



Australian Government

Australian Fisheries Management Authority



# Residual Risk Assessment of the Level 2 Productivity Susceptibility Assessment

Non-Teleost and Non-Chondrichthyan Species

Report for the Danish seine method of the Commonwealth  
Trawl Sector



2012

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## **EXECUTIVE SUMMARY**

The Australian Fisheries Management Authority (AFMA) has undertaken detailed ecological risk assessments (ERAs) for all major Commonwealth managed fisheries as a key part of the move towards ecosystem-based fisheries management. ERAs assess the risks that fishing poses to the ecological sustainability of the marine environment by considering the impact of fishing on all components of the marine environment. The main purpose of ERAs is to prioritise the management, research, data collection and monitoring needs for each fishery.

The ecological risk management (ERM) framework has been developed to ensure that a consistent process is followed across fisheries when responding to the ERA outcomes. This framework ties into current fishery management processes and structures so that it can be easily implemented by fisheries. To support implementation of the ERM framework, AFMA will fully document the risk management strategies for each fishery. This will ensure transparency in the process and allow for easier co-ordination within and between fisheries. Using the results presented in this report, along with the results from any subsequent levels of assessment, appropriate management arrangements will be developed to address the high priority species as part of the ERM framework.

Due to the semi-quantitative nature of the risk assessment, the Level 2 PSA results do not directly account for all management measures, resulting in an over-estimation of the actual risk for some species. To better encompass this, the Level 2 PSA analysis has undergone further refinement by applying a set of residual risk guidelines.

In early 2007, the residual risk guidelines were developed in consultation with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and stakeholders to assist AFMA managers in refining the Level 2 PSA results. They have been developed to maintain the key features of objectivity and consistency from the ERA process, and to ensure a repeatable and transparent assessment process. These guidelines take into account methodology related matters and most current management arrangements. To assist managers, a clear set of decision rules are outlined that are to be applied to individual species.



The 2012 Level 2 Residual Risk ERA builds upon the 2010 Level 2 Residual Risk ERA noting new species caught or interacted with and re-assessing high risk species. A Level 3 Sustainability Assessment for Fishing Effects (SAFE) has been undertaken by CSIRO but has only been applied to teleost and chondrichthyan species. This is primarily due to not being able to obtain essential growth parameters for non-teleost and non-chondrichthyan species. Therefore, the 2012 Level 2 Residual Risk ERA only assesses non-teleost and non-chondrichthyan species for residual risk. For the Danish seine method, the results from the Level 2 PSA table are used here to determine the residual risk at this level of assessment. Overall one high risk species was assessed, which could not be reduced under any guidelines and remains high risk – the Australian Fur Seal. One shearwater species of medium risk was assessed, which was reduced to low under guideline 5.



# 1. Overview

## 1.1 Ecological Risk Management Framework

A key component in the Australian Fisheries Management Authority's (AFMA's) move towards ecosystem based fisheries management (EBFM) has been the undertaking of ecological risk assessments (ERAs) for all major Commonwealth managed fisheries. By assessing the impacts of fishing on all components of the marine environment, the ERAs encompass an ecosystem-based assessment approach. The ERAs help to prioritise research, data collection, monitoring needs and management actions for fisheries and provide information to assist the decision making process so that they can be managed both sustainably and efficiently.

The ERA process is hierarchical, and currently includes three levels of assessment. The first is a Level 1 Scale Intensity Consequence Analysis (SICA), which is a qualitative assessment that broadly looks at which hazards (activities) could lead to a significant impact on species, habitats or communities. The next is a Level 2 Productivity Susceptibility Analysis (PSA) which is a semi-quantitative analysis. Under PSA, risk to a species, habitat or community is based on its susceptibility to fishing, and productivity, or the rate at which the unit can recover after an impact. Level 2 PSA has been completed for all major Commonwealth fisheries. The final Level 3 is a quantitative assessment, and can include assessments such as the CSIRO's sustainability assessment for fishing effects (SAFE), or stock assessments for commercially fished species.

Due to the semi-quantitative nature of the Level 2 ERAs, not all risk scores are an accurate representation of actual risk. To account for this and to ensure management effort is not unnecessarily expended on 'false positives', an additional step called a residual risk assessment is included in the ERA process. The residual risk assessment is used to account for current management measures which reduce the level of risk posed by a fishery to species, and adjust risk scores where appropriate. During a detailed review of the ERA methodology, AFMA found that some ERAs did not include all existing management arrangements at the time of assessment. Furthermore, since the initial ERAs were completed in 2007, the management of some fisheries has changed and additional data and information may have become available to provide further detail on the actual level of risk of fishing on a species, habitat or community.

To assist with the implementation of EBFM across all fisheries AFMA has established a process for implementing ecological risk management (ERM) (see **Figure 1**). This process ensures that a consistent process is followed across fisheries when responding to the ERA



outcomes. While this focuses on responding to the results of ERAs, it acknowledges that there are other initiatives contributing to the achievement of EBFM. The ERM framework will streamline fisheries' responses to the results of ERAs and incorporate other initiatives such as bycatch and discard programs and species-specific management arrangements.

