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Ecological Risk Assessment for the Effects of Fishing

Report for the Southern and Eastern Scalefish and Shark Fishery (Gillnet Hook and Trap Sector): Shark gillnet sub-fishery 2012-2016

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Notes to this document:

This fishery ERA Report document contains figures and tables with numbers that correspond to the full methodology document for the ERAEF method:

> Hobday, A. J., A. Smith, H. Webb, R. Daley, S. Wayte, C. Bulman, J. Dowdney, A. Williams, M. Sporcic, J. Dambacher, M. Fuller, T. Walker (2007). Ecological Risk Assessment for the Effects of Fishing: Methodology. Report R04/1072 for the Australian Fisheries Management Authority, Canberra

Thus, table and figure numbers within the fishery ERA Report document are not sequential as not all are relevant to the fishery ERA Report results.

Additional details on the rationale and the background to the methods development are contained in the ERAEF Final Report:

> Smith, A., A. Hobday, H. Webb, R. Daley, S. Wayte, C. Bulman, J. Dowdney, A. Williams, M. Sporcic, J. Dambacher, M. Fuller, D. Furlani, T. Walker (2007). Ecological Risk Assessment for the Effects of Fishing: Final Report R04/1072 for the Australian Fisheries Management Authority, Canberra.

This document also reflects some changes in methods that are detailed in AFMA's ERA guide (2017).

> Australian Fisheries Management Authority (2017). Guide to AFMA's Ecological Risk Management. 130 p. (Commonwealth of Australia, Canberra).

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Acknowledgments

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Executive summary

The “Ecological Risk Assessment for Effect of Fishing” ERAEF was developed jointly by CSIRO Marine and Atmospheric Research and the Australian Fisheries Management Authority (Hobday et al. 2007, 2011b). This assessment of the ecological impacts of the Southern and Eastern Scalefish and Shark (SESSF) Gillnet Hook and Trap Sector (GHAT) shark gillnet sub-fishery was undertaken using the ERAEF method version 9.2, with some additional modifications currently in final stages of development with AFMA (Australian Fisheries Management Authority 2017). This revised ERAEF provides a hierarchical framework for a comprehensive assessment of the ecological risks arising from fishing, with impacts assessed against five new ecological components –key commercial and secondary commercial species; byproduct and bycatch species; protected species; habitats; and (ecological) communities (ERM Guide; AFMA, 2017).

ERAEF proceeds through four stages of analysis: scoping; an expert judgement-based Level 1 analysis (SICA – Scale Intensity Consequence Analysis); an empirically based Level 2 analysis (PSA – Productivity Susceptibility Analysis); and a model-based Level 3 analysis. This hierarchical approach provides a cost-efficient way of screening hazards, with increasing time and attention paid only to those hazards that are not eliminated at lower levels in the analysis. Risk management responses may be identified at any level in the analysis.

Application of the ERAEF methods to a fishery represents a set of screening or prioritization steps that work towards a full quantitative ecological risk assessment. At the start of the process, all components are assumed to be at risk. Each step, or Level, potentially screens out issues that are of low concern. The Scoping stage screens out activities that do not occur in the specific fishery. Level 1 screens out activities that are judged to have low impact, and potentially screens out components with all low impact scores. Level 2 is a screening or prioritization process for individual species, habitats, and communities at risk from direct impacts of fishing, using either PSA or SAFE. The Level 2 methods do not provide absolute measures of risk. Instead, they combine information on productivity and exposure to fishing to assess potential risk – the term used at Level 2 is risk. Because of the precautionary approach to uncertainty, there will be more false positives than false negatives at Level 2, and the list of high-risk species or habitats should not be interpreted as all being at high risk from fishing. Level 2 is a screening process to identify species or habitats that require further investigation. Some of these may require only a little further investigation to identify them as a false positive; for some of them managers and industry may decide to implement a management response; others will require further analysis using Level 3 methods, which do assess absolute levels of risk.

This 2012-2016 assessment of the SESSF Gillnet Hook and Trap sector (GHAT): shark gillnet sub-fishery consists of the following:

- Scoping
- Level 1 results for all components
- Level 2 results for 3 components
- Residual risk analysis for high-risk PSA species

Fishery Description

Gear:	Shark Gillnet
Area:	Gillnet Hook and Trap Sector of the Southern and Eastern Scalefish and Shark Fishery: Western Australia–South Australia border to Victoria–New South Wales border on continental shelf
Depth range:	1 - 1216 m; mean: 54.9 m; median: 52 m
Fleet size:	~61 vessels
Effort:	~7300 sets (6812-8285)
Landings:	~1700 kg p.a. (1300-2900 kg)
Discard rate:	Gummy shark (6%), school shark (15%), elephant fish (75%) and sawshark (15%) assumed since 2015
Commercial species (ERA classification):	Gummy shark (key) and school shark (secondary)
Management:	Quota management system across species/stocks.
Observer program:	AFMA Observer program. Electronic Monitoring (since July 2015)

Ecological Units Assessed

Table ES1.1. Ecological units assessed in 2018 and 2006.

ECOLOGICAL COMPONENT	2018#	2006
Key/secondary commercial species	1 key; 1 secondary	1^
Byproduct and bycatch species	29 byproduct; 141 bycatch	80 byproduct; 56 bycatch
Protected species	61	192
Habitats	29 demersal, 4 pelagic	98 demersal*, 4 pelagic
Communities	25 demersal, 5 pelagic	9 demersal, 2 pelagic

*these habitats are not comparable with current assessment
based on assessment period: 2012-2016
^ corresponds to target species

A total of 233 species across the three ecological components were assessed in this ERAEF compared to 329 species in 2006 (Table ES1.1). The difference in the number of protected species between assessments is mainly due to the inclusion of only species that interacted in this sub-fishery (apart from any expansion of species groups identified from AFMA logbook, Observer data or Electronic Monitoring data).

Level 1 Results and Summary

Three ecological components were eliminated at Level 1 leaving two that were further assessed at Level 2 (at least one risk score of 3 i.e., moderate, or above for each component; Table ES1.2).

All but one hazard (fishing activity) was eliminated at Level 1 (risk scores 1 or 2). That remaining included:

- Fishing (direct capture impacts - two ecological components).

As a result of direct capture by fishing, the most vulnerable byproduct species, draughtboard shark *Cephaloscyllium laticeps* was the most caught (~321 t; i.e., ~50 t retained and ~271 t discarded; AFMA logbook data) and has no Tiered stock assessment, was assessed at moderate risk largely due to unknown population size within this assessment period. In addition, ~154 t of draughtboard sharks *Cephaloscyllium spp.* have also been caught (~155 t; i.e., ~11 t retained and ~144 t discarded; AFMA logbook data) within this assessment period. Given their high post capture survival (Braccini et al. 2012), these sharks are likely to survive. While relative catch-per-unit-effort (CPUE) indices for the trawl-caught draughtboard shark have shown no decline over 1996-2006 period (Walker and Gason 2007), there are no indices that extend to 2016 or indices based on gillnet-caught draughtboard shark. Furthermore, CPUE indices correspond to about a third of the species range. Therefore, given the uncertainty regarding population size the risk score remained moderate.

The shortfin mako was considered a moderate risk as it was the most caught of all protected species and has an unknown population but believed to be declining world-wide. IndoPacific bottlenose dolphins were also assessed at moderate risk, also due largely to the uncertainty of its population size and substructuring. Australian and Longnose fur seals may have the lowest mortality, but most recent capture rates increased possibly as a result of implementation of the Electronic Monitoring System and greater detection ability. Fur seal populations are currently stable or declining (Shaughnessy et al. 2014) and there is a risk that some colonies might be incurring greater impact from these mortalities more than others.

The impact of fishing did not represent a significant risk to habitats largely due to a shift in location of the concentration of effort away from area with highly vulnerable fauna. Communities were also not considered at risk from the gillnet fishery as the biomass of landed sharks was relatively low although from a higher trophic order perhaps exposing the structure of the community at risk at greater levels of effort.

Significant external hazards included other fisheries in the region on all components and coastal development on protected species. Only external fisheries were rated at major or above risk (scores 4) on key commercial, protected species and communities.

Table ES1.2. Outcomes of assessments for ecological components conducted in 2018 and 2006.

ECOLOGICAL COMPONENT	2018 (CURRENT)	2006 (PREVIOUS)
Key/secondary commercial species	Level 1	Level 2^
Byproduct and bycatch species	Level 2	Level 2^
Protected species	Level 2	Level 2^
Habitats	Level 1	Level 2
Communities	Level 1	Level 2*

- no habitat assessment was conducted in 2006
*triggered but due to lack of methodology available in 2006 and ecosystem modelling projects underway in 2016 this component was not assessed at L2 in the ERA process.
^SAFE analysis was also performed on species 2007-2010 (Zhou et al. 2012). Risk categories for Level 2 are not directly comparable with 2018 assessment.

Table ES1.3. Key and secondary commercial species stock status, assessment and tier status, and ERA classification for gillnet sub-fishery. NSTOF: Not subject to overfishing; NOF: Not overfished; OF: Overfished; UNC: uncertain. Primary: C1; Secondary: C2. ^: based on ABARES classification. ^^ based on stock assessment.

COMMON NAME	SPECIES NAME	ERA CLASSIFICATION	FISHING MORTALITY^	BIOMASS^	STATUS^^	REFERENCE	YEAR LAST ASSESSED	TIER	COMMENTS
Gummy shark	*Mustelus antarcticus*	C1	NSTOF	NOF	Above limit reference	Punt et al. 2016	2016	1	
School shark	*Galeorhinus galeus*^	C2	UNC	OF	Below limit reference	Thomson and Punt 2009; Thomson 2012	2012 (2009 assessment re-run with additional catch data 2009-12)	1	Uncertain if total mortality will allow recovery in required time frame. Estimate of pup production is below 20% of unexploited levels

^ subject to a rebuilding strategy

Level 2 Results and Summary

PSA

Bycatch species

Two of the eight teleost species that were unassessable in bSAFE were assessed at high risk following a PSA, which were reduced to low risk due to the low number of interactions within the assessment period. The other six species were either medium (3) or low (3) risk. Similarly, six of 16 high risk invertebrate species were reduced to low risk following a residual risk analysis. The other 10 invertebrate species were either medium (3) or low risk (7).

Protected species

Of a total of 56 species, 27 were assessed at high risk (22 marine birds, five marine mammals), 23 medium risk (16 birds, seven marine mammals,) and six species low risk (five marine birds, one marine mammal) following a PSA. After a residual risk analysis on the 27 high risk species, five bird species remained high risk, while seven bird species were reduced to medium risk and 10 to low risk. The remaining five high risk species were Campbell albatross *Thalassarche*

impavida, shy albatross *Thalassarche cauta*, wandering albatross *Diomedea exulans*, blue petrel *Halobaena caerulea* and soft-plumaged petrel *Pterodroma mollis* (Table ES1.4). Of the five high risk marine mammal species, two remained at high risk, two were reduced to medium risk and one was reduced to low risk. The two remaining high risk marine mammal species were the Indian Ocean bottlenose dolphin *Tursiops aduncus* and common bottlenose dolphin *Tursiops truncatus* (Table ES1.4).

bSAFE

Byproduct species

None of the 29 byproduct species were assessed at high risk.

Bycatch species

Eight of 125 species were unassessable in the bSAFE method due to missing biological attributes and were assessed with a PSA (see above). Of the 117 species, one was medium risk and the remaining 116 species were low risk.

Protected species

All five protected species were assessed at low risk following a bSAFE analysis.

Summary

A total of 233 species were assessed of which seven species were assessed at high risk following a residual risk analysis (Table ES1.4). These consisted of two marine mammal species, five marine bird species and no teleosts or chondrichthyans. All five marine bird species resulted from expanding higher-level taxonomic group classifications i.e. from family codes, rather than from species-specific identifications, and none may have actually interacted with the fishery. Logbook/Observer data did not identify them specifically (Table 2.2; Protected species issues and interactions) but without better taxonomic resolution, these species remain potentially at high risk. Similarly, the high-risk Indian Ocean bottlenose dolphin *Tursiops aduncus* was also expanded from a generic group code but also remains potentially at high risk without further taxonomic resolution.

The protected species, white shark *Carcharodon carcharias* was assessed at low risk, but could be considered further, given uncertain population estimates.

Table ES1.4. Extreme or high-risk PSA or bSAFE species following a residual risk (RR) analysis in the GHAT gillnet sub-fishery. x: risk score following RR analysis. #: unassessable in bSAFE. CH: chondrichthyan; TEL: teleost; INV: invertebrate; MM: marine mammal; MB: marine bird. No. Missing: Number of missing attributes in PSA analysis. Grey shading: expanded species from group code. ^: at risk from Zhou et al. (2012).

LEVEL 2 ANALYSIS	ERA CLASSIFICATION	TAXA	No. MISSING	SCIENTIFIC NAME	COMMON NAME	EXTREME RISK	HIGH RISK
PSA	PS	MB	1	*Thalassarche impavida*	Campbell albatross		x
		MB	1	*Thalassarche cauta*	Shy albatross		x
		MB	1	*Diomedea exulans*	Wandering albatross		x
		MB	3	*Halobaena caerulea*	Blue petrel		x
		MB	1	*Pterodroma mollis*	Soft-plumaged petrel		x
		MM	0	*Tursiops aduncus*	Indian Ocean bottlenose dolphin		x
		MM	0	*Tursiops truncatus*	Common bottlenose dolphin		x

1 Overview

1.1 Ecological Risk Assessment for the Effects of Fishing (ERAEF) Framework

1.1.1 The Hierarchical Approach

The Ecological Risk Assessment for the Effects of Fishing (ERAEF) framework involves a hierarchical approach that moves from a comprehensive but largely qualitative analysis of risk at Level 1, through a more focused and semi-quantitative approach at Level 2, to a highly focused and fully quantitative "model-based" approach at Level 3 (Figure 1.1). This approach is efficient because many potential risks are screened out at Level 1, so that the more intensive and quantitative analyses at Level 2 (and ultimately at Level 3) are limited to a subset of the higher risk activities associated with fishing. It also leads to rapid identification of high-risk activities, which in turn can lead to immediate remedial action (risk management response). The ERAEF approach is also precautionary, in the sense that risks will be scored high in the absence of information, evidence or logical argument to the contrary.

