary.

A Level ERA 1 analysis for the SSJF, completed in 2006, did not identify any indicators of threat to any of the five ecological components from jig fishing.

The Ecological Risk Management (ERM) framework has been developed to further refine and respond to the outcomes of ERAs. The ERM framework will provide a consistent and effective process for fisheries to apply when responding to ERA outcomes. The priorities identified in ERAs will complement and tie in with other initiatives including: the preparation of harvest strategies for target and byproduct species; Bycatch and Discard Workplans and the development of additional bycatch and discarding actions; and ongoing initiatives to minimise any interactions with TEP species. The ERM framework aims to bring all of these initiatives together to deliver more streamlined and focused fisheries management, focusing efforts on the key issues and avoiding duplication.

An ERM report for the SSJF was completed in April 2009 and submitted to the Department of Environment Water Heritage and the Arts (DEWHA). The report showed that the risk of jigging to the 216 protected (TEP) species, identified as occurring within the area of this fishery, was considered negligible or minor.

7.2. Nature of impacts on the ecosystem

There are minimal impacts on the ecosystem by the SSJF as has been confirmed by the Ecological Risk Assessment (2006), the Bycatch Action Plan (2004), the Bycatch and Discarding Workplan (2009) and the draft Ecological Risk Management report (2009).

8. Progress in implementing recommendations resulting from the DEWHA assessment of the fishery

8.1. Description of progress in implementing each recommendation

Table 6: Recommendations - Exemption, 1 November 2004 to 31 October 2009

Performance Criteria	Level of Achievement as at 30 May 2009	Deadline
Recommendation 1. AFMA to inform DEH of any proposed amendment to the management regime for the Southern Squid Jig Fishery, to enable DEH to evaluate any impact on the ecological sustainability of the fishery.	***Ongoing*** • The Fishery moved to the *Southern Squid Jig Fishery Management Plan 2005* using effort controls based on a set number of standard squid jigging machines allocated to a gear Statutory Fishing Right (SFR) on 1 January 2006. • A Harvest Strategy (HS) for the SSJF was developed in line with the Commonwealth Harvest Strategy Policy and implemented in 1 January 2008. The HS specifies decision rules which guide TAC setting and fishing effort in the fishery to ensure sustainability of the stock and fishing activity. • DEWHA was advised of both these developments	None specified.
R2. AFMA to continue to cooperate with other relevant jurisdictions to pursue complementary management and research of shared stocks for squid target and by-product species, which may be affected by cross-jurisdictional issues.	***Ongoing*** • OCS arrangements are in place with South Australia and Victoria to manage squid resources in inshore areas as well as the relevant Commonwealth waters. • Currently, there is no arrangement with Tasmania. Plans are in progress to arrange for regular catch data updates so	Within 12 months.

	that the squid catch data is representative of the entire catch. • The current AFMA Policy on Apportionment of a Squid catch between the Squid Jig Fishery and the Commonwealth Trawl Sectors describes the arrangements that apply across these fisheries and provides a comprehensive approach to managing the take of squid from Commonwealth managed waters. • The HS uses a system of within-season monitoring against catch triggers for both the jig and trawl sector to ensure sustainability of squid stocks. • SquidMAC has two permanent observers from the Tasmanian and Victorian State Fisheries.	
R3. Within 2 years of completion of the Ecological Risk Assessment project, AFMA to identify and implement appropriate management strategies to address/mitigate impacts identified through the ecological risk assessment of the Southern Squid Jig Fishery	***Achieved*** • The Ecological Risk Assessment for the SSJF was undertaken in 2005 and the final report completed in mid 2006. No indicators were identified that posed a threat to the environment as a consequence of jigging, thus only a Level 1 analysis was completed. • A draft Ecological Risk Management report was completed in April 2009. The report assessed the qualitative ecological risk to the marine ecosystems from the SSJF activities as negligible to minimal.	Within 2 years of completion of the Ecological Risk Assessment project.
R4. AFMA to continue to encourage and facilitate further research on Arrow Squid that will assist with the development of ecologically sustainable yield estimates.	***Ongoing*** • In 2008 a Depletion Analysis was completed to assist the Harvest Strategy. The findings from this research provided avenues for further analyses for the SSJF if required. • FRDC has agreed to fund a research project submitted by Dr George Jackson from the	Within 12 months.