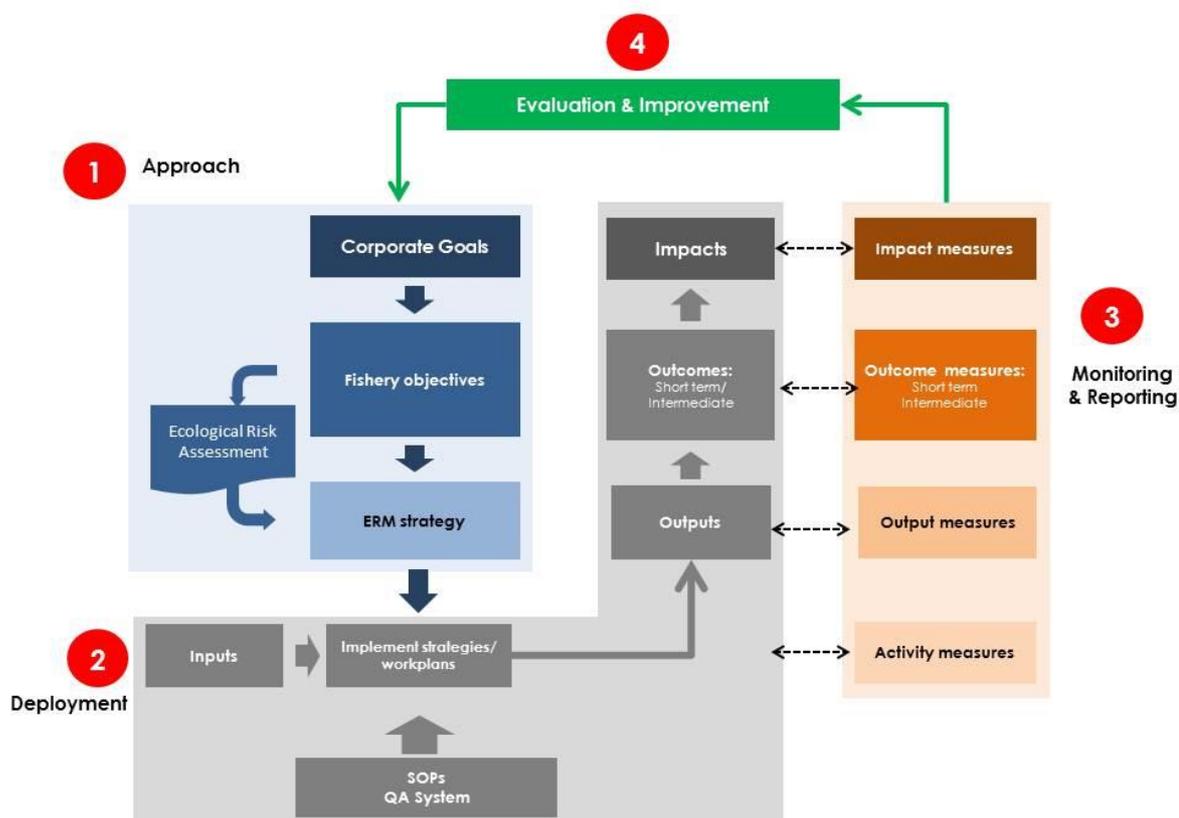


Figure 1 Ecological Risk Management Process Map

## 1.2 Ecological Risk Assessment Methodology

The ERA methodology is an adaptation of a traditional risk assessment to suit commercial fishing operations. The assessment is designed to evaluate the impact of fishing activities on five major components of the marine ecosystem:

- target species
- byproduct and bycatch species
- threatened, endangered and protected (TEP) species
- habitats

- ecological communities.

The ERA assessment adopts a hierarchical approach (**Figure 2**). With every progressive level, the precision increases along with confidence in the risk scores (noting that not all components of a system progress all the way through the assessment hierarchy). The Level 2 PSA, residual risk assessment and SAFE assessments are detailed below. For the full ERA methodology, including Scoping and Level 1 Scale, Intensity, Consequence, Analysis (SICA), please refer to *Ecological Risk Assessment for Effects of Fishing: Methodology* (2007).

### Risk Assessment Hierarchy

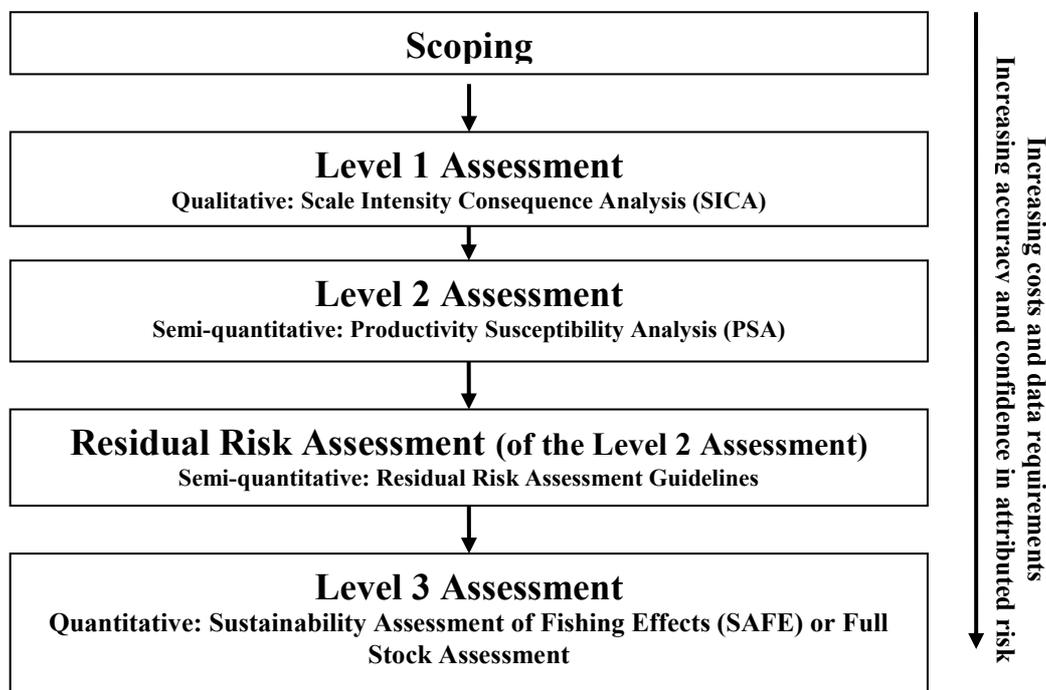


Figure 2 The different levels of risk assessment and the trend in confidence and cost

