



Australian Government

Australian Fisheries Management Authority

# Residual Risk Assessment of the Level 2 Productivity Susceptibility Analysis

Non-Teleost and Non-Chondrichthyan Species

**Report for the Scalefish Automatic Longline Method of the  
Gillnet Hook and Trap Sector**



2012



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## Executive Summary

The Australian Fisheries Management Authority (AFMA) has undertaken detailed ecological risk assessments (ERAs) for all major and minor 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 Productivity Susceptibility Analysis (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 previous high risk species. A 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 Auto-longline method of the Gillnet



Hook and Trap sector, the results from the Level 2 PSA table are used here to determine the residual risk at this level of assessment. Overall 29 high risk species were re-assessed. 27 species were seabirds and two were marine mammals. All species had their risk scores reduced. Seabird species were reduced from high risk after consideration of management strategies which attributed to lowering the risk rating to these species in the fishery. The two marine mammals had their risk scores reduced based on the number of interactions in the fishery.



# 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 quantitative 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.



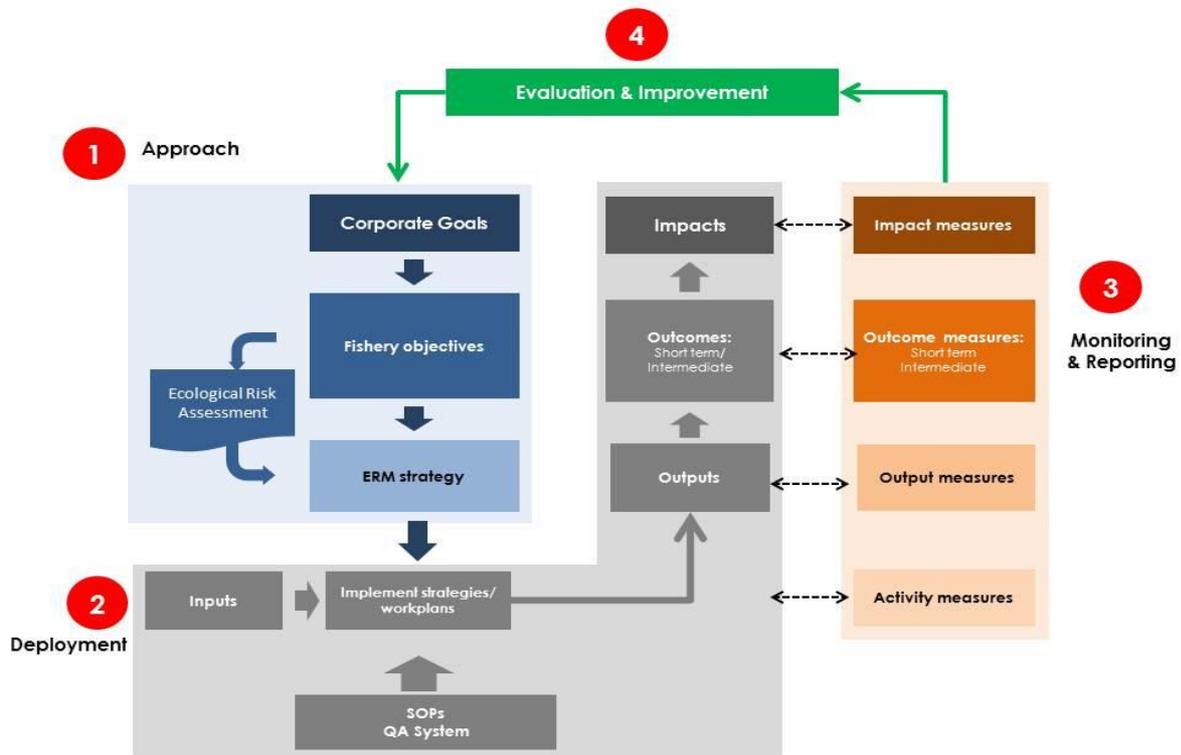


Figure 1 Ecological Risk Management Process Map

## 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 all 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

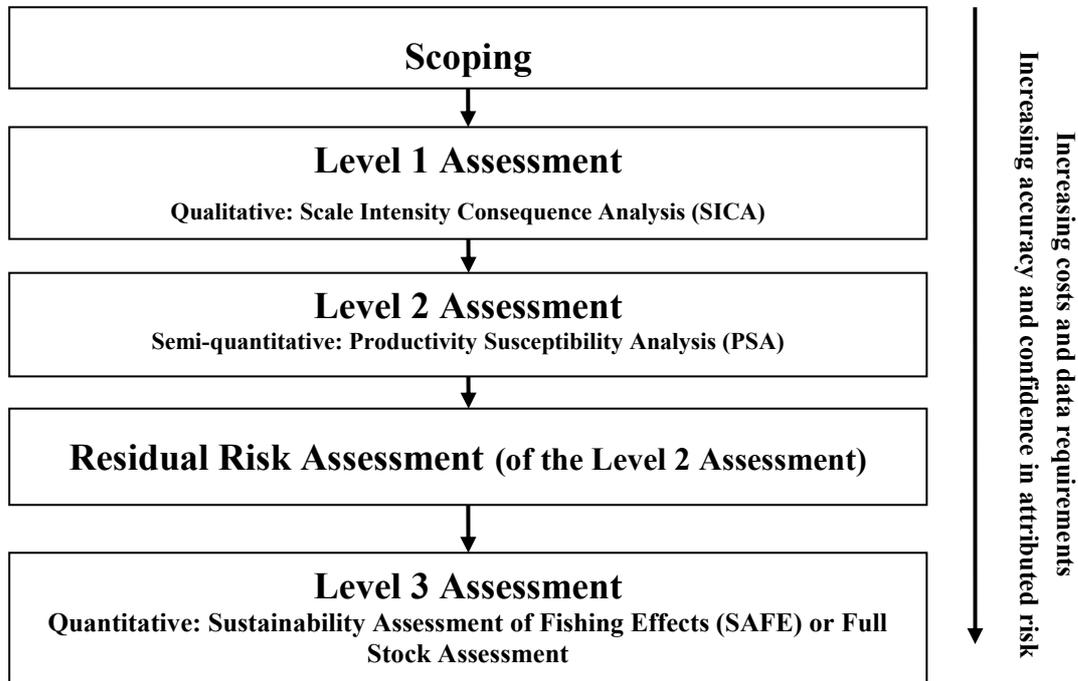


Figure 2 The different levels of risk assessment and the trend in confidence and cost

### 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; and
- **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.

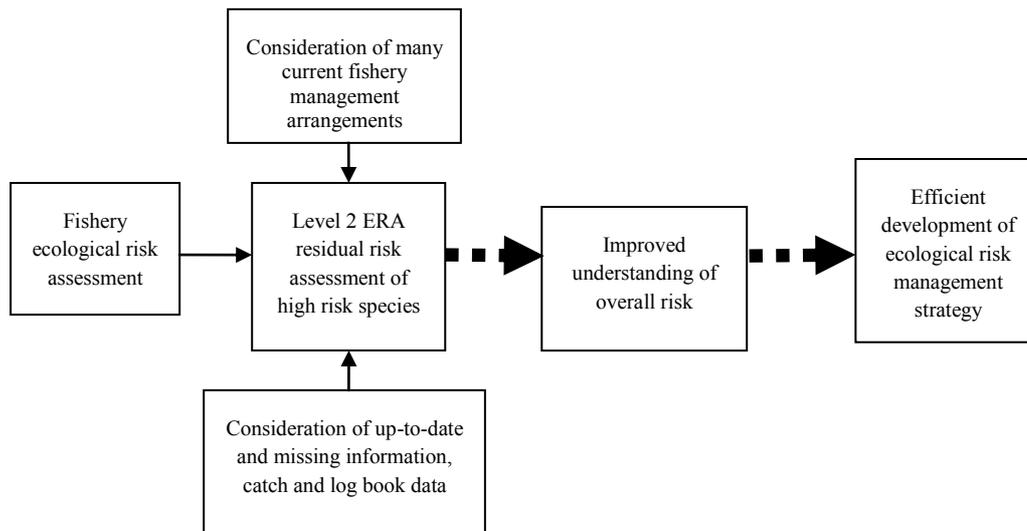
The guidelines have been designed to ensure that a consistent, transparent and repeatable process is adopted across all fisheries. A summary of the guidelines is given in **Table 1**. Within each category there are clear decision rules that can be applied to a species (if relevant) to calculate Level 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 (RAG) and Management advisory committees (MAC) 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 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 Automatic Longline sub-fishery of the Commonwealth Gillnet Hook and Trap Sector of the Southern and Eastern Scalefish and Shark Fishery* (Dayley *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 Automatic Longline of the Gillnet Hook and Trap 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 automatic longline.