	University of Tasmania on *Arrow Squid – stock variability, fishing techniques, trophic linkages.* The project commenced in 2006 and is expected to be completed in 2010. • AFMA in conjunction with the Southern Squid Jig Fishery Management Advisory Committee and Resource Assessment Group continue to promote research in the Southern Squid Jig Fishery.	
R5. AFMA to develop, within 2 years, interim performance measures sufficient to detect significant declines in the abundance of squid.	***Achieved*** The HS uses a system of catch triggers, fishing effort triggers and catch per unit effort triggers that signal the need for assessment and review of management arrangements. Some of the catch triggers in the jig fishery are: • 3000t intermediate catch trigger or 30 standard vessels – requires a depletion analysis, increased investment in fishery monitoring and biological data collection. If there is no indication of depletion, fishing may continue up to the next limit. • 5000t limit catch trigger – requires further catches be suspended pending another depletion analysis. If there is no indication of depletion, a further, higher trigger limit may be considered. If there is depletion, catch or effort may be capped. • There are also criteria that signal excessive fishing effort during periods of low squid availability, and similar decision rules to the intermediate catch trigger apply in that case.	Within 2 years
R6. AFMA to ensure that adequate validation of logbook data on bycatch and protected species interactions is undertaken.	***Ongoing*** • The squid jig method takes almost no by-product or by-catch and there have been no reported interactions with protected species. AFMA continually monitors logbook data on bycatch and TEP species interactions.	Ongoing.

With regard to the fourth recommendation, SquidMAC considers the expectation that further research will assist with the development of ecologically sustainable yield estimates for arrow squid is unrealistic and possibly unachievable given the economic performance of the fishery and the ephemeral nature of the stock.

Summary

The squid jig fishing method is highly selective, targeting a single species (*Nototodarus gouldi* Arrow/Goulds squid) with minimal bycatch or discards. There is no record of interactions in the SSJF with TEP species. No significant threats were identified in the SSJF based on a Level 1 Ecological Risk Assessment in 2005 and an Ecological Risk Management report in 2009. Current fishing efforts are restricted to a small part of the range of Arrow Squid and catch levels are considered to be well below sustainable levels. The Harvest Strategy, implemented in January 2008, has set catch triggers, fishing effort triggers and CPUE triggers that signal the need for assessment and review of management arrangements to ensure stock sustainability. Currently the major issues affecting the SSJF are economic, as the price of squid has dropped due to competition with imported product.

9. REFERENCES

Arnould, J., Trinder, D.M. and McKinley, C.P. 2003, Interactions between fur seals and a squid jig fishery in southern Australia*, Marine and Freshwater Research*, vol. 54, no. 8, pp. 979-984.

Triantafillos L. 2008. Use of depletion analysis in the Southern Squid Jig Fishery of Australia. Report submitted to the Australian Fisheries Management Authority – August 2008.

10. ABBREVATIONS AND ACRONYMS

AFMA	**Australian Fisheries Management Authority**
CDR	**Catch disposal record**
EPBC Act	***Environmental Protection and Biodiversity Conservation Act 1999***
ERA	**Environmental Risk Assessment**
ERM	**Environmental Risk Management**
MAC	**Management Advisory Committee**
OCS	**Offshore Constitutional Settlement**
RAG	**Resource Assessment Group**
SESSF	**Southern and Eastern Scalefish and Shark Fishery**
SSJF	**Southern Squid Jig Fishery**
SFR	**Statutory Fishing Right**
TAP	**Threat Abatement Plan**
TEP	**Threatened, endangered or protected**
The Plan	***Southern Squid Jig Fishery Management Plan 2005***