#### Level 2 Productivity Susceptibility Assessment (PSA)

Level 2 PSA is a semi-quantitative analysis of the risk posed by fishing to all individual species, habitats and communities identified in the scoping stage. Level 2 PSA allows all units (species, habitats or communities) to be effectively and comprehensively screened for risk. Level 2 PSA assesses the direct impact of fishing and is based on the assumption that risk to an individual unit is based on two characteristics of the unit:

- **Susceptibility:** where the extent of the impact on an ecological unit is determined by the susceptibility of the unit to the fishing activities



- **Productivity:** which determines the rate at which the unit can recover after potential depletion or damage by fishing activities.

The Level 2 PSA approach examines a number of **attributes** of each unit that contribute to or reflect its *susceptibility* or *productivity*. A score on a three point scale (low, medium, high) is determined for each unit for both productivity and susceptibility which combined provides a relative measure of risk for each unit. The attributes used to assess productivity and susceptibility are given in **Appendix A**. The Level 2 PSA risk scoring system is precautionary in that, where there is no information known on a specific productivity or susceptibility attribute for a unit, it is given a default score of ‘high risk’.

The Level 2 PSA utilises a precautionary approach when calculating susceptibility by assuming species distribution is only within the jurisdictional boundary of the fishery. While this is appropriate for species that form discrete populations or stocks, the risk score for species that extend beyond the boundary of the fishery such as pelagic and migratory species is not.

Some species have a low to negligible level of interaction with the fishing gear. Species with very low biological productivity may however still be scored high or medium risk irrespective of their low susceptibility. Considering the likelihood of interaction is already low there is little additional management that a fishery can introduce to mitigate the risk. The level of interaction or capture is therefore included as part of the Level 2 PSA residual risk process (see below).

### **Constraints of Level 2 PSA**

The methodology used in the Level 2 PSA assessment results in risk scores of high, medium or low to reflect potential rather than actual risk. Due to the semi-quantitative nature of the Level 2 PSA risk assessment, analysis does not take into account all management measures currently in place in fisheries, which may result in an over-estimate, or false-positive, of the actual risk for some species. The management strategies that are not accounted for in the Level 2 assessment include:

- limits to fishing effort;
- catch limits (such as Total Allowable Catches - TACs); and
- other controls such as seasonal closures.

Management actions or strategies that *are* accounted for in the assessment include:

- spatial management that limits the range of the fishery (affecting availability);
- gear limits that affect the size of animals that are captured (selectivity); and
- handling practices that may affect the survival of species after capture (post capture mortality).



It may be the case that not all management actions are considered. As a result, the Level 2 PSA is intentionally designed to generate more **false positives** for high risk (species assessed have a high risk when they are actually low risk) than **false negatives** (species assessed to be low vulnerability when they are actually high vulnerability). An example of this is when a species is missing information on its productivity and susceptibility attributes the risk score defaults to high risk.

In addition, TEP species are included within the assessment on the basis that they occur in the area of the fishery, whether or not there has been a recorded interaction with the fishery. For this reason there may be a higher proportion of false positives for high risk TEP species, unless there is a robust observer program that can verify that species do not interact with the fishing gear. Regardless of their risk scores, AFMA will take all reasonable steps to minimise any future interactions with TEP species through the ERM strategy.

When AFMA reviewed the methodology using example fisheries data in 2007, some additional concerns arose. Since the original Level 2 PSA results were produced there is now an improved understanding of: new or updated catch data available from log books and catch records; advances in scientific knowledge that may have become available; and more resolution on the spatial distribution of species.

## **Level 2 - Residual Risk Analysis of PSA results**

In 2007 AFMA, with input from CSIRO and stakeholders, developed a set of guidelines to assess the residual risk for species identified as having a high potential risk based on the Level 2 PSA. Before moving to a SAFE assessment, the residual risks are assessed to account for some of the constraints of the Level 2 PSA (mentioned above). The Level 2 PSA residual risk process incorporates some of the concepts of a Level 3 assessment and is more cost effective than a full SAFE assessment. Furthermore, the Level 2 PSA residual risk results more accurately represent overall risk within a fishery and will help clarify if a higher level assessment is necessary.