## 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).

## 2. Fishery Description

The auto-longline sector is part of the Gillnet Hook and Trap sector (GHAT) of the Commonwealth Southern and Eastern Scalefish and Shark Fishery (SESSF). The area of the auto-longline sector includes all Commonwealth waters of the Australian Fishing Zone (AFZ) off South Australia, Victoria and Tasmania from 3nm to the extent of the AFZ. It also includes waters off southern Queensland (south of Sandy Cape) and New South Wales from approximately the 4,000m depth contour (60-80nm from the coast) to the extent of the AFZ. Waters inside this line off the New South Wales and Queensland coasts, and inside 3nm around South Australia, Victoria and Tasmania, are managed under the jurisdiction of the State Governments.

Current management arrangements restrict fishing by auto-longline vessels to waters deeper than 183m to prevent targeting of School and Gummy Shark. An auto-longline permit allows a maximum of 15,000 hooks at any one time, to target deepwater teleosts. Blue-eye Trevalla and Pink Ling are the primary targets with Ribaldo and Hapuka being other important commercial species.

The major markets for the auto-longline sector are in southern and eastern Australia. The amount of effort in this sector peaked in 2005 at 9,776,448 hooks set, decreasing to 4,882,414 hooks set in 2010.



## Fishery Specifics

Gear: Automatic longline, maximum of 15,000 hooks, Tori line must be used, Best Fishing Gear (BFG) or Mustad auto-longlining systems only.

Area: Fraser Island to SA/WA border

Depth range: 183 m to approximately 700 m

Main target species: Blue-eye Trevalla, Pink Ling

Management: Input controls: gear restrictions, species specific area closures

Output controls: individual transferable quotas

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

	Fleet Size – Number of Scalefish Fishing Permits	Fleet Size – Number of Active Vessels	Effort - Number of Hooks	Observer Program - Number of Hooks
<b>2007-2008 Season</b>	57	-	6,732,100	-
<b>2008-2009 Season</b>	57	-	7,235,460	-
<b>2009-2010 Season</b>	57	22	5,218,613	658,750
<b>2010-2011 Season</b>	57	24	4,882,414	431,070

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

The Upper-Slope Dogfish Management Strategy has been developed by AFMA, in consultation with the fishing industry, scientific experts, conservation NGOs and other stakeholders. Implemented in October 2012, the objectives of the strategy are to rebuild the populations of Harrison's Dogfish (*Centrophorus harissoni*), and Southern Dogfish (*C. zeehaani*). The strategy also offers some level of protection for Greeneye Spurdog (*Squalus chloroculus*) and Endeavour Dogfish (*Centrophorus moluccensis*). The strategy relies on a network of spatial closures supplemented by a range of operational measures including regulated handling practices, 100 per cent monitoring, move-on provisions and no retention of gulper sharks.

Auto longline operators are required to have a number of mitigation measures in place to reduce interactions with seabirds during both the set and haul. During 2013 additional measures



were implemented to assist in reducing seabird mortalities. When hauling gear operators are now required to have a bird excluder device (brickle curtain) deployed at all times. AFMA have implemented an individual responsibility model for seabird interactions which requires operators to set at night for the remainder of a trip if a seabird mortality occurs. If the number of seabird mortalities observed on a vessel exceeds a cumulative rate of 0.01 Seabird per 1000 hooks at any time during the season, that vessel will be required to set at night for the remainder of the season.

Seabird mitigation measures were strengthened further during 2014, with AFMA now requiring all auto longline vessels to have an individual vessel seabird mitigation plan as well as being subject to 100 per cent monitoring achieved through either e-monitoring or an AFMA observer. Operators were also required to achieve a sink rate of 0.3m/sec to a depth of 15m prior to fishing after 1 September 2014.