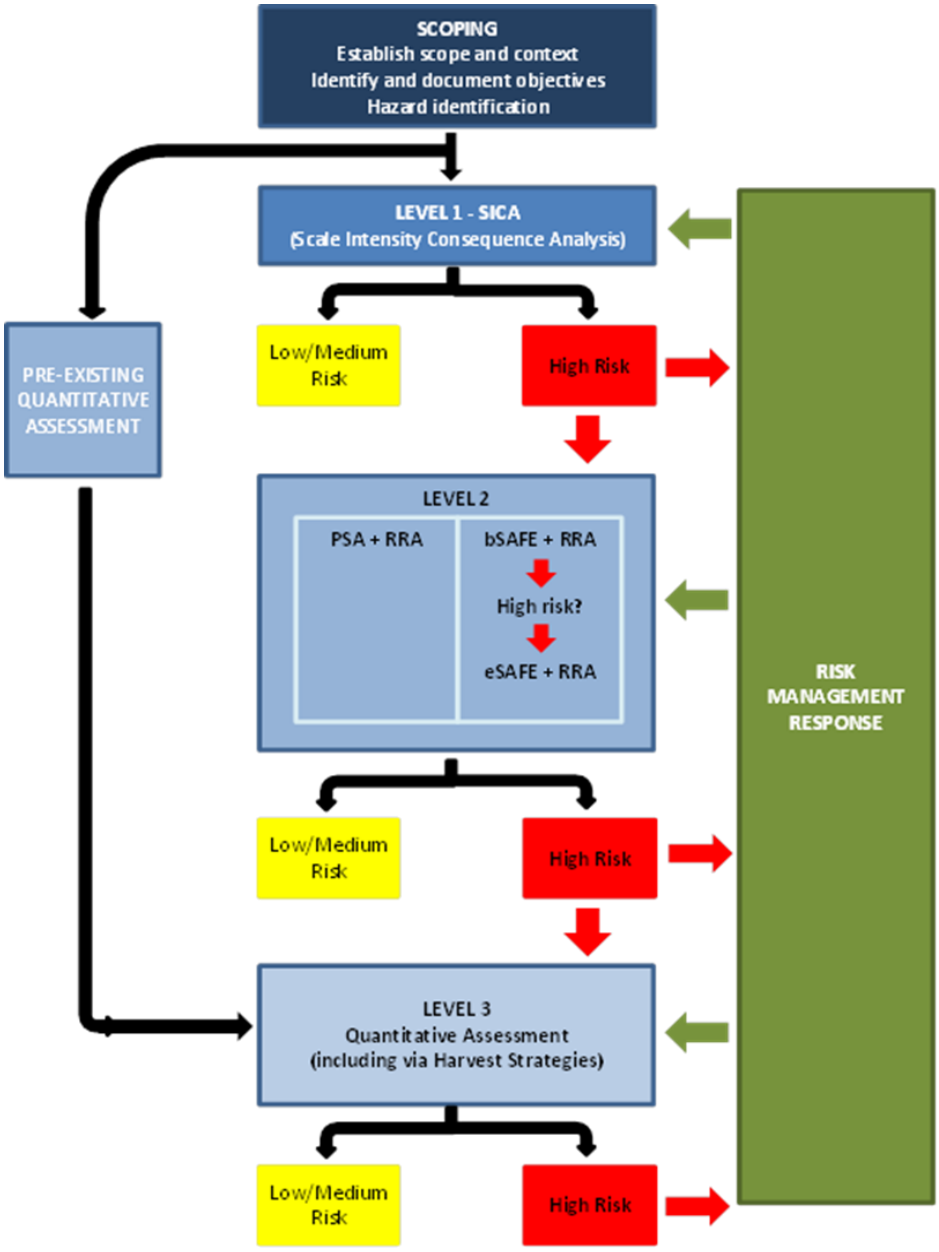


Figure 1.1. Structure of the 3 level hierarchical ERAEF methodology. SICA – Scale Intensity Consequence Analysis; PSA – Productivity Susceptibility Analysis; SAFE – Sustainability Assessment for Fishing Effects; RRA – Residual Risk Analysis. T1 – Tier 1. eSAFE may be used for species classified as high risk by bSAFE.

Conceptual Model

The approach makes use of a general conceptual model of how fishing impacts on ecological systems, which is used as the basis for the risk assessment evaluations at each level of analysis (Levels 1-3). For the ERAEF approach, five general ecological components are evaluated, corresponding to five areas of focus in evaluating impacts of fishing for strategic assessment under EPBC legislation. The five revised *components* are:

- Key commercial species and secondary commercial species

- Byproduct and bycatch species
- protected[1] species (formerly referred to as threatened, endangered and Protected[2] species or TEPs)
- Habitats
- Ecological communities

This conceptual model (Figure 1.2) progresses from *fishery characteristics* of the fishery or sub-fishery, → *fishing activities* associated with fishing and *external activities*, which may impact the five ecological components (target, byproduct and bycatch species, protected species, habitats, and communities); → *effects of fishing and external activities* which are the direct impacts of fishing and external activities; → *natural processes and resources* that are affected by the impacts of fishing and external activities; → *sub-components* which are affected by impacts to natural processes and resources; → *components*, which are affected by impacts to the sub-components. Impacts to the sub-components and components in turn affect achievement of management objectives.

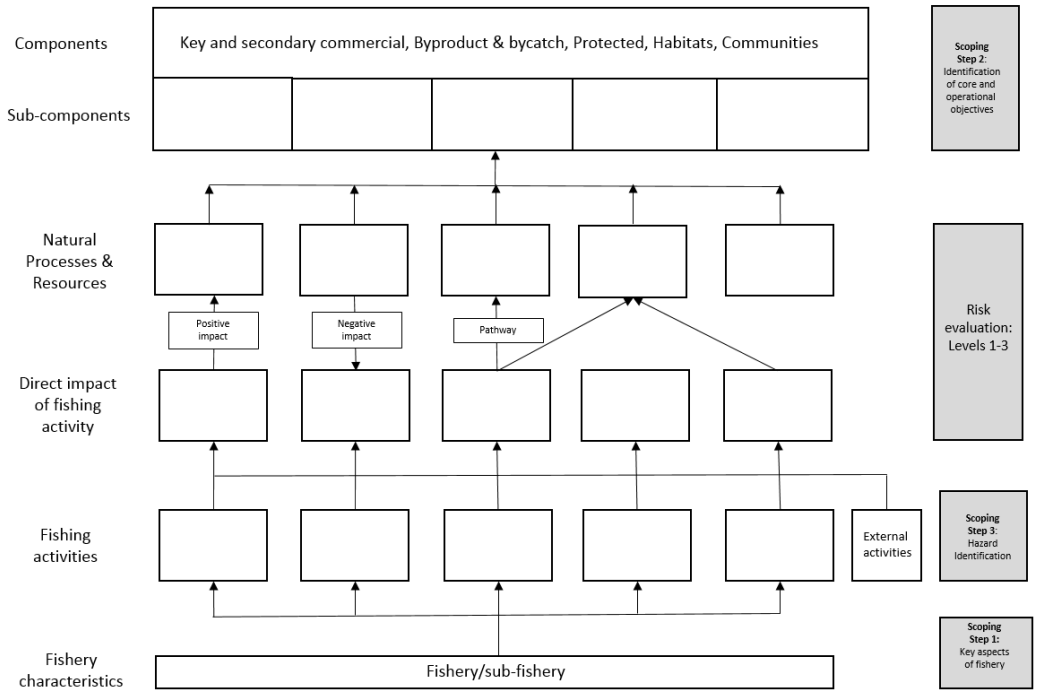


Figure 1.2. Generic conceptual model used in ERAEF.

The external activities that may impact the fishery objectives are also identified at the Scoping stage and evaluated at Level 1. This provides information on the additional impacts on the

[1] The term "protected species" refers to species listed under [Part 13] of the EPBC Act (1999) and replaces the term "Threatened, endangered and protected species (TEPs)" commonly used in past Commonwealth (including AFMA) documents.

[2] Note "protected" (with small "p") refers to all species covered by the EPBC Act (1999) while "Protected" (capital P) refers only to those protected species that are threatened (vulnerable, endangered, or critically endangered).

ecological components being evaluated, even though management of the external activities is outside the scope of management for that fishery.

The assessment of risk at each level considers current management strategies and arrangements. A crucial process in the risk assessment framework is to document the rationale behind assessments and decisions at each step in the analysis. The decision to proceed to subsequent levels depends on

- Estimated risk at the previous level
- Availability of data to proceed to the next level
- Management response (e.g. if the risk is high but immediate changes to management regulations or fishing practices will reduce the risk, then analysis at the next level may be unnecessary).

1.1.2 ERAEF stakeholder engagement process

A recognized part of conventional risk assessment is the involvement of stakeholders involved in the activities being assessed. Stakeholders can make an important contribution by providing expert judgment, fishery-specific and ecological knowledge, and process and outcome ownership. The ERAEF method also relies on stakeholder involvement at each stage in the process, as outlined below. Stakeholder interactions are recorded.

1.1.3 Scoping

In the first instance, scoping is based on review of existing documents and information, with much of it collected and completed to a draft stage prior to full stakeholder involvement. This provides all the stakeholders with information on the relevant background issues. Three key outputs are required from the scoping, each requiring stakeholder input.

1. Identification of units of analysis (species, habitats and communities) potentially impacted by fishery activities (Section 2.2.2; Scoping Documents S2A, S2B1, S2B2 and S2C1, S2C2).
2. Selection of objectives (Section 2.2.3; Scoping Document S3). The primary objective to be pursued for species assessed under ERAEF is that of ensuring populations are maintained at biomass levels above which recruitment failure is likely, as stated in Chapter 2 (ERM Guide; AFMA 2017). This is consistent with current legislation and fisheries policies and represents a change from when the ERAEF was first developed and there was less policy or legislation-based guidance on sustainability objectives, with stakeholders able to choose from a range of "sustainability" objectives (e.g. tables 5A-C in Hobday et al. 2007).
3. Selection of activities (hazards) (Section 2.2.4; Scoping Document S4) that occur in the sub-fishery is made using a checklist of potential activities provided. The checklist was developed following extensive review and allows repeatability between fisheries. Additional activities raised by the stakeholders can be included in this checklist (and

would feed back into the original checklist). The background information and consultation with the stakeholders is used to finalize the set of activities. Many activities will be self-evident (e.g. fishing, which obviously occurs), but for others, expert or anecdotal evidence may be required.

1.1.4 Level 1. SICA (Scale, Intensity, Consequence Analysis)

The SICA analysis evaluates the risk to ecological components resulting from the stakeholder-agreed set of activities. Evaluation of the temporal and spatial scale, intensity, sub-component, unit of analysis, and credible scenario (consequence for a sub-component) should be prepared by the draft fishery ERAEF report author and reviewed at an appropriate stakeholder meeting (e.g. Resource Assessment Group meeting). Due to the number of activities (up to 24) in each of five components (resulting in up to 120 SICA elements), preparation before involving the full set of stakeholders may allow time and attention to be focused on the uncertain or controversial or high-risk elements. Documenting the rationale for each SICA element ahead of time for the straw-man scenarios is crucial to allow the workshop debate to focus on the right portions of the logical progression that resulted in the consequence score.

SICA elements are scored on a scale of 1 to 6 (negligible to extreme) using a "plausible worst case" approach (see ERAEF Methods Document for details; Smith et al. 2007). Level 1 analysis potentially result in the elimination of activities (hazards) and in some cases whole components. Any SICA element that scores 2 or less is documented, but not considered further for analysis or management response.

1.1.5 Level 2. PSA and SAFE (semi-quantitative and quantitative methods)

When the risk of an activity at Level 1 (SICA) on a species component is moderate or higher and no planned management interventions that would remove this risk are identified, an assessment is required at Level 2 (to determine if the risk is real and provide further information on the risk). The tools used to assess risk at Level 2 allow units (e.g. all individual species) within any of the ecological species components (e.g. key/secondary commercial, byproduct/bycatch, and protected species) to be effectively and comprehensively screened for risk. The analysis units are identified at the scoping stage. To date, Level 2 tools have been designed to measure risk from direct impacts of fishing only (i.e. risk of overfishing, leading to an overfished fishery), which in all assessments to date has been the hazard with the greatest risks identified at Level 1[3].

In the period since the first ERAEF was implemented across Commonwealth fisheries, much of the management focus has been on the assessment results associated with Level 2 and Level 2.5 or 3 risk assessment methods, which comprise semi-quantitative or rapid simple quantitative methods (e.g. PSA and SAFE). This level has been subject to the greatest level of change and improvement which are discussed in the following sections. Additional

[3] Future iterations of the methodology will include PSAs modified to measure the risk due to other activities, such as gear loss.

improvements are being developed for implementation in the near future (see Chapter 4.13 of AFMA ERM Guide, AFMA 2017).

Level 2 was originally designed to rely on a single risk assessment methodology, the Productivity-Susceptibility Analysis (PSA) (see Chapter 4.8.3 of AFMA ERM Guide, AFMA 2017), however a more quantitative method called the Sustainability Assessment for Fishing Effects (SAFE) (see Chapter 4.8.4 of AFMA ERM Guide, AFMA 2017) was developed early in the implementation of the ERAEF and classed as a Level 2.5 or Level 3 tool.

Under the revised ERAEF:

- bSAFE has now been reclassified as the preferred Level 2 method (over PSA) where sufficient spatial and biological data (to support bSAFE) are available. Typically, this has been used for teleost and chondrichthyan species.
- Species estimated to be at high risk under bSAFE may then be assessed under eSAFE which may provide reduced estimates of uncertainty pertaining to the actual risk.
- Where either the data or species biological characteristics are insufficient to support bSAFE analyses, it is recommended that PSA be applied instead. This will be the case for many protected species, invertebrate bycatch species and some other species.
- At Level 2, either PSA or SAFE methods should be applied to any given species, not both.
- For high-risk species it is a management choice whether to progress to eSAFE, pursue a Level 3 fully quantitative stock assessment, or to take more immediate management action to reduce the risk. The types of considerations required in making that choice (i.e. moving up the ERAEF assessment hierarchy or taking direct management action) are outlined in Chapter 5.5 of the AFMA ERM Guide (AFMA 2017).

It is also recognised that several additional tools, including some of the “data poor” assessment tools that are used to inform harvest strategies, could potentially be included within the Level 2 toolkit. They are distinguished from Level 3 quantitative tools (i.e. stock assessment models) that are more data rich and able to more precisely quantify uncertainty.

PSA (Productivity Susceptibility Analysis)

Details of the PSA method are described in the accompanying ERAEF Methods Document and summarised in Section 4.8.3 of the AFMA ERM Guide (AFMA 2017). Stakeholders can provide input and suggestions on appropriate attributes, including novel ones, for evaluating risk in the specific fishery. Attribute values for many of the units (e.g. age at maturity, depth range, mean trophic level) can be obtained from published literature and other resources (e.g. scientific experts) without initial stakeholder involvement. Stakeholder input is required after preliminary attribute values are obtained. In particular, where information is missing, expert opinion can be used to derive the most “reasonable” conservative estimate. For example, if species attribute values for annual fecundity have been categorized as low, medium, or high on the set (<5, 5-500, >500), estimates for species with no data can still be made. Also, estimated fecundity of a broadcast-spawning fish species with unknown fecundity is still likely to be greater than the high fecundity category (>500). Susceptibility attribute estimates, such as “fraction alive when landed”, can also be made based on input from experts such as

scientific observers. Feedback to stakeholders regarding comments received during the preliminary PSA consultations is considered crucial. The final PSA is completed by scientists and results are presented to the relevant stakeholder group (e.g. RAG and/or MAC) before decisions regarding Level 3 analysis are considered. The stakeholder group may also decide on priorities for analysis at Level 3.

Residual Risk Analysis

There were several limitations due to the semi-quantitative nature of a Level 2 PSA assessment. For example, certain management arrangements which mitigate the risks posed by a fishery, as well as additional information concerning levels of direct mortality, may not be easily considered in assessments. To overcome this, Residual risk analyses (RRA) are used to consider additional information, particularly mitigating effects of management arrangements that were not explicitly included in the ERAs or introduced after the ERA process commenced. Priority for this process has typically been focused on those species attributed a high-risk rating (those likely to be most at risk from fishing activities). It could in theory be used to also determine if some species have been incorrectly classified as low risk.