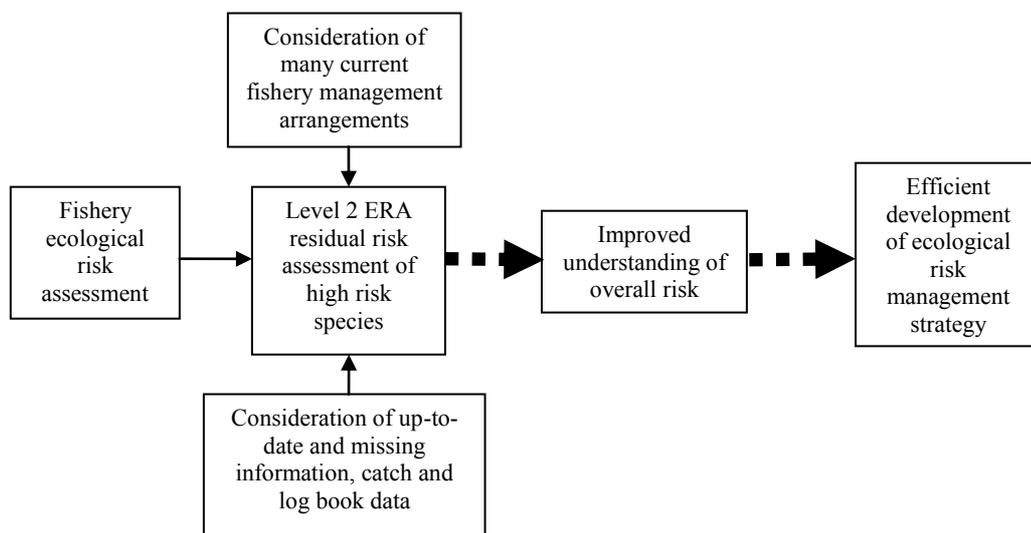
The guidelines have been designed to ensure that a consistent, transparent and repeatable process is adopted across all fisheries. A summary of the guidelines is given in **Table 1**. Within each category there are clear decision rules that can be applied to a species (if relevant) to calculate Level 2 PSA residual risk. Each of the guidelines is applied on a species-by-species basis to determine the residual risk within the fishery.

When determining the Level 2 PSA residual risk, all considerations included in the calculation process must be recorded, along with the guidelines applied with a detailed justification clearly stated. This ensures that a transparent process is maintained. In review of the ERA results, the guidelines are applied to all high risk species by managers in consultation with Resource Assessment Groups (RAGs) and Management Advisory



Committees (MACs) and fishery experts. Broadly the application processes involved the following steps:

- Sorting the ERA result by high risk, then grouping the high risk species by role (e.g. target, byproduct or discarded species) within the fishery, then by taxonomic group;
- Creating a list of all management arrangements not included in the ERA results for reference when applying the guidelines;
- Collating spatial information from experts, observer and logbook data for all high risk species for reference when applying the guidelines;
- Deciding if and what guideline applies to each of the high risk species by conducting a species-by-species application;
- Making changes to the necessary attributes, productivity and susceptibility scores to calculate the Level 2 PSA residual risk score;
- Recording all workings, guidelines used, how they have been applied and a justification for the Level 2 PSA residual risk score.
- Providing preliminary Level 2 PSA residual risk results to RAGs and MACs for feedback; and
- Finalising the Level 2 PSA residual risk results for release.



**Figure 3. Flow diagram of the Level 2 ERA residual risk process**

**Table 1 Summary of Level 2 ERA Residual Risk Guidelines**

<b>Guideline Number</b>	<b>Summary</b>
<b>Guideline 1.</b> Risk rating due to missing/incorrect information.	Considers if susceptibility and/or productivity attribute data for a species is missing or incorrect for the fishery assessment, and is corrected using data from a trusted source or another fishery.
<b>Guideline 2.</b> Additional scientific assessment.	Considers any additional rigorous scientific assessment (i.e. rapid Level 3 risk assessment, population viability analysis) that calculates the species level of risk from fishing, or considers any other scientific published assessments or results.
<b>Guideline 3.</b> At risk due to missing attributes.	When there are three or more missing productivity attributes, considers closely related species within a fishery that have those productivity attributes known.
<b>Guideline 4.</b> At risk with spatial assumptions.	Uses additional information on spatial distribution of species populations to better represent the species distribution overlap with the fishery.
<b>Guideline 5.</b> At risk in regards to level of interaction/capture with a zero or negligible level of susceptibility.	Considers observer or expert information to better calculate susceptibility for those species known to have a low likelihood or no record of interaction or capture with the fishery.
<b>Guideline 6.</b> Effort and catch management arrangements for target and byproduct species.	Considers current management arrangements based on effort and catch limits set using a scientific assessment for key species.
<b>Guideline 7.</b> Management arrangements to mitigate against the level of bycatch.	Considers management arrangements in place that mitigate against bycatch by the use of gear modifications, mitigation devices and catch limits.
<b>Guideline 8.</b> Limits on associated species through other management arrangements.	Considers the implications of management arrangements for a particular species on other associated species.
<b>Guideline 9.</b> Management arrangements relating to seasonal, spatial and depth closures.	Considers management arrangements based on seasonal, spatial and/or depth closures.

### **Level 3 – Quantitative Risk Assessment**

At the conclusion of the Level 2 PSA assessment, a number of units may have been identified as being at high risk because of the activities of the fishery. At this stage a Level 3 analysis may be warranted. This can take various forms including a quantitative sustainability assessment for fishing effects (SAFE) developed by CSIRO to assess multiple species or a fully quantitative assessment of a specific species (similar to a standard stock assessment).

The SAFE methodology can only be applied to teleost (fish) and chondrichthyan (sharks and rays) species as it is difficult to obtain essential growth parameters for other species. For non-teleost and non-chondrichthyan species, the Level 2 PSA residual risk analysis is the highest level of assessment currently available.



### **1.3 ERA Milestones and Previous ERA Assessments**

#### **2001**

Funding was received to invest into ecological risk assessments (ERA's). The methodology was developed to be applied to Australian Commonwealth fisheries across 6 years in 2 stages. The first stage (Hobday *et al.* 2004) occurred between 2001 and 2004 and developed the basic methods and approach and applied them to several fisheries managed by the Australian Fisheries Management Authority (AFMA). Stage 2 (Smith *et al.* 2007) occurred between 2004 and 2007 and extended the Ecological Risk Assessment for Effects of Fishing (ERAEF) methods, particularly for Level 2 PSA assessments, and applied the methods to 31 sub-fisheries within 13 of AFMA's managed fisheries.