In 2013 the South-east Commonwealth Marine Reserves Network was established to assist in conserving the regions biodiversity. The network includes 14 marine reserves, offering levels of protection from Multiple Use to Sanctuary Zone. A total of seven marine reserves overlap with the scalefish auto longline fishery and prohibit commercial fishing activity. These areas include:

- Nelson Commonwealth Marine Reserve
- Zeehan Commonwealth Marine Reserve Special Purpose Zone
- Tasman Fracture Commonwealth Marine Reserve Special Purpose Zone
- Huon Commonwealth Marine Reserve Habitat Protection Zone
- South Tasman Rise Commonwealth Marine Reserve
- Freycinet Commonwealth Marine Reserve
- Flinders Commonwealth Marine Reserve



### 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 Automatic Longline Sub-Fishery of the Southern and Eastern Scalefish and Shark Fishery (Daley *et al.* 2007):

##### Number of Ecological Units Assessed

Target species:	2
Byproduct species:	66
Discard species:	26
TEP species:	212
Habitats:	149
Communities:	39

No ecological components were eliminated at Level 1 (there was at least one risk score of 3 – moderate – or above for each component).

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

Those remaining included:

- fishing (direct impacts on all 5 ecological components and indirect impacts on habitat)
- translocation of species (impact on species components)
- on-board processing (impact on target species)

Significant external hazards included impacts from other fisheries in the region.

Risks rated as major (risk score 4) were related to direct impacts from primary fishing operations on target species, and risks associated with disease introduction in imported bait on all species components. The latter risks were scored as uncertain. Severe impacts (risk score 5) were confined to impacts of fishing on byproduct/bycatch species.

Impacts from fishing on all species components were assessed in more detail at Level 2.

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



## Level 2 Productivity Susceptibility Analysis

Of the 306 species assessed at Level 2 using the PSA analysis, expert/observer over-rides were used on 124 species. A total of 56 species were found to be at high risk. Of these, 9 species had more than 3 missing attributes. Of the 56 high risk species identified in the PSA analysis, 2 were target species, 13 byproduct species, 14 bycatch species, and 27 TEP species. By taxa, 20 were chondrichthyans, 26 marine birds, 8 teleosts and 1 marine mammal.

All except 1 of the 27 high risk TEP species were seabirds, the majority of which are albatross. Seabirds are known as a group to be at risk from line fishing because of their very low productivity and propensity to target bait on hooks. However, mitigation measures as required under the Threat Abatement Plan (2006) for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operation (TAP) are effective in minimising seabird captures in this fishery. The TAP has been in place in this fishery since 2000.

For detailed results and methodology, refer to *Ecological Risk Assessment for the Effects of Fishing. Report for the automatic longline sub-fishery of the Southern and Eastern Scalefish and Shark Fishery* (Daley *et al.*, 2007)

## Level 2 PSA residual risk

For this 2012 residual risk assessment the guidelines are applied to non-teleost and non-chondrichthyan species that have been caught or interacted with between 2007 and 2011. The guidelines are also applied to the non-teleost and non-chondrichthyan species assessed as at high risk in the 2010 residual risk assessment (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.

**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 fishing pressure within the auto-longline sector and have not been caught in numbers which would be detrimental to the species.

One marine mammal and 27 seabirds were carried over from the 2010 residual risk assessment. In addition to these, the Australian Fur Seal and Flesh-footed Shearwater were added to the assessment as TEP species which had been interacted with since the last assessment (**Appendix C**).

**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 27 high risk seabird species have had their risk scores reduced to medium and two species reduced from medium to low. All seabird species had their risk scores reduced using guideline 7 which reduces risk based on management arrangements that successfully mitigate the risk to a species. There is a Threat Abatement Plan in place for all bird species when using automatic longline method in the GHAT which has high level of compliance.

Guideline 5 considers interaction rates, and was used to reduce the risk score Hectors Beaked Whale and the Australian Fur Seal.



**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>Hector's Beaked Whale</b>	<i>Mesoplodon hectori</i>	TEP	High	2.86	1.00	There has been no recorded logbook catch (See: Note 3) and no ISMP catch (See: Note 2). (See Note 1) Key Consideration C applies, the susceptibility if high, however there is no recorded catch of this species. Therefore, the susceptibility risk score was reduced to 1, which reduced the species to medium. The level of cryptic mortality is negligible and likelihood is thought to be low.	Medium
Marine Bird	<b>Southern Giant-Petrel</b>	<i>Macronectes giganteus</i>	TEP	High	2.29	1.67	Observer over-ride: Has been captured but in low numbers relative to the population size. (AFMA observer phone interviews, PSA database). There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Bullers Shearwater</b>	<i>Puffinus bulleri</i>	TEP	High	2.57	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Shy Albatross</b>	<i>Thalassarche cauta</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Southern Fulmar</b>	<i>Fularus glacialisoides</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.	Medium