Recently revised Residual risk guidelines have been developed (see below) to assist in making accurate judgments of residual risk consistently across all fisheries. At the moment, they are applied to species and not applicable to habitats or communities.

These guidelines are not seen as a definitive guide on the determination of residual risk, and it is expected they may not apply in a small number of cases. Care must also be taken when applying them to ensure residual risk results are appropriate in a practical sense. There are several conditions which underpin the residual risk guidelines and should be understood before the guidelines are applied:

- All assessments and management measures used within the residual risk assessment must be implemented prior to the assessment with sufficient data to demonstrate the effect. Any planned or proposed measures can be referred to in the assessment but cannot be used to revise the risk score.
- When applied, the guidelines generally result in changes to particular "attribute" scores for a particular species. Only after all the guidelines have been applied to a particular species, should the overall risk category be re-calculated. This will ensure consistency, as well as facilitating the application of multiple guidelines.
- Unless there is clear and substantiated information to support applying an individual guideline, then the attribute and residual risk score should remain unchanged. All supporting information considered in applying these Guidelines must be clearly documented and referenced where applicable. This is consistent with the precautionary approach applied in ERAs, with residual risk remaining high unless there is evidence to the contrary ensuring a transparent process is applied.

The results (including supporting information and justifications) from residual risk analyses must be documented in “Residual Risk Reports” for each fishery (or can be integrated into the Level 2 risk assessment report). These will be publically available documents.

SAFE (Sustainability Assessment for Fishing Effects)

The SAFE method developed is split into two categories: base SAFE (bSAFE) and an enhanced SAFE (eSAFE). eSAFE has greater data processing requirements and is recommended to only be used to assess species estimated to be at high risk via the bSAFE. It is also able to more appropriately model spatial availability aspects when sufficient data are available.

bSAFE

Relative to the PSA approach, the bSAFE approach (Zhou and Griffiths, 2008; Zhou et al. 2007, 2011):

- is a more quantitative approach (analogous to stock assessment) that can provide absolute measures of risk by estimating fishing mortality rates relative to fishing mortality rate reference points (based on life history parameters),
- requires less productivity data than the PSA,
- is able to account for cumulative risk and
- potentially outperforms PSA in several areas, including strength of relationship to Tier 1 assessment classifications (Zhou et al. 2016).

Like PSA, the bSAFE method is a transparent, relatively rapid, and cost-effective process for screening large numbers of species for risk and is far less demanding of data and much simpler to apply than a typical quantitative stock assessment.

As such it is recommended that bSAFE be used as the preferred Level 2 assessment tool for all fish species and some invertebrates and reptiles (e.g. some sea snakes) with sufficient data.

In estimating fishing mortality, bSAFE utilises much of the same information as the PSA, to estimate:

- Spatial overlap between species distribution and fishing effort distribution,
- Catchability resulting from the probability of encountering the gear and size-dependent selectivity and
- Post-capture mortality.

The fishing mortality is essentially the fraction of overlap between fished area and the species distribution area within the jurisdiction, adjusted by catchability and post-capture mortality. Uncertainty around the estimated fishing mortality is estimated by including variances in encounterability, selectivity, survival rate and fishing effort between years.

The three biological reference points are based on a simple surplus production model:

- $\mathbf{F_{MSY}}$ – instantaneous fishing mortality rate that corresponds to the maximum number of fish in the population that can be killed by fishing in the long term. The latter is the maximum sustainable fishing mortality (MSM) at B_{MSM}, similar to target species MSY.
- $\mathbf{F_{LIM}}$ – instantaneous fishing mortality rate that corresponds to the limit biomass B_{LIM} where B_{LIM} is a assumed to be half of the biomass that supports a maximum sustainable fishing mortality ($0.5B_{MSM}$)

- F_{CRASH} – minimum unsustainable instantaneous fishing mortality rate that, in theory, will lead to population extinction in the long term.

This methodology produces quantified indicators of performance against fishing mortality-based reference points and as such does allow calibration with other stock assessment and risk assessment tools that measure fishing mortality. It allows the risk of overfishing to be determined, via the score relative to the reference line. Uncertainty (error bars) are related to the variation in the estimation of the scores for each axis.

It is recommended that species assessed as being potentially at high risk under bSAFE are then progressed to analysis by eSAFE which can narrow uncertainties around the risk (but is more time and resource intensive than bSAFE).

Assumptions and issues to be aware of:

- Comparisons of PSA and SAFE analyses for the same fisheries and species support the claim that the PSA method generally avoids false negatives but can result in many false positives. Limited testing of SAFE results against full quantitative stock assessments suggests that there is less "bias" in the method, but that both false negatives and false positives can arise.
- SAFE analyses retain some of the key precautionary elements of the PSA method, including assumptions that fisheries are impacting local stocks (within the jurisdictional area of the fishery).
- Although the bSAFE analyses provide direct estimates of uncertainty in both the exploitation rate and associated reference points, they are less explicit about uncertainties arising from key assumptions in the method, including spatial distribution and movement of stocks.
- The method assumes there would be no local depletion effects from repeat trawls at the same location (i.e. populations rapidly mix between fished and unfished areas). The fishing mortality will likely be overestimated if this assumption is not satisfied (ERA TWG 2015)[4].
- The method also assumes that the mean fish density does not vary between fished area and non-fished area within their distributional range. Hence, the level of risk would be over-estimated for species found primarily in non-fished habitat, while risk would be under-estimated for species that prefer fished habitat (ERA TWG 2015).
- The SAFE methodology makes greater assumptions than Tier 1 stock assessments in coming to its F estimates (due to a lack of the data relative to that used in a Tier 1 assessment) and it is not capable of measuring risk of a stock being already overfished (so the type of risk it measures relates only to overfishing, which may then lead to future overfished state). The limitations of SAFE with respect to measuring overfished risks are the same essentially as for PSA.

[4] ERA Technical Working Group, September 2015

eSAFE

Enhanced SAFE (eSAFE) appears, based on calibration with Level 3 assessments, to provide improved estimates of fishing mortality relative to the base SAFE (bSAFE) method. The eSAFE requires more spatially explicit data and takes more analysis time than bSAFE, and so might only be used to further assess species that were identified as at high risk using bSAFE (and which have not had further direct management action taken). The eSAFE enhances the bSAFE method by estimating varying fish density across their distribution range as well as species- and gear-specific catch efficiency for each species.

1.1.6 Level 3

This stage of the risk assessment is fully quantitative and relies on in-depth scientific studies on the units identified as at medium or greater risk in the Level 2. It will be both time and data intensive. Individual stakeholders are engaged as required in a more intensive and directed fashion. Results are presented to the stakeholder group and feedback incorporated, but live modification is not considered likely.

1.1.7 Conclusion and final risk assessment report

The conclusion of the stakeholder consultation process has resulted in a final risk assessment report for the individual fishery according to the ERAEF methods. It is envisaged that the completed assessment will be adopted by the fishery management group and used by AFMA for a range of management purposes, including to address the requirements of the EPBC Act as evaluated by Department of the Environment and Energy.

1.1.8 Subsequent risk assessment iterations for a fishery

The frequency at which each fishery must revise and update the risk assessment is not fully prescribed. As new information arises or management changes occur, the risks can be re-evaluated, and documented as before. The fishery management group or AFMA may take ownership of this process, or scientific consultants may be engaged. In any case the ERAEF should again be based on the input of the full set of stakeholders and reviewed by independent experts familiar with the process.

Fishery re-assessments for byproduct and bycatch species under the ERAEF will be undertaken every five years[5] or sooner if triggered by re-assessment triggers. The five-year timeframe is based on several factors including:

- The time it takes to implement risk management measures; for populations to respond to those measures to a degree detectable by monitoring processes; and to collect sufficient data to determine the effectiveness of those measures.

[5] Based on a recommendation by the ERA Technical Working Group, September 2015.

- Alignment with other management and accreditation processes.
- The cost of re-assessments.
- The review period for Fisheries Management Strategy (FMS).

For byproduct and bycatch species, in the periods between scheduled five-year ERA reviews[6], AFMA will develop and monitor a set of fishery indicators and triggers, on an annual basis, to detect any changes (increase or decrease) in the level of risk posed by the fishery to any species. Where indicators exceed specified trigger levels, AFMA will investigate the causes and provide opportunity for RAG comment/advice during that process. Pending outcomes of that review, and RAG advice, AFMA can, if necessary, request a species specific or full fishery re-assessment (i.e. prior to the scheduled re-assessment dates).

The ERA TWG (September 2015) identified five key indicators upon which such triggers could be based, these being changes in:

- Gear type/use
- Mitigation measures (use or type)
- Area fished
- Catch or interaction rate
- Fishing effort

Where possible, the triggers should look to take into account additional sources of risk from interacting non-Commonwealth fisheries. In addition, if a major management change is planned for a fishery, such as a move from input to output controls, the fishery will need to be reassessed prior to that management change coming into effect. In considering each indicator and trigger level, the RAG should consider the following:

- The data upon which the indicator is based must be sufficiently representative of actual changes in catch, effort, area, gear, or mitigation methods. Consideration should be given to the level of uncertainty associated with the data underpinning any prospective indicator.
- The trigger level chosen should not be overly sensitive to the normal inter-annual variance that is typical of the indicator and independent of fishing pressure, assuming such variance is unlikely to relate to a significant change in the risk posed by the fishery to any or all species.
- The trigger level should equate to the minimum level of change that the RAG (by its expert opinion) considers might potentially represent a significant change in the risk posed by the fishery.

[6] In contrast to key and secondary commercial species managed via catch/effort limits under Harvest Strategies, which depending on species and Harvest Strategy, can be re-assessed any time between 1 and 5 years.

- The trigger level could represent an absolute change (number/level) in an indicator or a percentage change in an indicator.
- The RAG should consider whether a "temporal" condition should be placed on the trigger (i.e. the trigger is breached 2 years in a row) to further reduce the likelihood of natural population variance or data errors triggering a re-assessment unnecessarily.

The final set of indicators and triggers will be developed for each fishery by AFMA in consultation with its fishery RAG (or for fisheries lacking a RAG, the ERA TWG), in association with the next planned re-assessment (see Table 8 in AFMA ERM Guide, AFMA 2017). A RAG may choose a subset of these indicators and triggers or include an additional indicator/trigger(s), based on consideration of the availability and reliability of data upon which to base any of the above indicators/triggers, however justification of this must be provided.

Research is currently underway to develop specific guidance for RAG to aid in the selection of appropriate triggers, which will in the meantime be determined using RAG expert opinion. In the longer term it may be possible to refine indicators and triggers using the existing PSA and SAFE methods to test which attributes the end risk scores are most sensitive to (ERA TWG 2015)[7]. The RAG will record both the final set of indicators and triggers chosen, and a justification for those, in the RAG minutes. Once the final set of indicators and triggers is determined for a fishery, they will require implementation within the FMS and a monitoring and review process.

[7] ERA TWG recommendation, September 2015

2 Results

The focus of analysis is the fishery as identified by the responsible management authority. The assessment area is defined by the fishery management jurisdiction within the Australian Fisheries Zone (AFZ). The fishery may also be divided into sub-fisheries based on fishing method and/or spatial coverage. These sub-fisheries should be clearly identified and described during the scoping stage. Portions of the scoping and analysis at Level 1 and beyond are specific to a particular sub-fishery. The fishery is a group of people carrying out certain activities as defined under a management plan. Depending on the jurisdiction, the fishery/sub-fishery may include any combination of commercial, recreational, and/or indigenous fishers.

The results presented below are for the shark gillnet sub-fishery of the Southern and Eastern Scalefish and Shark Fishery (SESSF) Gillnet Hook and Trap (GHAT) Sector. A full description of the ERAEF method is provided in the methodology document (Hobday et al. 2007; Hobday et al. 2011b). This fishery report contains figures and tables with numbers that correspond to this methodology document. Thus, table and figure numbers within this fishery ERAEF report are not sequential, as not all figures and tables are relevant to the fishery risk assessment results.

2.1 Stakeholder Engagement

Table 2.1. Summary Document SD1. Summary of stakeholder involvement for sub-fishery: SESSF GHAT shark gillnet sub-fishery.

FISHERY ERA REPORT STAGE	TYPE OF STAKEHOLDER INTERACTION	DATE OF STAKEHOLDER INTERACTION	COMPOSITION OF STAKEHOLDER GROUP (NAMES OR ROLES)	SUMMARY OF OUTCOME
Scoping	Phone calls and emails	Various	Ryan Keightly (AFMA), Claire Taylor (AFMA), David Schubert (AFMA Observer)	Discussion re. species list and Scoping
Draft report	Submitted to AFMA	April 2018	Brodie MacDonald (AFMA), Ryan Keightly (AFMA)	
Draft report	Shark RAG meeting	December 2018	Brodie MacDonald (AFMA), Ryan Keightly (AFMA), Shark RAG members and invited participants	Presentation of Level 1, Level 2 and RR analyses.
Draft final report	Submitted to AFMA	March 2019	Brodie MacDonald (AFMA), Ryan Keightly (AFMA)	
Updated methodology	Submitted to AFMA	August 2019	SESSFRAG	Submitted supplement on updated methodology
Updated methodology	Presentation of results at SharkRAG meeting	September 2020	SharkRAG	Updated methodology accepted
Updated methodology	Submitted to AFMA	November 2020	SEMAC	Additional consultation on report
Final report	Submitted to AFMA	April 2021	AFMA	Final report submitted
Final report	Submitted to AFMA	June 2021	AFMA	Final report submitted

2.2 Scoping

The aim in the Scoping stage is to develop a profile of the fishery being assessed. This provides information needed at stakeholder meetings and to complete Levels 1 and 2. The focus of analysis is the fishery, which may be divided into sub-fisheries based on fishing method and/or spatial coverage. Scoping involves six steps:

Step 1. Document the general fishery characteristics
Step 2. Generating "unit of analysis" lists (species, habitat types, communities)
Step 3. Selection of objectives
Step 4. Hazard identification
Step 5. Bibliography
Step 6. Decision rules to move to Level 1

2.2.1 General Fishery Characteristics (Step 1).

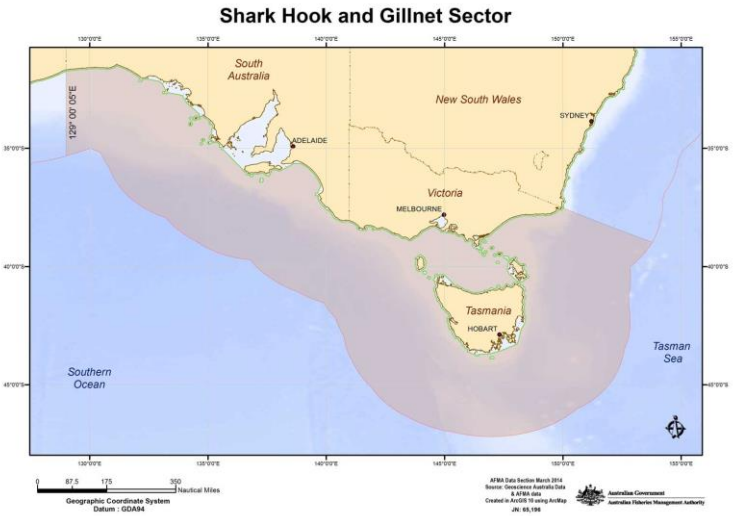
The information used to complete this step came from a range of documents such as the Fishery's Management Plan, Assessment Reports, Bycatch Action Plans, and any other relevant background documents.