#### **2007**

The report *Ecological Risk Assessment for Effects of Fishing: Report for the Danish Seine Sub-Fishery of the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery* (Wayte *et al.* 2007) was produced. This report completes 4 stages of the ERA method: Scoping, Level 1, Level 2 and a model based Level 3 analysis.

The residual risk guidelines were developed in consultation with CSIRO and stakeholders to assist AFMA managers in refining the Level 2 PSA results. They were developed to maintain the key features of objectivity and consistency from the ERA process, and to ensure a repeatable and transparent assessment process.

The Level 3 Sustainability Assessment for Fishing Effects (SAFE) method was initially developed for the SESSF in 2007 and applied to teleost and chondrichthyan species impacted by five fishing methods across the SESSF: otter board trawl and Danish seine in the Commonwealth Trawl Sector, otter board trawl in the Great Australian Bight trawl sector, shark gillnet and scalefish automatic longline in the Gillnet, Hook and Trap Sector (Zhou *et al.* 2007).

#### **2010**

The report *Residual Risk Assessment of the Level 2 Ecological Risk Assessment Species Results: Report for the Danish Seine Fishery* (AFMA, 2010) was produced. This report uses the results from the Level 2 PSA table and the residual risk guidelines to determine the residual risk category for the species impacted by the Danish seine method.

#### **2012**

This residual risk assessment is for the non-teleost and non-chondrichthyan species assessed as at high risk in the 2010 residual risk assessment. The aim was to assess



whether the ERM framework had been successful in reducing the risk the fishery poses upon the species. This was also an assessment of the non-teleost and non-chondrichthyan species which have been caught or interacted with in the time since the previous ERA was completed

The Level 3 SAFE methodology was updated to include the most recent fishery distribution and effort data, new species from logbook and observer data and the introduction of the Danish seine method into the Great Australian Bight trawl sector (GABT). The analysis was applied to all teleost and chondrichthyan species for six major methods in the SESSF: otter board trawl in the Commonwealth trawl sector, otter board trawl in the Great Australian Bight trawl sector, Danish seine in the Commonwealth Trawl Sector, shark gillnet in the gillnet, hook and trap sector, automatic longline in the gillnet, hook and trap sector, and Danish seine in the Great Australian Bight trawl sector (Zhou *et al.* 2012). A residual risk assessment has been carried out for species assessed as at high risk under this SAFE. Those species which remained at high risk are now the focus of the Southern and Eastern Scalefish and Shark Ecological Risk Management Strategy.

## 2. Fishery Description

The Danish seine fleet is part of the Commonwealth Trawl Sector Fishery (CTS) of the larger Southern and Eastern Scalefish and Shark Fishery (SESSF). The CTS covers the area of the Australian Fishing Zone extending southward from Barrenjoey Point (north of Sydney) around the NSW, Victorian and Tasmanian coastlines to Cape Jervis in South Australia. The CTS is overlapped by parts of the Gillnet Hook and Trap (GHAT) sector of the SESSF.

The Danish seine fleet target Tiger Flathead and School Whiting. The fleet operates mainly out of the port of Lakes Entrance, Victoria, and fishing activities are centred on inshore grounds and offshore to the edge of the continental shelf in eastern Bass Strait.

The CTS is one of the main sources of Australian fresh fish for the Sydney and Melbourne markets. Danish seine operators are required to use a minimum 38mm mesh on their nets. Danish-seine effort has increased by 16.5 per cent between the 2007-2008 and the 2010-11 fishing seasons.

### Fishery Specifics

Gear:	Danish seine ( $\geq 38$ mm mesh at any part of the net)
Area:	Continental shelf close to Lakes Entrance (Victoria)
Depth range:	Down to 250 m



Main target species: Tiger Flathead and School Whiting

Management: Input controls: limited entry, gear restrictions, species specific spatial closures.

Output controls: quota management for target species, trip limits for some non-quota finfish species.

**Table 3. Fleet Size, Fishing Effort and Observer Input – 2007-2011. Data Source: ABARES Fish Status Reports 2008 and 2010.**

	Fleet Size – Number of Active Trawl Vessels	Effort - Number of Shots Per Year	Observer Program - Number of Shots Per Year
2007-2008 Season	-	6250	24
2008-2009 Season	-	6510	15
2009-2010 Season	16	7038	32
2010-2011 Season	15	7285	80

## **2.1 New Management Arrangements Introduced Since the 2010 Level 2 Residual Risk ERA**

No new management arrangements have been implemented in the fishery since the 2010 Level 2 Residual Risk ERA was completed.

## **3. Results**

### **Level 1 Scale Intensity Consequence Analysis (SICA)**

The following results are derived from the Level 1 assessment undertaken in the *Ecological Risk Assessment for Effects of Fishing: Report for the Danish seine Sub-Fishery of the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery* (Wayte *et al.* 2007):

#### **Number of ecological units assessed**

Target species: 6

Byproduct species: 31



Discard species:	116
TEP species:	198
Habitats:	82
Communities:	11 demersal, 2 pelagic

Two ecological components were eliminated at Level 1 – byproduct/discard species and communities.

A number of hazards (fishing activities) were eliminated at Level 1 (risk scores 1 or 2). Those remaining included:

- fishing (direct impacts on target and TEP species and habitats)
- fishing without capture (indirect impact on habitats)
- discarding catch (impact on TEP species).

Significant external hazards included other fisheries in the region, and coastal development.

Risks rated as major or above (risk scores 4 or 5) are all related to direct or indirect impacts from primary fishing operations.

Impacts from fishing on target and TEP species components are assessed in more detail at Level 2.

For more detail regarding scoring refer to *Ecological Risk Assessment for Effects of Fishing: Methodology* (Hobday *et al.*, 2007).