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 #
							Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	
Marine Bird	<b>Kerguelen Petrel</b>	<i>Lugensa brevirostris</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Black Petrel</b>	<i>Procellaria parkinsoni</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Westland Petrel</b>	<i>Procellaria westlandica</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Whitebelly Storm-Petrel</b>	<i>Fregatta tropica</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Great Skua</b>	<i>Catharacta skua</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.	Medium

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 #
							Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	
Marine Bird	<b>Herald Petrel</b>	<i>Pterodroma heraldica</i>	TEP	High	2.43	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Campbell Albatross</b>	<i>Thalassarche impavida</i>	TEP	High	2.71	1.44	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Whitechin Petrel</b>	<i>Procellaria aequinoctialis</i>	TEP	High	2.29	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Southern Royal Albatross</b>	<i>Diomedea epomophora</i>	TEP	High	2.57	1.44	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Wandering Albatross</b>	<i>Diomedea exulans</i>	TEP	High	2.57	1.44	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.	Medium

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 #
							Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	
Marine Bird	<b>Northern Royal Albatross</b>	<i>Diomedea sanfordi</i>	TEP	High	2.57	1.44	Observer override as for Southern Giant Petrel.  There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.  Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Indian Yellow Nose Albatross</b>	<i>Thalassarche carteri</i>	TEP	High	2.57	1.44	Observer override as for Southern Giant Petrel.  There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.  Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Salvin's Albatross</b>	<i>Thalassarche salvini</i>	TEP	High	2.57	1.44	Observer override as for Southern Giant Petrel.  There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.  Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Amsterdam Albatross</b>	<i>Diomedea amsterdamensis</i>	TEP	High	2.57	1.44	Observer override as for Southern Giant Petrel.  There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance.  Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>White-neck Petrel</b>	<i>Pterodroma cervicalis</i>	TEP		2.57	1.44	Observer override as for Southern Giant Petrel.  There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high	Medium

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 #
				High			level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	
Marine Bird	<b>Tahiti Petrel</b>	<i>Pseudobulweria rostrata</i>	TEP	High	2.29	1.67	Guideline 1: Productivity data for this species in the ETBF filled in missing data, reducing the productivity from 3.00 to 2.29. Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Pacific Albatross</b>	<i>Thalassarche nov. sp.</i>	TEP	High	2.57	1.67	Guideline 1: Productivity data for this species in the ETBF filled in missing data, reducing the productivity from 3.00 to 2.29. Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Chatham Albatross</b>	<i>Thalassarche eremite</i>	TEP	High	2.43	1.44	Guideline 3: Missing productivity attributes (for size only) can be borrowed from the shy albatross, a species within the genus Thalassarche. Two species within the same genus that are similar species to the Chatham, attributes were borrowed from the Shy because the Chatham is considered a sub-species of the Shy (See Note: 6) Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium

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 Bird	<b>Whitecap Albatross</b>	<i>Thalassarche steadi</i>	TEP	High	2.71	1.67	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.67, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Gibson's Albatross</b>	<i>Diomedea gibsoni</i>	TEP	High	2.86	1.44	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Antipodean Albatross</b>	<i>Diomedea antipodensis</i>	TEP	High	2.86	1.44	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium
Marine Bird	<b>Tristan Albatross</b>	<i>Diomedea dabbenena</i>	TEP	High	2.86	1.44	Observer override as for Southern Giant Petrel. There is a Threat Abatement Plan in place for all bird species in the auto-longline sector which has high level of compliance. Encounterability reduced from 3 to 1 resulting in susceptibility score of 1.44, which reduces this species to medium risk under this guideline.	Medium