Scoping Document S1 General Fishery Characteristics

Fishery Name: Southern and Eastern Scalefish and Shark Fishery (GHAT) - Shark gillnet sub-fishery
Assessment date: March 2018
Assessor: AFMA and authors of this report (CSIRO)

Table 2.2. General fishery characteristics

GENERAL FISHERY CHARACTERISTICS	
Fishery Name	Southern and Eastern Scalefish and Shark Fishery
Sub-fisheries	In 2003 four Commonwealth fisheries in the southern region were amalgamated into the Southern and Eastern Scalefish and Shark Fishery (SESSF) under a common set of management objectives. The component sectors of the SESSF are: Commonwealth Trawl Sector (previously South East Trawl Fishery (SETF)) • Otter trawl • Danish seine Gillnet Hook and Trap Sector • Scalefish Hook – demersal longline • Scalefish Hook – auto-longline • Scalefish Hook – dropline • Scalefish trap • Shark gillnet • Shark Hook – demersal longline Great Australian Bight Trawl Sector East Coast Deepwater Trawl Sector
Sub-fisheries assessed	This report covers the shark gillnet sub-fishery of the Commonwealth Gillnet Hook and Trap Sector of the SESSF.
Start date/ history	Commercial shark fishing began in the mid-1920s using demersal longlines to target school shark, but as gillnets gradually replaced longlines as the main fishing method over the period from the mid-1960s to the early 1970s. Since the early 1970s gummy shark has progressively replaced school shark as the principal target species.

	Since the previous ERA, there has been a re-structure (~2007). This has led to a reduction in the number of active vessels in this sub-fishery. New management arrangements have also been implemented, such as spatial closures (see Appendix D) which include the Upper-slope deepwater dogfish closures. Since 2012, a number of gear and area closures (primarily off South Australia) have been introduced in this sector to reduce the risk of interactions with Australian sea lions and dolphins.
Geographic extent of fishery	 **Area of the Shark Gillnet and Hook sectors.** Shark Gillnet and Hook Sectors The Shark Hook and Shark Gillnet Sectors include waters from the New South Wales/Victorian border westward to the South Australian/Western Australian border, including the waters around Tasmania, to the extent of the AFZ. All targeted shark fishing is prohibited inside Victorian coastal waters, which is inside 3nm. Shark fishing in Tasmanian Coastal Waters and South Australian Coastal Waters is managed as part of the SESSF. Coastal waters permit holders for South Australia or Tasmania are able to fish out to 3nm from the Baseline (as defined in the Seas and Submerged Lands (Territorial Sea Baseline) Proclamation 2006). Coastal Waters permits do not allow fishing in the internal waters of Tasmania or South Australia.
Regions or Zones within the fishery	Shark zones are used in the statistical analyses to provide overall abundance indices for target and byproduct species (see below, excerpt from Sporcic 2015). These annual indices are employed into (i) Tier 1 stock assessments to determine the stock status of gummy shark, or (ii) Tier 4 assessments (elephant fish and sawshark) and used directly as a management tool to determine the recommended biological catch (RBC) from which TACs are determined. Shark region / Shark region name / Shark zone WA — Western Australia — 10 WSA — Western South Australia — 1 CSA — Central South Australia — 2 SAV-E — Southern Australia-Victoria East — 3 WBS — Western Bass Strait — 4 WT — Western Tasmania — 6 ET — Eastern Tasmania — 7 EBS — Eastern Bass Strait — 5 NSW — New South Wales — 8 SAV-W — Southern Australia-Victoria West — 9
Fishing season	Fishing occurs throughout the year. The fishing season for all sectors of the SESSF is from 1 May to 30 April each year.
Key/second-ary commercial species and stock status	The SESSF is a multi-species fishery that catches over 100 species of commercial value. For the purposes of this analysis the key and secondary species for the gillnet sector have been defined as the species (or species groups) which contribute a significant proportion of the total landed catch. For the gillnet sector of the SESSF these are gummy shark and school shark. Gummy shark (*Mustelus antarcticus*) is the main key commercial species in the gillnet sector. The most recent assessment was completed in 2016 and estimated all three sub-stocks were above the target reference point. For the purpose of ERA, school shark is classified as a secondary commercial species. They are caught incidentally while fishing for gummy shark. School shark are a longer-lived and less productive species than gummy shark. They are currently assessed as overfished and are under a rebuilding strategy. A full list of primary and secondary species and their stock status is included in **Appendix A.**
Bait collection and usage	Not applicable.

Current entitlements

The number of active boats decreased from 46 to 37 active boats entitlements in this fishery.

A list of the number of gillnet concessions, concession holders and number of active boats 2008 to 2016 is in **Appendix B**.

Current and recent TACs, quota trends by method

Quotas exist for the main species and Total Allowable Catches (TACs) apply to all fishing methods in the SESSF. Research quota are included in these figures. Current and recent TACs for primary and secondary species with % of TAC caught are provided in **Appendix C**.

Agreed Total Allowable Catch (t) for main shark quota species in the SESSF for assessment period and current. Fishing season-01 May to 30 April.

	FISHING SEASON						
QUOTA SPECIES	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Elephant Fish	89	89	109	109	163	92	114
Gummy Shark	1717	1714	1836	1836	1836	1836	1774
Saw Shark	226	226	339	459	482	433	442
School Shark	176	150	215	215	215	215	215

Source: AFMA

Current and recent fishery effort trends by method

Gillnet effort (total gillnet length set and number of shots) decreased in 2007 due to the structural adjustment of the SESSF which saw several vessels leave the fishery, then again from 2010 where management arrangements were implemented to protect Australian sea lions.

Gillnet effort (total net set and number of shots) since the last ERA assessment.

CALENDAR YEAR	GILLNET LENGTH (M)	NO. OF SHOTS
2008	35,511,408	9,482
2009	37,182,659	10,163
2010	39,925,097	10,729
2011	36,613,490	9,551
2012	32,846,722	8,285
2013	31,904,469	7,254
2014	32,424,006	7,432
2015	30,848,491	7,065
2016	30,703,220	6,812
2017	34,748,295	7,619

Source: AFMA logbook database.

Current and recent fishery catch trends by method

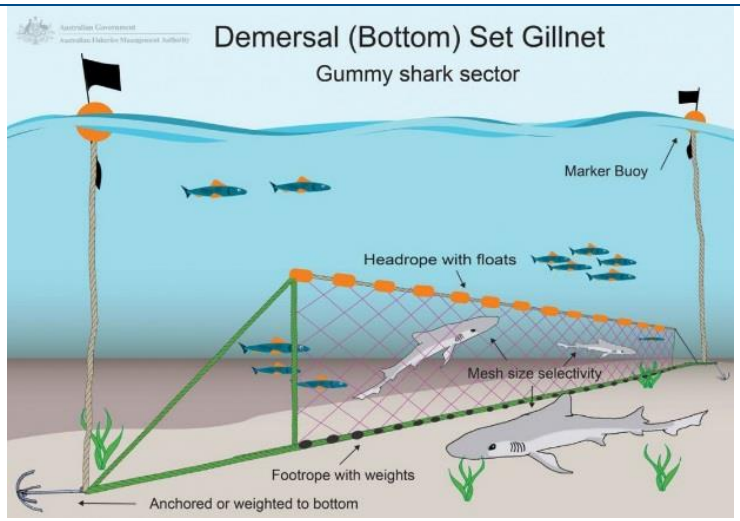
Total catch (t) of the main species caught by gillnet.

YEAR	GUMMY SHARK	SCHOOL SHARK	ELEPHANT FISH	SAWSHARKS	OTHER
2008	1,562	216	40	115	164
2009	1,322	228	44	89	198
2010	1,213	150	35	92	192
2011	1,131	147	34	103	154
2012	996	101	45	75	110
2013	917	80	38	71	106
2014	1,009	108	31	81	99
2015	1,197	83	29	79	98

2016	1,313	86	36	95	85

Source: AFMA

Current and recent value of fishery ($)	The current and recent value for this sub-fishery is confidential and withheld in this report. See ABARES Fishery Status Report 2017 (Patterson et al. 2017).
Relationship with other fisheries	There are other Commonwealth, State and recreational fisheries that overlap this sub-fishery. Recreational catches may be significant for gummy and school shark and elephant fish. Many permit holders who operate in the sub-fisheries of the GHAT also have permits to operate in a variety of other fisheries. Tasmania and South Australia both have scalefish fisheries within three nm of their coastlines that use both gillnets and hooks. These fisheries take school and gummy shark as byproduct. **The following fisheries operate in the area coved by this fishery, either under Commonwealth jurisdiction or Joint jurisdiction between the Commonwealth and States:** • Southern Bluefin Tuna Fishery • Southern Squid Jig Fishery • Southern/ Western Tuna and Billfish Fishery • Bass Strait Central Zone Scallop Fishery • Jack Mackerel fishery • East Coast tuna and billfish fishery **The following fisheries operate under Victorian jurisdiction in waters overlapping or adjacent to this fishery:** • Abalone Fishery • Rock Lobster Fishery • Ocean Access Fishery • Victorian Inshore Prawn Trawl Fishery **The following fisheries operate under Tasmania jurisdiction in waters overlapping or adjacent to this fishery:** • Abalone Fishery • Rock Lobster Fishery • Giant Crab Fishery • Scalefish Fishery • Tasmania Scallop Fishery **The following fisheries operate under South Australian jurisdiction in waters overlapping or adjacent to this fishery:** • Marine Scalefish Fishery • Rock Lobster Fishery • Abalone Fishery **The following fisheries operate under Western Australian jurisdiction in waters overlapping or adjacent to this fishery:** • Abalone fishery • Australian Herring Trap Fishery • Western Australian Pilchard Fishery • Western Australian Pink Salmon Fishery • Western Australian Rock Lobster Fishery • Western Australian Salmon Fishery • Western Australian Scallop Fishery • Western Australian Shark Fishery
Gear	
Fishing methods and gear	Gillnets are long rectangular panels of netting with diamond-shaped mesh that are held vertically in the water column and anchored to the ocean floor at either end. Fish swim into the net and are entangled by the gills, fins, and spines. The nets are kept vertical by the floats along the top and weights along the bottom. Only demersal gillnets (touching the ocean's floor) are permitted in Commonwealth fisheries.

	 Net length varies from ~2000 m to 6000 m. Some operators split their net into fleets, for example a 4200 m net can be split into two fleets of 2100 m. Source: AFMA Feb. 2018: http://www.afma.gov.au/portfolio-item/trawling/
Fishing gear restrictions	The following describe conditions in shark gillnet SFRs with regards to gear requirements/restrictions: a) the total headrope length of gillnet, or, if more than one net is used, the total combined headrope length of gillnet that may be deployed from a boat at any time (i.e., that may be in the water at any one time) in South Australian waters must not exceed 4200 m. b) The total headrope length of gillnet, or, if more than one net is used, the total combined headrope length of gillnet that may be deployed from a boat at any one time (i.e., that may be in the water at any one time) in all other areas of the Commonwealth Gillnet Sector must not exceed 6000 m. c) Conditions a) and b) do not apply for vessels with a functioning electronic monitoring system. d) The depth or 'drop' of a net must not exceed 20 meshes. A mesh in a gillnet must be: a) greater than or equal to 150 mm in width; and b) less than or equal to 165 mm in width. Source: AFMA Management Arrangements Booklet 2017
Selectivity of fishing methods	Mesh size is restricted to be between 150 mm and 165 mm wide so that mostly medium size shark are caught. Research indicates that this mesh-size used in this fishery (150-165 mm) is highly selective relative to other gear types, allowing many teleost fish (scalefish) species to pass through and not catching many larger chondrichthyan (sharks, rays and chimaeras) species (Walker et al. 2005). Gillnets are also a size-selective method for the target and byproduct species: gummy shark, school shark, elephant fish and saw shark (Walker and Hudson 2005). Sub-adult school shark and gummy shark are predominantly caught and not many large breeding females. Walker et al. (2005) analysed observer data from southern shark vessels and found that gillnet mesh-size had a major effect on catch composition and catch rate, whereas gillnet hanging ratio, hook-size, hook shank length, and hook-spacing had only minor effects. Gillnets set to target sharks were far more effective at capturing sharks than scalefish. Most discards are returned to the water alive and most of the catch of scalefish species is retained. The gillnet catch rate for chondrichthyan, and teleost species would increase markedly if the fishery changed from the present legal minimum mesh-size of 6 inches to a smaller mesh-size. Catches of species of cephalopoda, bivalvia, gastropoda, mammalia, aves, and reptilia are negligible (Walker et al. 2005). Source: AFMA; Walker et al. (2007).
Spatial gear zone set	Gear is restricted to continental shelf waters less than 183 m.
Depth range gear set	Gillnets are normally used in shelf waters less than 100 m, and are restricted to waters less than 183 m.