## **Level 2 Productivity Susceptibility Analysis**

Six target species and 198 TEP species were assessed at Level 2 using the PSA analysis. Of these, only one was assessed to be potentially at high risk – the Australian Fur Seal. This species is at high risk due to its low productivity and high susceptibility. Observer reports show that seals are encountered in the fishery, and do come into contact with the gear. However, overall it appears that the population has increased in recent years (Stewardson and Knuckey, 2005) so commercial fishing activity is not resulting in a declining seal population.

All byproduct and bycatch species were eliminated at Level 1 in the original ERA for the Danish seine sector and therefore were not subject to Level 2 assessment.



The Australian Fur Seal was assessed to be at high risk and the Shearwater was assessed to be at low risk. The Shearwater caught could not be identified to a species level. Therefore, PSA scores for all shearwaters were reviewed in order to determine an overall residual risk rating for this particular animal. All shearwaters assessed at Level 2 PSA analysis were assessed to be at medium risk – which automatically allocated a medium risk to this taxonomic group.

For detailed results and methodology refer to the *Ecological Risk Assessment for the Effects of Fishing: Report for the Danish seine sub-fishery of the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery* (Wayte *et al.*, 2007).

## Level 2 PSA Residual Risk Results

For this 2012 residual risk assessment the guidelines are applied only to non-teleost and non-chondrichthyan species that have been caught or interacted with between 2009 and 2011. The residual risk process and guidelines are also applied to the non-teleost and non-chondrichthyan species assessed as at high risk in the 2010 ERA (AFMA, 2010). This is to take into account the quantity of the species/number of individuals caught over the period specified and to potentially identify trends.

**Table 4** is a summary of the 2010 Level 2 PSA residual risk assessment for non-teleost and non-chondrichthyan species.

**Table 5** is a summary of this 2012 Level 2 PSA residual risk assessment. Risk scores for those species also assessed in 2010 have been re-evaluated to take into account changes to management strategies and changes to catch, discard and interaction data.

Overall 2 species were assessed, both of which are TEP species: Australian Fur Seal and Shearwater (species unidentified). The Australian Fur Seal remains high risk. Over the last decade, fur seal populations around south eastern Australia have increased. Fecundity, which is one of the aspects of productivity under the PSA, is still low when comparing to other otariids (Gibbens *et al.* 2010). The increase in population size has resulted in more interactions with fishing gear and higher levels of incidental capture. To address this issue, industry and AFMA have initiated collaborative projects with researchers to reduce seal interactions in this fishery, including the development of the ‘*Industry Code of Practice to Minimise Interactions with Seals*’. The Code defines measures to avoid the capture of seals in the nets and avoid attracting seals to the fishery grounds by setting out voluntary guidelines and standards of behaviour for responsible fishing practices.

Based on logbook and observer data, it was noted that one Shearwater (species unidentified) was caught or interacted with in 2010. This animal also remained alive. Guideline 5 was applied to the risk score for shearwater species which considers the level of interactions recorded through logbooks, observers, and expert information. The Danish



seine method is considered to have little impact on shearwater species, and the risk score was reduced from medium to low.

**Appendix B** shows the quantities of non-teleost and non-chondrichthyan species caught between 2009 and 2011 which were not assessed as part of this residual risk assessment. These species were assessed as low risk under the Level 2 PSA from Danish seine fishing pressure and have not been caught in numbers which would be detrimental to the population.



**Table 4. Level 2 PSA Residual Risk Results from the 2010 Ecological Risk Assessment for Non-Teleost and Non-Chondrichthyan Species**

Taxonomic Group	Common Name	Scientific Name	Role in Fishery*	Level 2 (PSA) Risk Score	Productivity Result	Susceptibility Result	Previous Justification #	Previous Level 2 PSA Residual Risk Score
Marine Mammal	<b>Australian Fur Seal</b>	<i>Arctocephalus pusillus doriferus</i>	TEP	High	2.29	3.00	The populations of these species are in the proximity of the SETF and considering the susceptibility of seals to gear and the fact that it is a TEP species, the Residual Risk score remains high	High

\*Role in Fishery – TEP (Threatened, Endangered or Protected)

# Data taken from *Residual Risk Assessment of the Level 2 Ecological Risk Assessment Species Results: Report for the Danish Seine Fishery, June 2010.*

**Table 5. Revised Level 2 PSA Residual Risk Results for Non-Teleost and Non-Chondrichthyan Species (Total Table) - Collation of 2010 and 2012 Species to Establish 2012 PSA Residual Risk Results**

Taxonomic Group	Common Name	Scientific Name	Role in Fishery*	Level 2 (PSA) Risk Score	Current and Planned Management/ Assessment	Level 2 PSA Residual Risk Guideline(s) Applied	Justification	Revised Level 2 PSA Residual Risk Score
Marine Mammal	<b>Australian Fur Seal</b>	<i>Arctocephalus pusillus doriferus</i>	TEP	High	There is an Industry Code of Practice to Minimise Interactions with Seals.  ISMP data collection	None	Seal captures have been increasing which could be explained by the increase in population. In 2011, 25 “seals” were caught or interacted with, which resulted with 12 alive and 13 dead. Based on Level 2 PSA selectivity results, it could be suggested that these “seals” were Australian fur seals.  The populations of these species are in the proximity of the SETF and considering the susceptibility of seals to gear and the fact that it is a TEP species, the residual risk score remains high	High

Taxonomic Group	Common Name	Scientific Name	Role in Fishery*	Level 2 (PSA) Risk Score	Current and Planned Management/ Assessment	Level 2 PSA Residual Risk Guideline(s) Applied	Justification	Revised Level 2 PSA Residual Risk Score
Marine Bird	<b>Shearwater – species unidentified</b>	<i>Genus - Puffinus</i>	TEP	Medium	ISMP data collection	Guideline 5	In 2010, 1 animal was recorded as caught and none have been recorded as caught or interacted with in the previous 3 years or since. This animal also remained alive. When Guideline 5 is applied: the level of interaction or capture of this species is negligible and the residual risk score is decreased to Low.	Low

\*Role in Fishery – TEP (Threatened, Endangered or Protected).