\*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 Auto-longline sector of the Gillnet Hook and Trap Fishery, April 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>Hector's Beaked Whale</b>	<i>Mesoplodon hectori</i>	TEP	High	No management arrangements – listed as vulnerable under the EPBC Act.	Guideline 5	Guideline 5 applies: Zero interactions have been recorded in the fishery which decreases the risk to Medium.	Low
Marine Bird	<b>Southern Giant-Petrel</b> <b>Buller's Shearwater</b> <b>Southern Fulmar</b> <b>Kerguelen Petrel</b> <b>Black Petrel</b> <b>Westland Petrel</b> <b>Whitebelly Storm-Petrel</b> <b>Great Skua</b> <b>Herald Petrel</b> <b>Campbell Albatross</b> <b>Southern Royal Albatross</b> <b>Wandering Albatross</b>	<i>Macronectes giganteus</i> <i>Puffinus bulleri</i> <i>Fularus glacialisoides</i> <i>Lugensa brevirostris</i> <i>Procellaria parkinsoni</i> <i>Procellaria westlandica</i> <i>Fregatta tropica</i> <i>Catharacta skua</i> <i>Pterodroma heraldica</i> <i>Thalassarche impavida</i> <i>Diomedea epomophora</i>	TEP	High	A Threat Abatement Plan 2006 (TAP2) is in place and is currently being revised by the Australian Antarctic Division of SEWPAC with sign off by the Minister.	Guideline 7	<p>There is a TAP in place for all bird species in the auto-longline sector, which has a high level of compliance. Therefore, the encounterability has been reduced to 1.</p> <p>No interactions with these species have been recorded.</p> <p>Considering that the TAP has put management in place for this species the risk rating has been reduced to Medium.</p>	Medium

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
	<b>Northern Royal Albatross</b> <b>Indian Yellow Nose Albatross</b> <b>Salvin's Albatross</b> <b>Amsterdam Albatross</b>  <b>White-neck Petrel</b> <b>Tahiti Petrel</b> <b>Pacific Albatross</b> <b>Chatham Albatross</b> <b>Whitecap Albatross</b> <b>Gibson's Albatross</b> <b>Antipodean Albatross</b> <b>Tristan Albatross</b>	<i>Diomedea exulans</i> <i>Diomedea sanfordi</i> <i>Thalassarche carteri</i>  <i>Thalassarche salvini</i> <i>Diomedea amsterdamensis</i> <i>Pterodroma cervicalis</i> <i>Pseudobulweria rostrata</i> <i>Thalassarche nov. sp.</i> <i>Thalassarche eremite</i> <i>Thalassarche steadi</i> <i>Diomedea gibsoni</i> <i>Diomedea antipodensis</i> <i>Diomedea dabbenena</i>		High				High
Marine Bird	<b>Shy Albatross</b>	<i>Thalassarche cauta</i>	TEP	High	A Threat Abatement Plan 2006 (TAP2) is in place and is currently being revised by the Australian Antarctic Division of SEWPAC with sign off by the Minister.	Guideline 7	<p>There is a TAP in place for all bird species in the auto-longline sector, which has a high level of compliance. Therefore, the encounterability has been reduced to 1.</p> <p>One animal of this species was interacted with in 2010. This animal remained alive and vigorous and contact was light whilst the bird was flying.</p> <p>Considering that the TAP has put management in place for this species the risk rating has been reduced to Medium.</p>	Medium

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>White Chinned Petrel</b>	<i>Procellaria aequinoctialis</i>	TEP	High	A Threat Abatement Plan 2006 (TAP2) is in place and is currently being revised by the Australian Antarctic Division of SEWPAC with sign off by the Minister.	Guideline 7	<p>There is a TAP in place for all bird species in the auto-longline sector, which has a high level of compliance. Therefore, the encounterability has been reduced to 1.</p> <p>Four animals of this species were caught or interacted with in 2010 and four were caught or interacted with in 2011. In 2010, one animal was alive and vigorous, two were dead and flexible and one was dead and in rigour. In 2011, one animal was alive and vigorous, one was dead and flexible and two were dead and in rigour. The predominant type of interaction was that the animal was hooked or caught. However, the capture rate is lower than the threshold set by the threat abatement plan (1 bird per 100,000 hooks)</p> <p>Considering that the TAP has put management in place for this species the risk rating has been reduced to Medium.</p>	Medium
Marine Bird	<b>Flesh-footed Shearwater</b>	<i>Puffinus carneipes</i>	TEP	Medium	A Threat Abatement Plan 2006 (TAP2) is in place and is currently being revised by the Australian Antarctic Division of SEWPAC with sign off by the Minister.	Guideline 7	<p>There is a TAP in place for all bird species in the auto-longline sector, which has a high level of compliance. Therefore, the encounterability has been reduced to 1.</p> <p>Four animals of this species were caught in 2011. All animals were recorded as hooked or caught and were dead and flexible when brought aboard. However, the capture rate is lower than the threshold set by the threat abatement plan (1 bird per 100,000 hooks)</p>	Low