How gear set	Gillnets are held vertically in the water column and anchored to the ocean floor at either end. The nets are kept vertical by the floats along the top and weights along the bottom. Some operators split their net into fleets, for example a 4200 m net can be split into two fleets of 2100 m. The average soak time (of the net) is seven hours but can vary from three to 12 hours. Gear is often retrieved at dawn. The net is hauled onto the net drum from one end over a roller mounted on the gunnels. All species are removed from the net by one of the crew (often the first mate or 'deck boss'). Length of a fishing trip varies (typically five to 10 days). Source: AFMA Feb. 2018, http://www.afma.gov.au/portfolio-item/trawling/
Area of gear impact per set or shot	The gear has an intermediate footprint and is thought to have a lower impact on the bottom as they are static when set. It is not clear what impact a line under tension may have on benthic fauna. All fishing gear used in the GHAT Fishery is passive gear that has minimal effect on habitat. Gillnets, automatic longlines and traps are all in contact with the benthos but are thought not to damage it significantly.
Capacity of gear	Not available
Effort per annum all boats	See Current and recent fishery effort trends by method.
Lost gear and ghost fishing	While lost or discarded gillnets have the capacity to ghost fish, these events are rare in the sub-fishery and gear can be retrieved. Ghost fishing is not considered to be a significant issue within this fishery.
Issues	
Key/second-ary commercial species issues and Interactions	Gummy shark (*Mustelus antarcticus*) is the main target species in the gillnet sector. The most recent assessment was completed in 2016 and estimated all three sub-stocks were above the target reference point. For the purpose of ERA, school shark is classified as a secondary commercial species. They are caught incidentally while fishing for gummy shark. School shark are a longer-lived and less productive species than gummy shark. They are currently assessed as overfished and are under a rebuilding strategy. The TAC is intended to cover unavoidable bycatch of school shark. Also, a catch ratio of school shark to gummy shark was implemented in 2011-2012 season to ensure that school shark is not targeted. This ratio applies to either a gillnet or shark hook operator so that the amount of school shark caught cannot exceed 20 % of their gummy shark quota holding.
Byproduct and bycatch issues and interactions	Byproduct species are defined as species which do not make a significant contribution to the overall catch but are sometimes landed for sale. Sawshark and elephant fish are considered to be the main byproduct species. Both species are taken nearly entirely as a byproduct and sell for far lower prices than both school and gummy shark. Tighter management arrangements may lead to discarding of these species. Currently, sawshark are discarded at a rate of 15%, while and elephant fish are discarded at a higher rate of 75% (Castillo-Jordán et al. 2018) due to low market demand. Given that the post capture survival (PCS) of elephant fish is very low (0.07; Braccini et al. 2012), discarded elephant fish are unlikely to survive. Since there are no current population estimates (note: Tier 4 analyses employ relative abundance indices), total fishing mortality could be high.
Protected species issues and interactions	As part of the previous ERA, 192 protected species were identified as occurring within the area of the gillnet sector, although, operators interacted with very few of these. Operators are required to report all interactions with protected species in their logbooks and AFMA reports quarterly to the Department of Environment and Energy (see table below). In this assessment there are 16 species identified but seven broader classifications. The issue for most protected species is current knowledge of distribution and population size. Even for some quite well-known researched species currency of data is still an issue. Since 2012, several gear and area closures (primarily off South Australia) have been introduced in the gillnet sector to reduce the risk of interactions with Australian sea lions and dolphins. These have changed the fishing areas and targeting behaviour of fishers, influenced the take of target species and consequently affected catch-per-unit-effort. While the introduction of trigger limits has reduced mortality of ASL, the populations continue to decline (ASL report 2014/15, S. Goldsworthy SARDI pers. com. 23 March 2018). To mitigate dolphin interactions in the gillnet sector of the SESSF, AFMA revised the 2014 Gillnet Dolphin Mitigation Strategy and extended it across the whole gillnet sector in May 2017. This extended the individual responsibility approach for dolphin interactions across the whole gillnet sector to create incentives for fishers to innovate and adopt best practice to avoid interactions. The Gillnet Dolphin Mitigation Strategy implements a management response for every dolphin interaction. For any subsequent interactions, a series of escalating management responses are applied to individual fishers culminating in closures for fishers who are unable to minimise their interactions. Unknown population sizes of all dolphins and their low fecundity remains an issue for them. **Recorded wildlife interactions from the AFMA Logbook database for the period 2012-2016 inclusive. A: alive; D: dead.**

	2012		2013		2014		2015		2016		TOTAL	
COMMON NAME	ALIVE	DEAD	ALIVE	DEAD	ALIVE	DEAD	ALIVE	DEAD	ALIVE	DEAD	ALIVE	DEAD
Albatrosses	1					1	1	2	2		4	3
Australian gannet									1		1	0
Birds									1	5	1	5

Cormorants		1				3		2		11	0	17
Fairy prion										1	0	1
Little penguin									6	3	6	3
Pacific gull										1	0	1
Petrels, prions and shearwaters	3	3	1	2	1	2	1	10	1	52	7	69
Shearwaters									1	10	1	10
Short tailed shearwater		1									0	1
White faced storm petrel									1		1	0
Wilson's storm petrel							2		2	1	4	1
Australian fur Seal	2	2		1		1	1	11		10	3	25
New Zealand fur seal	1	4		4				1		5	1	14
Seals		1	1		1	6	3	9	3	17	8	33
Australian sea lion		6		1		1		2	1	1	1	11
Grey nurse sharks										1	0	1
Porbeagle				1							0	1
Shortfin mako		164		77		120		55	6	67	6	483
White shark	5		3		17	2	8	5	7	1	40	8
Bottlenose dolphin								2			0	2
Common dolphin								6	2	19	2	25
Dolphin	1	17	1	8	2	17		21		15	4	78

Source: AFMA and AFMA Wildlife Interaction Reports http://www.afma.gov.au/sustainability-environment/protected-species-management/protected-species-interaction-reports/

Habitat issues and interactions

The gear has an intermediate footprint and is thought to have a lower impact on the bottom. It is not clear what impact a line under tension may have on benthic fauna.

All fishing gear used in the GHAT Fishery is passive gear that has minimal effect on habitat. Gillnets are all in contact with the benthos but are thought not to significantly damage it.

Community issues and interactions

The fishing gear is selective and only removes some parts of the demersal community. It is unknown what effect this has on community species composition and/or structure, but any effects of the broader SESSF need to be considered as whole as there is substantial overlap with trawling methods. Also, the possibility of overfishing the target species, gummy shark, raises concern for the communities in which they are targeted.

Discarding

Since the introduction of electronic monitoring, logbook-recorded discards in the gillnet sector have become more reliable.

Recent Integrated Scientific Monitoring Program (ISMP) coverage has been insufficient to establish reliable discard estimates for gummy shark, school shark, elephant fish and saw shark, however historical discard rate estimates (i.e. from 2015) suggest approximately 6%, 15%, 75% and 15% respectively (Castillo-Jordán et al. 2018).

MANAGEMENT: PLANNED AND THOSE IMPLEMENTED

Manage-ment objectives

The objectives of the Southern and Eastern Scalefish and Shark Fishery Management Plan 2003 (updated 4 May 2016) are as follows:

a) to implement efficient and cost-effective fisheries management of the fishery on behalf of the Commonwealth;

	b) to ensure that the exploitation of the resources of the fishery and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development and the exercise of the precautionary principle and, in particular, the need to have regard to the impact of fishing activities on non-target species and the long-term sustainability of the marine environment; c) to maximise economic efficiency in the exploitation of scalefish and shark resources within the fishery; d) to ensure AFMA's accountability to the fishing industry and to the Australian community in the management of the resources of the fishery; e) to reach Government targets for the recovery of the costs of AFMA in relation to the fishery; f) to ensure, through proper conservation and management, that the living resources of the fishery are not endangered by over-exploitation; g) to ensure the best use of the living resources of the fishery; h) to ensure that conservation and management measures in the fishery implement Australia's obligations under international agreements that deal with fish stocks, and other relevant international agreements; i) to ensure, as far as practicable, that measures adopted in pursuit of these objectives are not inconsistent with the preservation, conservation, and protection of all whale species.
Fishery management plan	The SESSF, which includes the gillnet sub-fishery is managed in accordance with the Management Plan available at www.legislation.gov.au/Series/F2005B02463. This fishery is mainly managed through TAC limits. A TAC is set for each quota species and some non-quota species (to cover incidental unavoidable catch). The Management Plan incorporates under a single umbrella at least seven fisheries (i.e. Commonwealth (Shark) Gillnet sector; Commonwealth Scalefish hook sector; Commonwealth Shark hook sector; Commonwealth South East Trawl sector; Great Australian Bight Trawl sector; Trap sector and East Coast Deepwater Trawl sector) with overlapping fishing entitlements, gear types and capture species. Managing the four fisheries under a single Management Plan provides the opportunity to manage the combined effects of the fishery on the ecosystem, including target species, bycatch and the broader environment. Other relevant management plans are: AFMA 2016 Southern and Eastern Scalefish and Shark Fishery Five Year Strategic Research Plan 2016-2020: https://www.afma.gov.au/sites/default/files/uploads/2017/06/SESSF-Five-Year-Strategic-Research-Plan-2016-2020.pdf?acsf_files_redirect AFMA 2017 Southern and Eastern Scalefish and Shark Fishery Management Arrangements Booklet: www.afma.gov.au/wp-content/uploads/2014/08/SESSF-Management-Arrangements-Booklet-2017.pdf Gillnet Sector Bycatch and Discard Workplan: https://www.afma.gov.au/sites/default/files/uploads/2014/11/Bycatch-Workplan-Shark-Gillnet-Fishery-2014-2016.pdf Guide to AFMA's Ecological Risk Management 2017: https://www.afma.gov.au/sites/default/files/uploads/2017/08/Final-ERM-Guide_June-2017.pdf Southern and Eastern Scalefish and Shark Fishery Management Plan 2003 (updated 4 May 2016): www.legislation.gov.au/Series/F2005B02463 Stock rebuilding strategies for conservation dependent species: a. School shark rebuilding strategy b. Upper Slope dogfish Management Strategy www.afma.gov.au/sustainability-environment/protected-species-management-strategies/
Input controls	A vessel must have a boat Statutory Fishing Right (SFR) allowing a vessel to operate in the fishery. This SFR will entitle a vessel to use gillnet gear in a specific area of water. Other input controls include mesh size restrictions to prevent the capture of juvenile fish and closures. Gear requirements are detailed earlier in this report. Closures are legislated under the *Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016*, *Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 11 2013*, *Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 6 2013*, *Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 2 2015* and under SFR conditions (**Appendix D**). In particular, the Upper-slope Dogfish Management Strategy has been implemented since the last ERA was undertaken. This strategy provides a level of protection for two species of gulper sharks: Harrisson's dogfish (*Centrophorus harrissoni*) and Southern dogfish (*Centrophorus zeehaani*). The management actions provide some protection for other dogfish species including Endeavour Dogfish (*Centrophorus moluccensis*) and Greeneye Spurdog (*Squalus chloroculus*). Australia's South-east Commonwealth Marine Reserves Network stretches from the far south coast of New South Wales, around Tasmania and Victoria and west to Kangaroo Island off South Australia. The reserves cover an area of 388 464 km2 with a depth of 40 m - 4600 m. The network includes 14 Commonwealth Marine Reserves, ranging in size from 537 to 162 000 km^2. Zoning and maps for each of the 14 marine reserves are available from the Department of Environment and Energy website: www.environment.gov.au/topics/marine/marine-reserves/south-east.

	The Temperate East Network covers 383 352 km^2 and includes eight marine parks. The network includes important offshore reef habitat at Elizabeth and Middleton Reefs, Lord Howe Island and at Norfolk Island. Several significant seamount ridges run parallel to the coast in this region. Zoning and maps for each of the 8 marine parks are available from the Department of Environment and Energy website: www.environment.gov.au/topics/marine/marine-reserves/temperate-east.
Output controls	All major target and byproduct species in the Gillnet sector of the SESSF are managed under quota. Quota is issued in the form of 'quota' SFRs and an operator must hold both the appropriate boat SFR and Quota SFRs to fish for quota species. Quota SFRs are tradable among sectors. There are some size limits on quota species (see 'Technical measures'). There are also trip limits in place for some byproduct species and state trip limits (**Appendix E**). Operators also must not carry or possess any shark (class Chondricthyes) dorsal, pectoral, caudal, pelvic or anal fins on board their boat that are not attached to the shark's carcass.
Technical measures	Retained and/or landed gummy shark and school shark must exceed 450 mm when measured in a straight line from the middle of the posterior edge of the aftermost gill-slit to the ventral insertion of the caudal fin. To ensure school shark is not targeted, a catch ratio of school shark to gummy shark was implemented in the 2011. The catch ratio rule means that a gillnet or shark hook operator cannot catch an amount of school shark that exceeds 20 % of their gummy shark quota holdings. In 2015, AFMA implemented a condition that if any school shark are taken alive, they must be returned to the water alive. This was implemented to minimise overall fishing mortality until the stock has rebuilt to above 20 % of the unfished levels.
Regulations	The *Fisheries Management Regulations 1992* prescribes detail on the management arrangements implemented in Commonwealth fisheries. Specifically, they cover bans on vessels over 130 m, administration of and standard conditions for fishing concessions including VMS operation, carrying observers, processing fish, marine environment impacts, payments and fees, registers and administration and allocation of SFRs, discarding offal at sea (not attributed to this fishery). Additional regulations were introduced regarding navigation in closures. Additional rules are contained in the Management Plan and SFR conditions. Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999), interactions with a protected species must be reported within seven days of the incident occurring to the Department of the Environment and Energy. A Memorandum of Understanding between AFMA and the Department for the Reporting of Fisheries Interactions with Protected Species streamlines those reporting requirements (2005 Reporting MOU). AFMA reports its protected species interactions to the Department of the Environment and Energy on a quarterly basis. Amendments to the International Maritime Organisation's International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V which came into force on 1 January 2013 prohibit the discharge of all garbage, from all ships, into the sea (except as provided otherwise, under specific circumstances). Fishers are encouraged to record loss of gear in vessel logbooks, however it is only compulsory for vessels operating in the Southern Ocean under the management of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR).
Initiatives, strategies and incentives	Bycatch Action Plans contain a list of actions designed to minimise the impact of fisheries interactions with bycatch species and the marine environment. The Plans are updated every two years to ensure that they are kept current. These Plans outline some actions that have been incorporated in management arrangements. The SESSF Gillnet Bycatch and Discard Workplan is available at www.afma.gov.au/sustainability-environment/bycatch-discarding/bycatch-discard-workplans/
Enabling processes	Fish Ageing Services now provides ageing services for the main quota species in the SESSF. The Integrated Scientific Monitoring Program (ISMP) was implemented in 1997 to replace the Scientific Monitoring Program in the South East Trawl Fishery. It provides statistically rigorous port-based and at sea monitoring in the south-east trawl, south east non-trawl and Great Australian Bight trawl sectors of this fishery. ISMP provides important information on discards, non-commercial species and non-quota commercial species. Fishery independent trawl surveys (FIS) have been carried out since 2006. They were original planned as a yearly summer and winter survey, however, are now carried during the winter of every second year in the Great Australian Bight Trawl and Commonwealth Trawl Sector. These surveys provide an independent abundance index, as well as other important biological and environmental data, some of which are used in current stock assessments. The assessment group structure comprises: • SESSF Resource Assessment Group (SESSFRAG - an assessment group for the whole SESSF) • South East Resource Assessment Group (formerly Shelf and Slope RAG) • Shark Resource Assessment Group (SharkRAG) • Great Australian Bight Assessment Group (GABRAG) SERAG, SharkRAG and GABRAG are responsible for undertaking stock assessments for a suite of key species, and for reporting on the status of those species to SESSFAG. SERAG is responsible for the assessment of scalefish species and SharkRAG is responsible for assessments of shark species taken by all sectors of the SESSF. GABRAG is responsible for assessment of a suite of species taken in the GAB trawl sector of the SESSF.

Summary of SESSF Harvest Strategy including assessments and harvest control rules

TIER LEVEL	REFERENCE POINT	REFERENCE POINT FUNCTION	INFORMATION REQUIREMENTS	CONTROL RULE
Tier 1	B_{20}	Limit	Catch, effort, discards, age, length, relative abundance, biomass information from: - Logbooks - ISMP - FIS	<B_{20}: No targeted fishing, rebuild strategy required
	B_{35}	HCR inflection	As above	<B_{35}: TACs are set at levels that allow stock to rebuild to target
	B_{48}	Target	As above	<B_{48}: Rebuild towards B_{48} > B_{48}: Fish at F_{48}
Tier 3	F_{20}	Limit	Catch, discards, age, length, information from: - Logbooks and CDRs - ISMP	<F_{20}: No targeted fishing, rebuild strategy required
	F_{40}	MSY Proxy	As above	<F_{40}: TACs are set at levels that allow stock to rebuild to target
	F_{48}	Target	As above	<F_{48}: Rebuild towards F_{48} >F_{48}: Fish at F_{48}
Tier 4	$CPUE_{20}$	Limit	Catch, effort, discards information from: - Logbooks - ISMP	<$CPUE_{20}$: No targeted fishing, rebuild strategy required
	$CPUE_{40}$	MSY Proxy	As above	<$CPUE_{40}$: TACs are set at levels that allow stock to rebuild to target
	$CPUE_{48}$	Target	As above	<$CPUE_{48}$: Rebuild towards $CPUE_{48}$ >$CPUE_{48}$: Fish at F_{48}

Other initiatives or agreements

Relevant to the Gillnet sector, Offshore Constitutional Settlements (OCS) are in place between the Commonwealth and the States of New South Wales, Victoria, Tasmania and South Australia. These OCS agreements define who has jurisdiction for which species stock, and puts trip limits in place where necessary.