**Table 6. Summary of Level 2 PSA Residual Risk Results for Non-Teleost and Non-Chondrichthyan Species**

Component	Changed from high to medium	Changed from high to low	Changed from medium to low	High Residual Risk	Medium Residual Risk	Low Residual Risk
TEP	0	0	1	1	0	1
<b>Total</b>	0	0	1	1	0	1

## 4. Conclusion

The purpose in applying the Level 2 PSA residual risk guidelines was to take into account additional information and to ensure that the assessment was refined appropriately. Refinements were considered in either increasing or reducing the risk as appropriate.

There were only 2 species assessed for the Danish seine method. The Australian Fur Seal remained at high risk due to low productivity scores. The risk score for the unidentified Shearwater species was reduced from medium to low using guideline 5 which considers interactions rates.

This ERA and the 2010 ERA results highlighted the important species that the fishery needs to focus on. The residual risk process brings the ERA assessment up-to-date with most of the current management initiatives within the fishery. Using the results presented here, an appropriate management response will be developed to address the high priority species as part of the ERM framework. The ERAs will be updated periodically to capture how effective the ERM strategy is in addressing the impact to high risk species.

## 5. Consultation and clearance

The residual risk assessment commenced in May 2012 and was finalised in August 2012. As part of the consultation process, AFMA presented preliminary results at the August 2012 meeting of the Southern and Eastern Scalefish and Shark RAG (SESSFRAG) which includes representatives from industry, science and management. Final results were presented to the Shark Resource Assessment Group in December 2013 and at the March 2014 SESSFRAG meeting. Final clearance has been given by George Day, Senior Manager of Demersal and Midwater Fisheries at AFMA.



## GLOSSARY

Activity	Refers to any fishing activity.
Actual risk	The real risk posed for a species from fishing activities.
Attribute	A general term for a set of properties relating to the productivity or susceptibility of a particular unit of analysis.
Availability	Used in Level 2 PSA assessment to calculate the impact on an ecological component due to a fishing activity. Considers overlap of fishing effort with a species distribution.
Bycatch	That part of fisher's catch which is returned to the sea either because it has no commercial value or regulations preclude it from being retained and;  That part of the catch that does not reach the deck of the fishing vessel but is affected by the interaction with the fishing gear.
Byproduct	A non-target species captured in a fishery that has value to the fisher and be retained for sale.
Catch limit	The vessel catch limit is a limit on the quantity each individual vessel can land per trip or short period of time.
Component	The marine ecosystem is broken down into five components for the risk assessment: target species (TA); byproduct (BI) and bycatch species (DI); threatened, endangered and protected species (TEP); habitats; and ecological communities.
EBFM	Ecosystem-based fisheries management considers the impact that fishing has on all of the aspects of the broader marine ecosystem, not just the target species.
Effort	The total fishing gear in use for a specified period of time.
Encounterability	Used in Level 2 PSA assessment to calculate the impact on an ecological component due to a fishing activity. Considers the likelihood that a species will encounter fishing gear that is deployed within the geographic range of that species (based on two attributes: adult habitat and bathymetry).
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act (Cth) 1999</i>
ERA	Ecological Risk Assessment for the effects of fishing as developed by AFMA and CSIRO.
ERM Framework	Ecological risk management process outlined by AFMA.
False negative	Species assessed to be low risk when they are actually high risk.
False positive	Species assessed to have a high risk when they are actually low risk.



Fishery	A related set of fish harvesting activities regulated by an authority (e.g. South-East Trawl Fishery).
Gear	The equipment used for fishing, e.g. gillnet, Danish Seine, pelagic longline, midwater trawl, purse seine, trap etc.
Level 1	The level of the ERA assessment which includes a qualitative assessment of scale, intensity, consequence analysis (SICA).
Potential risk	Possible risk as a result of fishing activities
Post Capture Mortality	Used in Level 2 PSA assessment to calculate the impact on an ecological component due to a fishing activity. Considers the condition and subsequent survival of a species that is captured and released (or discarded).
Precautionary	The approach whereby, if there is uncertainty about the risk, risk is assumed to be high, unless there is advice to the contrary.
PSA	Productivity susceptibility analysis for Level 2 assessment of the ecological assessment.
Productivity	This determines the rate at which the unit can recover after potential depletion or damage by the fishing.
Level 2 PSA Residual Risk	In the context of this document residual risk means the residual risk after the Level 2 PSA assessment.
Scoping	A general step in an ERA or the first step in the ERAEF involving the identification of the fishery history, management, methods, scope and activities.
Selectivity	Used in Level 2 PSA assessment to calculate the impact on an ecological component due to a fishing activity. Considers the potential of the gear to capture or retain species.
SICA	Scale, intensity, consequence analysis for the Level 1 assessment.
Spatial management	Fisheries management that encompasses spatial arrangements such as depth closures or area closures.
Susceptibility	Used in Level 2 PSA assessment to calculate the impact on an ecological component due to a fishing activity. The extent of the impact due to the fishing activity, determined by the affect of the fishing activities on the unit.
Unit	The entities for which attributes are scored in the Level 2 analysis. For example, the units of analysis for the Target Species component are individual "species".