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
							Considering that the TAP has put management in place for this species the risk rating has been reduced to Low.	
Marine Mammal	<b>Australian Fur Seal</b>	<i>Arctocephalus pusillus doriferus</i>	TEP	Medium	No management arrangements – listed as vulnerable under the EPBC Act.	Guideline 5	<p>In 2009, 59 Australian Fur Seals were recorded as being interacted with. No interactions have been recorded since. All animals remained alive and vigorous and the interaction occurred while animal was chasing or diving for the bait or target species. There are no records of captures of this species.</p> <p>It has been considered that it is a TEP species and in the proximity of the fishery but when Guideline 5 is applied: the level of interaction or capture of this species is negligible; the residual risk score is decreased to Low.</p>	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	27	1	2	0	27	3
<b>Total</b>	27	1	2	0	27	3

## 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.

Overall the most common guideline used to assess residual risk was Guideline 7. Twenty seven species were reduced under Guideline 7 as a Threat Abatement Plan (TAP) had been introduced for all bird species which has a high level of compliance within the auto-longline sector of the Gillnet Hook and Trap Fishery.

This ERA and the 2010 ERA results highlighted the important species that the fishery needs to focus on. This residual risk process brings the ERA assessment up-to-date with the most 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 and this will capture how effective the ERM strategy is in to addressing risk to high priority 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 approved 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	<p>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;</p> <p>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.</p>
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 – BYCATCH AND DISCARD SPECIES AND QUANTITIES CAUGHT BETWEEN 2007 AND 2011

**Table 7: Catches for All Non-Teleost and Non-Chondrichthyan Byproduct and Discard Species Caught in the Auto-longline Method 2009-2011 – Logbook Data**

Caab Code	Common Name	Scientific Name	Fin Year (Catch Weight (kg))		
			2008 - 2009	2009 - 2010	2010 - 2011
28850000	Crabs	<i>Brachyura - undifferentiated</i>	35	10	2
28915002	Giant Crab	<i>Pseudocarcinus gigas</i>	7	17	
23636004	Gould's Squid	<i>Nototodarus gouldi</i>			
23650000	Octopoda	<i>Order Octopoda - undifferentiated</i>			79

**Table 8: Catches for All Non-Teleost and Non-Chondrichthyan Byproduct and Discard Species Caught in the Auto-longline Method 2009-2011 – Observer Data**

Caab Code	Common Name	Scientific Name	Fin Year (Catch Weight (kg))		
			2008 - 2009	2009 - 2010	2010 - 2011
28825000	Anomurans	<i>Infraorder Anomura - undifferentiated</i>			
25416065	chalkfish (sea cucumber)	<i>Bohadschia similis</i>			
28850000	Crabs	<i>Brachyura - undifferentiated</i>	25		
37004000	Hagfishes	<i>Myxinidae - undifferentiated</i>	1.5		6
11120000	Jellyfish	<i>Scyphozoa spp - undifferentiated</i>			
28836000	King crabs	<i>Lithodidae - undifferentiated</i>	11.5	4	
28836900	King crabs (mixed)	<i>Lithodes spp</i>			
23000000	Molluscs	<i>Phylum Mollusca - undifferentiated</i>			
11173000	Octocorals & gorgonians	<i>Order Alcyonacea - undifferentiated</i>	9		
23659000	Octopuses	<i>Octopodidae - undifferentiated</i>		5	
11183000	Precious corals	<i>Coralliidae - undifferentiated</i>			
10114000	Spongiid sponges	<i>Spongiidae - undifferentiated</i>			
23615000	Squids	<i>Order Teuthoidea - undifferentiated</i>	0.75		



			Fin Year (Catch Weight (kg))		
Caab Code	Common Name	Scientific Name	2008 - 2009	2009 - 2010	2010 - 2011
25102000	Starfish	<i>Class Asteroidea - undifferentiated</i>	10.4	4.9	
11290000	Stony corals	<i>Order Scleractinia - undifferentiated</i>			2



## 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 2009-2011 in the Auto-longline Method – Logbook and Observer Data

		Calendar Year (Number of Interactions)		
Common Name	Scientific Name	2009	2010	2011
<b>Shy Albatross</b>	<i>Thalassarche cauta</i>		1	
<b>White Chinned Petrel</b>	<i>Procellaria aequinoctialis</i>		4	4
<b>Flesh-footed Shearwater</b>	<i>Puffinus carneipes</i>			4
<b>Australian Fur Seal</b>	<i>Arctocephalus pusillus doriferus</i>	59		



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