In addition, there are a number of national and international initiatives in place which impact management of the fishery. These include:

- Oceans Policy 1998
- National Plan of Action for the Conservation and Management of Sharks 2012
- United Nations Convention Law of the Sea
- FAO Code of Conduct for Responsible Fisheries
- United Nations Fish Stocks Agreement
- Declaration of the Harvest Operations of the Southern and Eastern Scalefish and Shark Fishery as an approved wildlife trade operation, February 2016
- Environment Protection and Biodiversity Conservation Act 1999
- Australian Sea Lion Management Strategy
- Gillnet Dolphin Mitigation Strategy
- Stock rebuilding strategies for conservation dependent species:
    - Orange roughy rebuilding strategy
    - Eastern gemfish rebuilding strategy
    - Redfish rebuilding strategy
    - Blue warehou rebuilding strategy
    - School shark rebuilding strategy
    - Upper Slope dogfish Management Strategy

Bycatch and discarding work plans for each sector of the fishery.

DATA

Logbook data

Catch and effort data and all interactions with protected species are recorded on a shot-by-shot basis in Daily Logbooks. Data has been compiled into a centralised database by AFMA and is updated annually to CSIRO Oceans and Atmosphere.

Electronic logbooks (e-logs) are an electronic alternative to submitting traditional paper logbooks. E-logs allow data to be received by AFMA in near real time, closer to actual fishing events. From 1 May 2018 it will be compulsory for all gillnet boats that have fished more than 50 days in the current or previous fishing season to have transitioned to e-logs.

See 'Other data' for information on electronic monitoring.

Observer data

The purpose of the Observer Program is to provide fisheries managers, research organizations, environmental agencies, the fishing industry, and the wider community with independent, reliable, verified and accurate information on the fishing catch, effort and practice of a wide range of boats operating inside, and periodically outside, the AFZ.

AFMA observers are highly experienced in fishery observer work in Australia. They:

- collect data on independent boat activity and catch data (not recorded in official logbooks)
- collect data and samples for research programs, supporting marine management and other issues relevant to environmental awareness and fisheries management
- monitor compliance of the boat with its fishing concession.

Observer data is collated in AFMA's centralised database and data have been made available outside AFMA in the form of observer trip reports and as raw data.

Observer coverage has decreased in the gillnet sector since the implementation of electronic monitoring (see 'Other data').

Observer coverage (%) in the gillnet sector by fishing season.

FISHING SEASON	NUMBER OF OBSERVED DAYS	NUMBER OF BOAT DAYS	PERCENT OBSERVER COVERAGE (BOAT DAYS)	GILLNET LENGTH (M) OBSERVED	TOTAL GILLNET LENGTH (M)	PERCENT OBSERVER COVERAGE (GILLNET LENGTH)
2008-09	38	4,790	0.79%	312,100	36,541,486	0.85%
2009-10	120	4,878	2.46%	1,008,165	37,432,023	2.69%
2010-11	241	5,201	4.63%	2,105,122	40,252,973	5.23%
2011-12	284	4,581	6.20%	2,205,640	34,320,150	6.43%
2012-13	295	4,238	6.96%	2,409,364	33,072,202	7.29%
2013-14	267	3,865	6.91%	2,245,248	30,974,144	7.25%
2014-15	137	4,188	3.27%	1,015,712	33,694,282	3.01%*
2015-16	5	3,669	0.14%	49,000	30,086,720	0.16%*
2016-17	0	3,890	0.00%	0	32,029,160	0.00%*

*** see 'Other data'**

Other data

Additional data is obtained via Fishery Independent Surveys every second year in the CTS.

Electronic monitoring (EM) is a system of video cameras and sensors capable of monitoring and recording fishing activities, which can be reviewed later to verify what fishers report in their fishing logbooks. EM systems are compulsory for fulltime vessels in the gillnet sector of the SESSF. EM is used to verify that:

- fishers accurately report the amount and type of fish they catch
- fishers report all interactions they may have with threatened, endangered, and protected species.

During the 2014-15 financial year, AFMA commenced the implementation of EM in the Gillnet sector of the SESSF. Gillnet boats that fish for more than 50 days in the previous or current fishing season are required to operate an EM system. EM systems must be working for operators to go fishing. Archipelago Asia Pacific (AAP) review a random selection of shots (fishers are unaware which shots will be reviewed). AAP send vessel feedback summary forms to AFMA and operators that compares the logbook data with the EM data. For boats that fish in South Australia, 100 per cent of EM footage is reviewed for interactions with protected species such as Australian sea lions.

Percentage of gillnet shots reviewed by EM (not including South Australia protected species review).

FISHING SEASON	NO. GILLNET SHOTS EM REVIEWED	TOTAL NO. GILLNET SHOTS	PERCENTAGE OF GILLNET SHOTS EM REVIEWED
2013-14	0	7,003	0%
2014-15	105	7,797	1.3%

	2015-16	559	6,772	8.3%
	2016-17	675	7,105	9.5%

Additional data is obtained via the Fishery Independent Surveys every second year in the SESSF.

The Southern and Eastern Scalefish and Shark Fishery Five Year Strategic Research Plan 2016-2020 (AFMA 2016) identifies the research priorities for the fishery over the next five years to assist with the pursuit of the management objectives for the SESSF and to enable the effective implementation and appraisal of management arrangements.

Legislative instruments and directions

Declaration of the Harvest Operations of the Southern and Eastern Scalefish and Shark Fishery as an approved wildlife trade operation, February 2016

www.environment.gov.au/biodiversity/wildlife-trade/trading/commercial/operations

Environment Protection and Biodiversity Conservation Act 1999 www.legislation.gov.au/Series/C2004A00485

FAO Code of Conduct for Responsible Fisheries

www.fao.org/docrep/005/v9878e/v9878e00.htm

Memorandum of Understanding between the Australian Fisheries Management Authority and the Department of the Environment and Energy for the reporting of fisheries interactions with protected species under the Environment Protection and Biodiversity Conservation Act 1999

www.afma.gov.au/wp-content/uploads/2010/06/mou.pdf

National Plan of Action for the Conservation and Management of Sharks 2012 Shark-plan 2. Licensed from the Commonwealth of Australia under a Creative Commons Attribution 3.0 Australia Licence. www.daff.gov.au/sharkplan2/

Oceans Policy 1998. Commonwealth of Australia 1998, ISBN 0 642 54592 8.

Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016

Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 6 2013

Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 11 2013

Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 2 2015

Southern and Eastern Scalefish and Shark Fishery Management Plan 2003

United Nations Convention Law of the Sea www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

United Nations Fish Stocks Agreement
www.un.org/Depts/los/convention_agreements/texts/fish_stocks_agreement/CONF164_37.htm

2.2.2 Unit of Analysis Lists (Step 2)

The units of analysis for the sub-fishery are listed by component:

- Species Components: key commercial and secondary commercial; byproduct/bycatch and protected species components. [Scoping document S2A Species]
- Habitat Component: habitat types. [Scoping document S2B1 and S2B2 Habitats]
- Community Component: community types. [Scoping document S2C1 and S2C2 Communities]

Ecological Units Assessed

Key commercial and secondary species:	1 (C1); 1 (C2)
Byproduct and bycatch species:	29 (BP); 141 (BC)
Protected species:	61
Habitats:	29 demersal, 4 pelagic
Communities:	30 (25 demersal, 5 pelagic)

Scoping Document S2A. Species

Each species identified during the scoping is added to the ERAEF database used to run the Level 2 analyses. A CAAB code (Code for Australian Aquatic Biota) is required to input the information. The CAAB codes for each species may be found at http://www.cmar.csiro.au/caab/

Key commercial/secondary commercial species

- *Key commercial species* – defined in the Harvest Strategy Policy (HSP) Guidelines as a species that is, or has been, specifically targeted and is, or has been, a significant component of a fishery.
- *Secondary commercial species* – commercial species that, while not specifically targeted, are commonly caught and generally retained, and comprise a significant component of a fishery's catch and economic return. These can include quota species in some fisheries.

Table 2.3. Key commercial (C1) and secondary commercial (C2) species list for the SESSF GHAT shark gillnet sub-fishery. AFMA: refers to AFMA Logbook, Observer and/or Electronic Monitoring data.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
C1	Chondrichthyan	Triakidae	37017001	*Mustelus antarcticus*	Gummy shark	AFMA
C2	Chondrichthyan	Triakidae	37017008	*Galeorhinus galeus*	School shark	AFMA

Byproduct species

List the byproduct species of the sub-fishery. Byproduct species refers to any species that are retained for sale but comprise a minor component of the fishery catch and economic return. Byproduct are considered to be commercial species under the CPFB 2000. This list is obtained by reviewing all available fishery literature, including logbooks, observer reports and discussions with stakeholders.

Table 2.4. Byproduct (BP) species list for the SESSF GHAT shark gillnet fishery. AFMA: refers to AFMA Logbook, Observer and/or Electronic Monitoring data.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BP	Chondrichthyan	Hexanchidae	37005001	*Heptranchias perlo*	Sharpnose sevengill shark	Apportion catch from 3705000 (sixgill and sevengill sharks unspecified). Total catch is ~ 5253 kg (apportioned from 3705000).
BP	Chondrichthyan	Hexanchidae	37005002	*Notorynchus cepedianus*	Broadnose shark	AFMA
BP	Chondrichthyan	Heterodontidae	37007001	*Heterodontus portusjacksoni*	Port Jackson shark	AFMA
BP	Chondrichthyan	Alopiidae	37012001	*Alopias vulpinus*	Thresher shark	Apportion catch from 37012901 - *Alopias* spp - Thresher sharks (mixed) to three species: 37012001; 37012002, 37012003. Species classification changed from BC to BP. 1.615 t p/a.
BP	Chondrichthyan	Alopiidae	37012002	*Alopias superciliosus*	Bigeye thresher	Apportion catch from 37012901 - *Alopias* spp - Thresher sharks (mixed) to three species: 37012001; 37012002, 37012003. Species classification changed from BC to BP. av. 1.615 t p/a.
BP	Chondrichthyan	Scyliorhinidae	37015001	*Cephaloscyllium laticeps*	Draughtboard shark	AFMA
BP	Chondrichthyan	Scyliorhinidae	37015013	*Cephaloscyllium albipinnum*	Whitefin swellshark	AFMA
BP	Chondrichthyan	Triakidae	37017003	*Furgaleus macki*	Whiskery shark	AFMA
BP	Chondrichthyan	Carcharhinidae	37018001	*Carcharhinus brachyurus*	Bronze whaler	AFMA
BP	Chondrichthyan	Sphyrnidae	37019004	*Sphyrna zygaena*	Smooth hammerhead	AFMA
BP	Chondrichthyan	Squalidae	37020006	*Squalus megalops*	Piked spurdog	Apportioned catch from 37020000 to 37020001; 37020006 and 37020008.
BP	Chondrichthyan	Pristiophoridae	37023001	*Pristiophorus nudipinnis*	Southern sawshark	AFMA
BP	Chondrichthyan	Pristiophoridae	37023002	*Pristiophorus cirratus*	Common sawshark	AFMA
BP	Chondrichthyan	Squatinidae	37024001	*Squatina australis*	Australian angelshark	Apportion catch of 37024000 Squatinidae-undifferentiated to this species (and 37024002). This species changed ERA classification from BC to BP

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BP	Chondrichthyan	Squatinidae	37024002	*Squatina tergocellata*	Ornate angelshark	Apportion catch of 37024000 Squatinidae-undifferentiated to this species (and 37024001). This species changed ERA classification from BC to BP
BP	Chondrichthyan	Myliobatidae	37039001	*Myliobatis australis*	Southern eagle ray	Apportion 37990018 catch across all 21 existing skates and rays within list. No change to ERA species classification
BP	Chondrichthyan	Callorhinchidae	37043001	*Callorhinchus milii*	Elephantfish	AFMA
BP	Teleost	Carangidae	37337006	*Seriola lalandi*	Yellowtail kingfish	AFMA
BP	Teleost	Sparidae	37353001	*Chrysophrys auratus*	Snapper	AFMA
BP	Teleost	Pentacerotidae	37367001	*Paristiopterus gallipavo*	Yellowspotted boarfish	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP ~ av. 1499kg p/a
BP	Teleost	Pentacerotidae	37367002	*Paristiopterus labiosus*	Giant boarfish	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP ~ av.1499kg p/a
BP	Teleost	Pentacerotidae	37367003	*Pentaceropsis recurvirostris*	Longsnout boarfish	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP ~ av. 1499kg p/a
BP	Teleost	Pentacerotidae	37367004	*Pentaceros decacanthus*	Bigspine boarfish	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP ~ av. 1499kg p/a
BP	Teleost	Pentacerotidae	37367005	*Zanclistius elevatus*	Blackspot boarfish	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP ~ av. 1499kg p/a
BP	Teleost	Pentacerotidae	37367009	*Pseudopentaceros richardsoni*	Pelagic armourhead	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP, since >1 t p/a on average. ~ 1499kg p/a
BP	Teleost	Pentacerotidae	37367010	*Parazanclistius hutchinsi*	Short boarfish	Apportion recorded Boarfishes - Pentacerotidae (37367000) catch (54,442 kg; Log 2012-2016) to 7 boarfish species in list. This species changed from BC to BP, since >1 t p/a on average. ~ 1499kg p/a
BP	Teleost	Cheilodactylidae	37377004	*Nemadactylus valenciennesi*	Blue morwong	AFMA
BP	Teleost	Latridae	37378001	*Latris lineata*	Striped trumpeter	AFMA
BP	Teleost	Centrolophidae	37445005	*Seriolella brama*	Blue warehou	AFMA

Bycatch (discard) species

Bycatch species are species that are not retained (i.e. are discarded, and includes catch that does not reach the deck of the vessel but which nonetheless is killed (or effected) as a result of the interaction with the fishing gear) and as such make no contribution to the value of the fishery. The term bycatch does *not* include discards of commercial species. Bycatch species are divided, for management purposes, into:

- *General bycatch species* (i.e. species of fish, sharks, invertebrates, etc. that are never retained for sale).