## APPENDIX A - SUMMARY OF PRODUCTIVITY AND SUSCEPTIBILITY SCORING

### Productivity

The productivity of a unit determines the rate at which the unit can recover after potential depletion or damage by fishing. The productivity score is the average of the following attributes:

1. Average age of species at maturity;
2. Average size of species at maturity;
3. Average maximum age of species;
4. Average maximum size of species;
5. Fecundity of species;
6. Reproductive strategy of species; and
7. Trophic level: organisms position in the food chain.

### Susceptibility

Susceptibility is the extent of the impact on an ecological component due to a fishing activity. The susceptibility score is the product of the following attributes:

1. **Availability:** considers overlap of fishing effort with a species distribution;
2. **Encounterability:** considers the likelihood that a species will encounter fishing gear that is deployed within the geographic range of that species (based on two attributes: adult habitat and bathymetry);
3. **Selectivity:** considers the potential of the gear to capture or retain species; and
4. **Post Capture Mortality:** considers the condition and subsequent survival of a species that is captured and released (or discarded).

Based on the Level 2 results, if a unit is assessed at low risk from fishing, the rationale is documented and it is not assessed at a higher level. For units assessed at medium or high risk, management strategies to mitigate the risks are to be further investigated and implemented. If there are no planned or agreed management responses, the assessment moves to Level 3 (for more detail, refer to Hobday *et al.*, 2007).



## APPENDIX B – NON TARGET SPECIES AND QUANTITIES CAUGHT BETWEEN 2007 AND 2011

Table 7: Catches for non-target species caught using Danish seine Method, 2009-2011 – Logbook Data

Caab Code	Common Name	Scientific Name	Fin Year (Catch Weight (kg))		
			2008 - 2009	2009 - 2010	2010 - 2011
24,207,000	Bailer shells	<i>Volutidae - undifferentiated</i>	23	18	4
28,821,000	Bugs - Shovel nosed and slipper lobsters	<i>Scyllaridae - undifferentiated</i>	6	12	33
23,617,000	Calamari	<i>Loliginidae - undifferentiated</i>	544	132	376
28,850,000	Crabs	<i>Brachyura - undifferentiated</i>	231	6	1,944
23,607,901	Cuttlefish (mixed)	<i>Sepia spp</i>	1,560	1,082	
28,915,002	Giant Crab	<i>Pseudocarcinus gigas</i>	7		
23,636,004	Gould's Squid	<i>Nototodarus gouldi</i>	3,960	3,318	5,590
23,650,000	Octopoda	<i>Order Octopoda – undifferentiated</i>	2,623	2,168	3,355
28,714,005	Royal Red Prawn	<i>Haliporoides sibogae</i>	5		25
23,999,999	Shells	<i>Shells</i>	155	597	356
23,615,000	Squids	<i>Order Teuthoidea – undifferentiated</i>	2		

Table 8: Catches for non-target species caught using Danish seine Method, 2009- Observer Data

Caab Code	Common Name	Scientific Name	Fin Year (Catch Weight (kg))		
			2008 - 2009	2009 - 2010	2010 - 2011
28,825,000	Anomurans	<i>Infraorder Anomura - undifferentiated</i>	8.3	67	0.1
24,207,000	Bailer shells	<i>Volutidae - undifferentiated</i>			1
24,207,900	Bailer shell (mixed)	<i>Zidoninae spp</i>			1
28,821,000	Bugs - Shovel Nosed and Slipper Lobsters	<i>Scyllaridae - undifferentiated</i>			0.1
23,270,007	Commercial Scallop	<i>Pecten fumatus</i>	0.01		
28,850,000	Crabs	<i>Brachyura - undifferentiated</i>	9.03	8	
23,607,901	Cuttlefish (mixed)	<i>Sepia spp</i>	14.3	2.5	25.3
23,636,000	Flying Squids	<i>Ommastrephidae</i>		1	
24,000,000	Gastropods	<i>Class Gastropoda - undifferentiated</i>	1.6		
23,636,004	Gould's Squid	<i>Nototodarus gouldi</i>	1		17.1
28,827,000	Hermit Crabs	<i>Diogenidae - undifferentiated</i>	0.1		16.2



			Fin Year (Catch Weight (kg))		
Caab Code	Common Name	Scientific Name	2008 - 2009	2009 - 2010	2010 - 2011
11,120,000	Jellyfish	<i>Scyphozoa spp - undifferentiated</i>	127		
23,650,000	Octopoda	<i>Order Octopoda - undifferentiated</i>	5.8		0.3
23,659,000	Octopuses	<i>Octopodidae - undifferentiated</i>	0.2	37	49.5
23,999,999	Shells	<i>Shells</i>	1.4	21	223
23,617,005	Southern Calamari	<i>Sepioteuthis australis</i>			6.5
23,615,000	Squids	<i>Order Teuthoidea - undifferentiated</i>	10.9	11	82.8
25,102,000	Starfish	<i>Class Asteroidea - undifferentiated</i>	2.18	1	97.6



## APPENDIX C – SUMMARY OF THREATENED, ENDANGERED AND PROTECTED (TEP) SPECIES INTERACTIONS BETWEEN 2007 AND 2011

Table 9: Summary of Threatened, Endangered and Protected (TEP) Species Interactions between 2007-2011 using the Danish Seine method – Logbook and Observer Data

		Calendar Year (Number of Interactions)		
Common Name	Scientific Name	2009	2010	2011
Shearwater – species unidentified	<i>Genus - Puffinus</i>		1	
Australian Fur Seal	<i>Arctocephalus pusillus doriferus</i>	4	9	25



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