Table 2.5. Bycatch (BC) species list for the SESSF GHAT shark gillnet fishery. AFMA: refers to AFMA Logbook, Observer and/or Electronic Monitoring data.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Chondrichthyan	Orectolobidae	37013003	*Orectolobus maculatus*	Spotted wobbegong	AFMA
BC	Chondrichthyan	Scyliorhinidae	37015009	*Figaro boardmani*	Australian sawtail catshark	AFMA
BC	Chondrichthyan	Scyliorhinidae	37015024	*Asymbolus rubiginosus*	Orange spotted catshark	AFMA
BC	Chondrichthyan	Triakidae	37017006	*Hypogaleus hyugaensis*	Pencil shark	AFMA
BC	Chondrichthyan	Carcharhinidae	37018003	*Carcharhinus obscurus*	Dusky whaler	AFMA
BC	Chondrichthyan	Carcharhinidae	37018004	*Prionace glauca*	Blue shark	AFMA
BC	Chondrichthyan	Centrophoridae	37020001	*Centrophorus moluccensis*	Endeavour dogfish	Apportioned catch from 37020000 to 37020001; 37020006 and 37020008.
BC	Chondrichthyan	Squalidae	37020008	*Squalus acanthias*	Whitespotted spurdog	Apportioned catch from 37020000 to 37020001; 37020006 and 37020008.
BC	Chondrichthyan	Somniosidae	37020025	*Centroscymnus coelolepis*	Portuguese dogfish	3702906: 25 ret. (Log; 2012-2016). *C. coelolepis* (37020025) used instead.
BC	Chondrichthyan	Squalidae	37020048	*Squalus chloroculus*	Greeneye spurdog	AFMA
BC	Chondrichthyan	Echinorhinidae	37022001	*Echinorhinus brucus*	Bramble shark	AFMA
BC	Chondrichthyan	Trygonorrhinidae	37027001	*Aptychotrema vincentiana*	Western shovelnose ray	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Trygonorrhinidae	37027011	*Trygonorrhina dumerilii*	Southern fiddler ray	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Hypnidae	37028001	*Hypnos monopterygius*	Coffin ray	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Narcinidae	37028002	*Narcine tasmaniensis*	Tasmanian numbfish	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Chondrichthyan	Rajidae	37031003	*Dentiraja cerva*	White-spotted skate	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Rajidae	37031005	*Dentiraja confusa*	Longnose skate	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Rajidae	37031006	*Spiniraja whitleyi*	Melbourne skate	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Rajidae	37031007	*Dentiraja lemprieri*	Thornback skate	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Rajidae	37031028	*Dipturus canutus*	Grey skate	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Dasyatidae	37035001	*Bathytoshia brevicaudata* *was Dasyatis brevicaudata*	Short-tail stingray	Apportion catch of 37035001 to this species. No change in species ERA classification. Also, apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038001	*Urolophus bucculentus*	Sandyback stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038002	*Urolophus cruciatus*	Crossback stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038004	*Urolophus paucimaculatus*	Sparsely-spotted stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038005	*Urolophus sufflavus*	Yellowback stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038006	*Trygonoptera testacea*	Common stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038007	*Urolophus viridis*	Greenback stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Urolophidae	37038015	*Trygonoptera mucosa*	Western shovelnose stingaree	Apportion 37990018 catch across all 18 existing skates and rays within list. No change to ERA species classification.
BC	Chondrichthyan	Chimaeridae	37042001	*Chimaera ogilbyi* *Was: Hydrolagus ogilbyi*	Ogilby's ghostshark	While this species was caught prior to 2012 ((13 kg ret; Log) and (108 ret., 7 kg dis.; Obs)), it remained in list due to recorded Chimaeridae-undifferentiated 37042001 within assessment period and no other ghostshark was recorded within the same assessment period.
BC	Invertebrate	Ostreidae	23257002	*Ostrea angasi*	Native oyster	AFMA
BC	Invertebrate	Pectinidae	23270006	*Mimachlamys asperrima*	Doughboy scallop	AFMA
BC	Invertebrate	Pectinidae	23270007	*Pecten fumatus*	Commercial scallop	AFMA
BC	Invertebrate	Sepiidae	23607001	*Sepia apama*	Giant cuttlefish	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Invertebrate	Ommastrephidae	23636004	*Nototodarus gouldi*	Gould's squid	AFMA
BC	Invertebrate	Volutidae	24207001	*Livonia mammilla*	False bailer shell	AFMA
BC	Invertebrate	Volutidae	24207072	*Melo miltonis*	southern bailer shell	AFMA
BC	Invertebrate	Asteriidae	25154011	*Coscinasterias muricata*	eleven-arm seastar	AFMA
BC	Invertebrate	Penaeidae	28711026	*Metapenaeus endeavouri*	Blue Endeavour prawn	AFMA
BC	Invertebrate	Palinuridae	28820001	*Jasus edwardsii*	Southern rocklobster	Apportioned 28820000 to this species. No other Palinuridae species within fishery range.
BC	Invertebrate	Scyllaridae	28821003	*Ibacus novemdentatus*	Balmain bug	AFMA
BC	Invertebrate	Scyllaridae	28821004	*Ibacus peronii*	Eastern Balmain bug	AFMA
BC	Invertebrate	Majidae	28880009	*Notomithrax minor*	Decorator crab - N minor	AFMA
BC	Invertebrate	Majidae	28880010	*Leptomithrax gaimardii*	Great spider crab	Expanded from Brachyura - undifferentiated (28850000), based on information from Observers. 23 t dis. (Obs; 2012-2016). Unlikely to be a BP based on rules.
BC	Invertebrate	Polybiidae	28911003	*Ovalipes australiensis*	Common sand crab	28911003 - Ovalipes spp - sand crab - EM data suggests that 1 animal was retained. No other sand crab in species list. 28911003 was chosen to represent this species.
BC	Invertebrate	Menippidae	28915002	*Pseudocarcinus gigas*	Giant crab	AFMA
BC	Teleost	Aulopidae	37117001	*Latropiscis purpurissatus*	Sergeant baker	AFMA
BC	Teleost	Paraulopidae	37120001	*Paraulopus nigripinnis*	Blacktip cucumberfish	AFMA
BC	Teleost	Moridae	37224003	*Pseudophycis barbata*	Bearded rock cod	AFMA
BC	Teleost	Moridae	37224006	*Pseudophycis bachus*	Red cod	AFMA
BC	Teleost	Ophidiidae	37228002	*Genypterus blacodes*	Pink ling	AFMA
BC	Teleost	Ophidiidae	37228008	*Genypterus tigerinus*	Rock ling	AFMA
BC	Teleost	Trachichthyidae	37255003	*Paratrachichthys macleayi*	Sandpaper fish	AFMA
BC	Teleost	Berycidae	37258001	*Beryx decadactylus*	Imperador	AFMA
BC	Teleost	Berycidae	37258002	*Beryx splendens*	Alfonsino	AFMA
BC	Teleost	Berycidae	37258003	*Centroberyx affinis*	Redfish	AFMA
BC	Teleost	Berycidae	37258004	*Centroberyx gerrardi*	Bight redfish	AFMA
BC	Teleost	Berycidae	37258005	*Centroberyx lineatus*	Swallowtail	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Berycidae	37258006	*Centroberyx australis*	Yelloweye redfish	AFMA
BC	Teleost	Cyttidae	37264002	*Cyttus australis*	Silver dory	AFMA
BC	Teleost	Zeidae	37264003	*Zenopsis nebulosus*	Mirror dory	AFMA
BC	Teleost	Zeidae	37264004	*Zeus faber*	John dory	AFMA
BC	Teleost	Lampridae	37268001	*Lampris guttatus*	Opah	Expanded to this species based on recorded (37268900; *L. guttas* and *L. immaculatus*) since neither species in existing species list
BC	Teleost	Lampridae	37268002	*Lampris immaculatus*	Southern moonfish	Expanded to this species based on recorded (37268900; *L. guttas* and *L. immaculatus*) since neither species in existing species list
BC	Teleost	Sebastidae	37287001	*Helicolenus percoides*	Reef ocean perch	AFMA
BC	Teleost	Neosebastidae	37287003	*Neosebastes pandus*	Bighead gurnard perch	AFMA
BC	Teleost	Neosebastidae	37287004	*Neosebastes bougainvillii*	Gulf gurnard perch	AFMA
BC	Teleost	Neosebastidae	37287005	*Neosebastes scorpaenoides*	Common gurnard perch	AFMA
BC	Teleost	Neosebastidae	37287006	*Neosebastes thetidis*	Thetis fish	AFMA
BC	Teleost	Scorpaenidae	37287008	*Scorpaena papillosa*	Southern red scorpionfish	AFMA
BC	Teleost	Sebastidae	37287103	*Trachyscorpia carnomagula*	Ocean perch (*T. carnomagula*)	AFMA
BC	Teleost	Triglidae	37288001	*Chelidonichthys kumu*	Red gurnard	AFMA
BC	Teleost	Triglidae	37288003	*Lepidotrigla vanessa*	Butterfly gurnard	AFMA
BC	Teleost	Triglidae	37288006	*Pterygotrigla polyommata*	Latchet	AFMA
BC	Teleost	Triglidae	37288007	*Lepidotrigla modesta*	Cocky gurnard	AFMA
BC	Teleost	Platycephalidae	37296001	*Platycephalus richardsoni*	Tiger flathead	AFMA
BC	Teleost	Platycephalidae	37296002	*Platycephalus conatus*	Deepwater flathead	AFMA
BC	Teleost	Platycephalidae	37296003	*Platycephalus bassensis*	Southern sand flathead	AFMA
BC	Teleost	Platycephalidae	37296006	*Platycephalus laevigatus*	Rock flathead	AFMA
BC	Teleost	Platycephalidae	37296035	*Platycephalus aurimaculatus*	Toothy flathead	AFMA
BC	Teleost	Platycephalidae	37296036	*Platycephalus grandispinis*	Longspine flathead	AFMA
BC	Teleost	Percichthyidae	37311034	*Macquaria novemaculeata*	Australian bass	No species to apportion recorded logbook catch to from 37311000 (Percichthyidae, Serranidae - undifferentiated). Therefore two representative species chosen, 37311034 (Australian Bass) and 37311091 (Blackbanded seaperch).

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Sillaginidae	37330014	*Sillago flindersi*	Eastern school whiting	37330000 accounted for
BC	Teleost	Pomatomidae	37334002	*Pomatomus saltatrix*	Tailor	AFMA
BC	Teleost	Carangidae	37337002	*Trachurus declivis*	Common jack mackerel	AFMA
BC	Teleost	Carangidae	37337007	*Seriola hippos*	Samson fish	AFMA
BC	Teleost	Carangidae	37337025	*Seriola dumerili*	Amberjack	AFMA
BC	Teleost	Carangidae	37337062	*Pseudocaranx georgianus*	Silver trevally	AFMA
BC	Teleost	Arripidae	37344002	*Arripis trutta*	Australian salmon	37344900 - Apportioned 3107 kg to *A. truuta* and *A. truutaceus*. No change to existing ERA classification of this species
BC	Teleost	Arripidae	37344004	*Arripis truttaceus*	Western Australian salmon	37344900 - Apportioned 3107 kg to *A. truuta* and *A. truutaceus*. No change to existing ERA classification of this species
BC	Teleost	Emmelichthyidae	37345001	*Emmelichthys nitidus*	Redbait	No Emmelichthys species in existing list. 37345001 added to account for Observer recorded entry: 37345901
BC	Teleost	Emmelichthyidae	37345002	*Plagiogeneion macrolepis*	Bigscale rubyfish	No logbook or Observer data within assessment period. However, EM data suggests that 1 animal was discarded of 37345900. There are no other Plagiogenion species within list. Therefore apportioned to 37345003 (*Plagiogeneion rubiginosum*) and 37345002 (*P. macrolepis*).
BC	Teleost	Emmelichthyidae	37345003	*Plagiogeneion rubiginosum*	Cosmopolitan rubyfish	No logbook or Observer data within assessment period. However, EM data suggests that 1 animal was discarded of 37345900. There are no other Plagiogenion species within list. Therefore apportioned to 37345003 (*Plagiogeneion rubiginosum*) and 37345002 (*P. macrolepis*).
BC	Teleost	Sciaenidae	37354001	*Argyrosomus japonicus*	Mulloway	AFMA
BC	Teleost	Mullidae	37355001	*Upeneichthys lineatus*	Bluestriped goatfish	Goatfishes (37355000): 24 kg (LOG; prior to 2012). However, apportioned Goatfishes (37355000) to this species, as I animal was retained (EM data).
BC	Teleost	Kyphosidae	37361001	*Kyphosus sydneyanus*	Silver drummer	AFMA
BC	Teleost	Scorpididae	37361003	*Tilodon sexfasciatus*	Moonlighter	AFMA
BC	Teleost	Scorpididae	37361004	*Scorpis aequipinnis*	Sea sweep	AFMA
BC	Teleost	Kyphosidae	37361007	*Girella tricuspidata*	Luderick	AFMA
BC	Teleost	Kyphosidae	37361008	*Girella zebra*	Zebrafish	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Scorpididae	37361009	*Scorpis lineolata*	Silver sweep	AFMA
BC	Teleost	Scorpididae	37361015	*Scorpis georgiana*	Banded sweep	AFMA
BC	Teleost	Oplegnathidae	37369002	*Oplegnathus woodwardi*	Knifejaw	AFMA
BC	Teleost	Cheilodactylidae	37377001	*Cheilodactylus nigripes*	Magpie perch	AFMA
BC	Teleost	Cheilodactylidae	37377002	*Nemadactylus douglasii*	Grey morwong	AFMA
BC	Teleost	Cheilodactylidae	37377003	*Nemadactylus macropterus*	Jackass morwong	AFMA
BC	Teleost	Cheilodactylidae	37377005	*Dactylophora nigricans*	Dusky morwong	AFMA
BC	Teleost	Cheilodactylidae	37377006	*Cheilodactylus spectabilis*	Banded morwong	AFMA
BC	Teleost	Cheilodactylidae	37377009	*Cheilodactylus fuscus*	Red morwong	AFMA
BC	Teleost	Cheilodactylidae	37377014	*Nemadactylus sp. [see Smith et al, 1996]*	King morwong	AFMA
BC	Teleost	Latridae	37378002	*Latridopsis forsteri*	Bastard trumpeter	AFMA
BC	Teleost	Labridae	37384001	*Bodianus vulpinus*	Western blackspot pigfish	AFMA
BC	Teleost	Labridae	37384002	*Achoerodus gouldii*	Western blue groper	AFMA
BC	Teleost	Labridae	37384003	*Notolabrus tetricus*	Bluethroat wrasse	AFMA
BC	Teleost	Labridae	37384020	*Pictilabrus laticlavius*	Senator wrasse	AFMA
BC	Teleost	Labridae	37384043	*Achoerodus viridis*	Eastern blue groper	AFMA
BC	Teleost	Labridae	37384057	*Bodianus frenchii*	Foxfish	AFMA
BC	Teleost	Uranoscopidae	37400003	*Kathetostoma laeve*	Common stargazer	AFMA
BC	Teleost	Uranoscopidae	37400018	*Kathetostoma canaster*	Speckled stargazer	AFMA
BC	Teleost	Gempylidae	37439001	*Thyrsites atun*	Barracouta	AFMA
BC	Teleost	Gempylidae	37439008	*Lepidocybium flavobrunneum*	Escolar	AFMA
BC	Teleost	Scombridae	37441001	*Scomber australasicus*	Blue mackerel	AFMA
BC	Teleost	Scombridae	37441002	*Thunnus albacares*	Yellowfin tuna	AFMA
BC	Teleost	Scombridae	37441003	*Katsuwonus pelamis*	Skipjack tuna	AFMA
BC	Teleost	Scombridae	37441004	*Thunnus maccoyii*	Southern Bluefin tuna	AFMA
BC	Teleost	Scombridae	37441005	*Thunnus alalunga*	Albacore	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Scombridae	37441019	*Gasterochisma melampus*	Butterfly mackerel	AFMA
BC	Teleost	Scombridae	37441020	*Sarda australis*	Australian bonito	AFMA
BC	Teleost	Xiphiidae	37442001	*Xiphias gladius*	Swordfish	AFMA
BC	Teleost	Centrolophidae	37445001	*Hyperoglyphe antarctica*	Blue-eye trevalla	AFMA
BC	Teleost	Centrolophidae	37445006	*Seriolella punctata*	Silver warehou	AFMA
BC	Teleost	Centrolophidae	37445011	*Seriolella caerulea*	White warehou	AFMA
BC	Teleost	Monacanthidae	37465003	*Eubalichthys mosaicus*	Mosaic leatherjacket	AFMA
BC	Teleost	Monacanthidae	37465005	*Meuschenia scaber*	Velvet leatherjacket	AFMA
BC	Teleost	Monacanthidae	37465006	*Nelusetta ayraud*	Ocean jacket	AFMA
BC	Teleost	Monacanthidae	37465007	*Scobinichthys granulatus*	Rough leatherjackets	AFMA
BC	Teleost	Ostraciidae	37466003	*Aracana aurita*	Shaw's cowfish	AFMA
BC	Teleost	Diodontidae	37469001	*Diodon nicthemerus*	Globefish	AFMA
BC	Teleost	Diodontidae	37469002	*Allomycterus pilatus*	Deepwater burrfish	AFMA
BC	Teleost	Serranidae	37311005	*Othos dentex*	Harlequin fish	AFMA
BC	Teleost	Polyprionidae	37311006	*Polyprion oxygeneios*	Hapuku	AFMA
BC	Teleost	Serranidae	37311091	*Hypoplectrodes annulatus*	Blackbanded seaperch	No species to apportion recorded logbook catch to from 37311000 (Percichthyidae, Serranidae - undifferentiated). Therefore two representative species chosen: 37311034 (Australian Bass) and 37311091 (Blackbanded seaperch)

Protected species

A protected species[2] refers to all species listed/covered under the EPBC Act 1999, which include Protected[3] species (listed threatened species i.e. vulnerable, endangered or critically endangered), cetaceans, listed migratory species and listed marine species.

Protected species that occur in the area of the sub-fishery. Protected species are often poorly listed by fisheries due to low frequency of direct interaction. Both direct (capture) and indirect (e.g. food source captured) interaction are considered in the ERAEF approach. A list of protected species has been generated for this sub-fishery and included in the PSA and SAFE (chondrichthyans) species list. This list was initially provided by AFMA which was further validated and reviewed using information on EPBC Act List of Threatened Fauna website; http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl and available literature on protected species occurrence and distribution such as Expert Panel on a Declared Commercial Fishing Activity (2014); marine birds: Menkhorst et al. (2017), Reid et al. (2002); marine mammals: Woinarski et al.(2014), Jefferson et al. (2015); teleosts: Atlas of Living Australia Fishmap http://fish.ala.org.au/, CAAB http://www.marine.csiro.au/caab/index.html , Fishes of Australia http://fishesofaustralia.net.au/). Species from higher order family categories that were considered to have potential to interact with fishery (based on geographic range and proven/perceived susceptibility to the fishing gear/methods and examples from other similar fisheries across the globe) were also included.

Table 2.6. Protected species (PS) list for the SESSF GHAT shark gillnet fishery. AFMA: refers to AFMA Logbook, Observer and/or Electronic Monitoring data.

ROLE IN FISHERY	TAXA	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE(S)
PS	Chondrichthyan	Odontaspididae	37008001	*Carcharias taurus*	Grey nurse shark	AFMA
PS	Chondrichthyan	Lamnidae	37010001	*Isurus oxyrinchus*	Shortfin mako	AFMA
PS	Chondrichthyan	Lamnidae	37010003	*Carcharodon carcharias*	White shark	AFMA
PS	Chondrichthyan	Lamnidae	37010004	*Lamna nasus*	Porbeagle	AFMA
PS	Marine bird	Spheniscidae	40001008	*Eudyptula minor*	Little penguin	AFMA

[2] The term “protected” species refers to species listed under [Part 13] the EPBC Act 1999 and replaces the term “Threatened, endangered and protected species (PS)” commonly used in past Commonwealth Government (including AFMA) documents.

[3] Note “protected” (with small “p”) refers to all species covered by the EPBC Act 1999 while “Protected” (capital P) refers only to those protected species that are threatened (vulnerable, endangered or critically endangered).

ROLE IN FISHERY	TAXA	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE(S)
PS	Marine bird	Diomedeidae	40040001	*Thalassarche bulleri*	Buller's albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040002	*Thalassarche cauta*	Shy albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040004	*Thalassarche chrysostoma*	Grey-headed albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040005	*Diomedea epomophora*	Southern Royal albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040006	*Diomedea exulans*	Wandering albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040007	*Thalassarche melanophrys*	Black-browed albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040008	*Phoebetria fusca*	Sooty albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040009	*Phoebetria palpebrata*	Light-mantled albatross; Light-mantled Sooty albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040010	*Diomedea gibsoni*	Gibson's albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040011	*Diomedea antipodensis*	Antipodean albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040012	*Diomedea sanfordi*	Northern Royal albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040013	*Thalassarche impavida*	Campbell albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Diomedeidae	40040014	*Thalassarche carteri*	Indian yellow-nosed albatross	Expanded from 40040000 - Diomedeidae - unfifferentiated
PS	Marine bird	Procellariidae	40041003	*Daption capense*	Cape petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041004	*Fulmarus glacialoides*	Southern fulmar	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041005	*Halobaena caerulea*	Blue petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041007	*Macronectes giganteus*	Southern giant-petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041008	*Macronectes halli*	Northern giant-petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041009	*Pachyptila belcheri*	slender-billed prion	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041011	*Pachyptila desolata*	Antarctic prion	Expanded from 40041000 - Procellariidae - undifferentiated

ROLE IN FISHERY	TAXA	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE(S)
PS	Marine bird	Procellariidae	40041012	*Pachyptila salvini*	Salvin's prion	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041013	*Pachyptila turtur*	Fairy prion	AFMA
PS	Marine bird	Procellariidae	40041017	*Pelecanoides urinatrix*	Common diving-petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041018	*Procellaria aequinoctialis*	White chinned petrel	AFMA
PS	Marine bird	Procellariidae	40041019	*Procellaria cinerea*	Grey petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041028	*Pterodroma inexpectata*	Mottled petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041029	*Pterodroma lessonii*	White-headed petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041030	*Pterodroma leucoptera*	Gould's petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041031	*Pterodroma macroptera*	Great-winged Petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041032	*Pterodroma mollis*	Soft-plumaged petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041035	*Pterodroma solandri*	Providence petrel	Expanded from 40041000 - Procellariidae - undifferentiated
PS	Marine bird	Procellariidae	40041038	*Puffinus carneipes*	Flesh-footed shearwater	Expanded from 40041000: Procellariidae - undifferentiated; 40041050: Puffinus spp - undifferentiated; 40041999: Puffinus spp.
PS	Marine bird	Procellariidae	40041040	*Puffinus gavia*	Fluttering shearwater	Expanded from 40041000: Procellariidae - undifferentiated; 40041050: Puffinus spp - undifferentiated; 40041999: Puffinus spp.
PS	Marine bird	Procellariidae	40041042	*Puffinus griseus*	Sooty shearwater	Expanded from 40041000: Procellariidae - undifferentiated; 40041050: Puffinus spp - undifferentiated; 40041999: Puffinus spp.
PS	Marine bird	Procellariidae	40041043	*Puffinus huttoni*	Hutton’s shearwater	AFMA
PS	Marine bird	Procellariidae	40041047	*Puffinus tenuirostris*	Short Tailed shearwater	AFMA
PS	Marine bird	Hydrobatidae	40042004	*Oceanites oceanicus*	Wilsons storm petrel	AFMA
PS	Marine bird	Hydrobatidae	40042007	*Pelagodroma marina*	White faced storm petrel	AFMA
PS	Marine bird	Hydrobatidae	40047002	*Morus serrator*	Australian gannet	AFMA

ROLE IN FISHERY	TAXA	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE(S)
PS	Marine bird	Phalacrocoracidae	40048002	*Phalacrocorax carbo*	Great cormorant	Expanded from 40048000 - Phalacrocoracidae - undifferentiated
PS	Marine bird	Phalacrocoracidae	40048003	*Phalacrocorax fuscescens*	black-faced cormorant	AFMA
PS	Marine bird	Laridae	40128014	*Larus pacificus*	Pacific Gull	AFMA
PS	Marine mammal	Delphinidae	41116001	*Delphinus delphis*	Common dolphin	AFMA
PS	Marine mammal	Delphinidae	41116002	*Feresa attenuata*	Pygmy killer whale	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Delphinidae	41116004	*Globicephala melas*	Long-finned pilot whale	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Delphinidae	41116005	*Grampus griseus*	Risso's dolphin	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Delphinidae	41116009	*Lissodelphis peronii*	Southern right whale Dolphin	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Delphinidae	41116011	*Orcinus orca*	Killer whale	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Delphinidae	41116013	*Pseudorca crassidens*	False Killer whale	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Delphinidae	41116019	*Tursiops truncatus*	Common bottlenose dolphin	AFMA
PS	Marine mammal	Delphinidae	41116020	*Tursiops aduncus*	Indian Ocean bottlenose dolphin	Expanded from 41116000 - Delphinidae - undifferentiated
PS	Marine mammal	Otariidae	41131001	*Arctocephalus forsteri*	New Zealand fur seal	AFMA
PS	Marine mammal	Otariidae	41131003	*Arctocephalus pusillus doriferus*	Australian fur seal	AFMA
PS	Marine mammal	Otariidae	41131004	*Arctocephalus tropicalis*	Subantarctic fur seal	Expanded from 41132999 - Seals.
PS	Marine mammal	Otariidae	41131005	*Neophoca cinerea*	Australian sea lion	AFMA
PS	Teleost	Syngnathidae	37282029	*Solegnathus spinosissimus*	Spiny pipehorse	AFMA

Scoping Document S2B1. Benthic Habitats

Since the previous assessments over a decade ago, there has been considerable research and habitat identification and modelling of demersal habitats around Australia and specifically in the SESSF region (Hobday et al. 2011a; Pitcher et al. 2015, 2016; Williams et al. 2009, 2010a, b, c, 2011). This has culminated in Pitcher et al. 2016 in an FRDC –funded project, redefined much of the Australian seafloor based on meso-scale surrogates collated from data from biological surveys, environmental data, protected area/fishery closure data. The temporal range of the fishery effort data of Pitcher et al. 2016 was from 1985 -~2012 is immediately prior to this current assessment period and was considered very relevant. The new data and methodology are not directly mappable to the original analyses, but these assessments are more comprehensive than the previous one, and will therefore be used in preference to the original scoping of habitats.

Although the new assessment was conducted for the trawl fisheries, the identification of vulnerable habitats within assemblages is also relevant when assessing other fishing methods in the region. By overlaying the fishery footprint over the assemblage distribution maps, we identified those containing vulnerable habitats that may be at particular risk. For the gillnet fishery we used both the SET otter trawl region (Figure 2.1) and the GAB region (Figure 2.2) as the fishery extends across both regions. However, most of the inner shelf in the GAB where gillnetting occurs is not characterised by Pitcher et al. 2016.

The most vulnerable types of habitats were identified in Williams et al. 2011 and Pitcher et al. 2016 and their locations were identified by A. Williams (CSIRO) (pers. comm. 19 Feb 2018) as follows:

- Sub-cropping friable sandstone supporting sponge gardens (in SET assemblage 20)
- Relict stalked crinoid on shelf breaks (in SET assemblage 2)
- Bryozoans on shelf edge (in SET assemblages 4, 14, 9)
- Tree-forming octocorals and black corals in steep upper-slope banks (in SET assemblage 2, 8).
- Habitat –forming benthos (in GAB assemblage 8)

The lack of evidence to prove direct impact from gillnetting impedes further analysis. Furthermore, using the more recent assessments by Pitcher et al. 2016 ideally need to be incorporated into the ERAEF protocol. Consequently, the SICA is preliminary and further assessment at Level 2 is not currently possible.

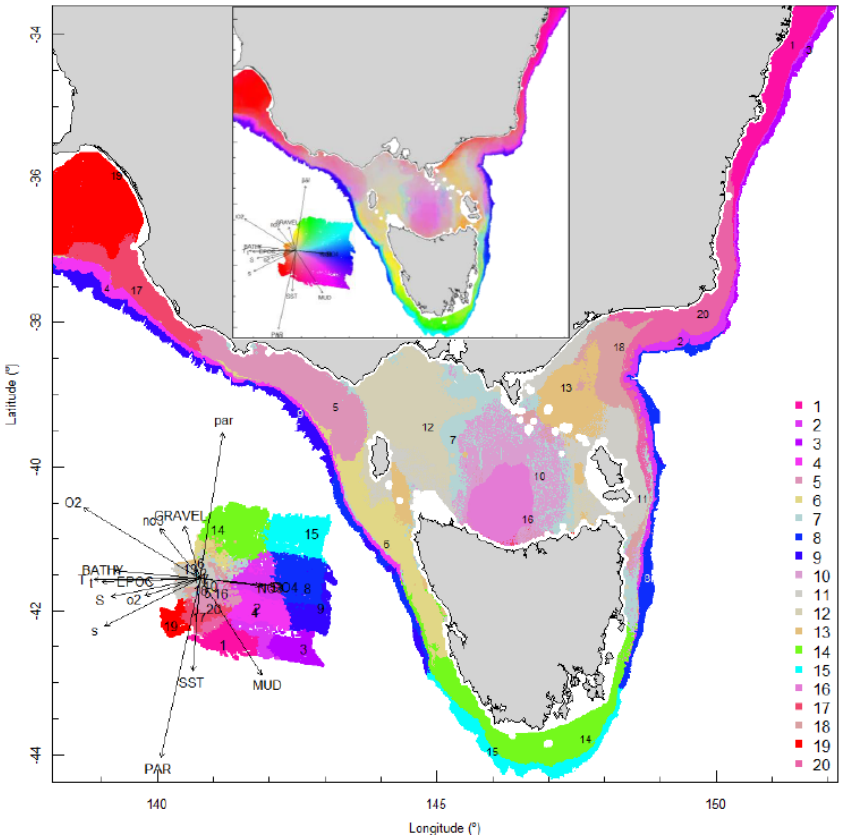


Figure 2.1. Map of the SESSF otter trawl region showing the 20 assemblages derived by Pitcher et al. 2016 (Excerpt from Pitcher et al. 2016). Each of the assemblages are now used as proxies for habitat in the assessment.

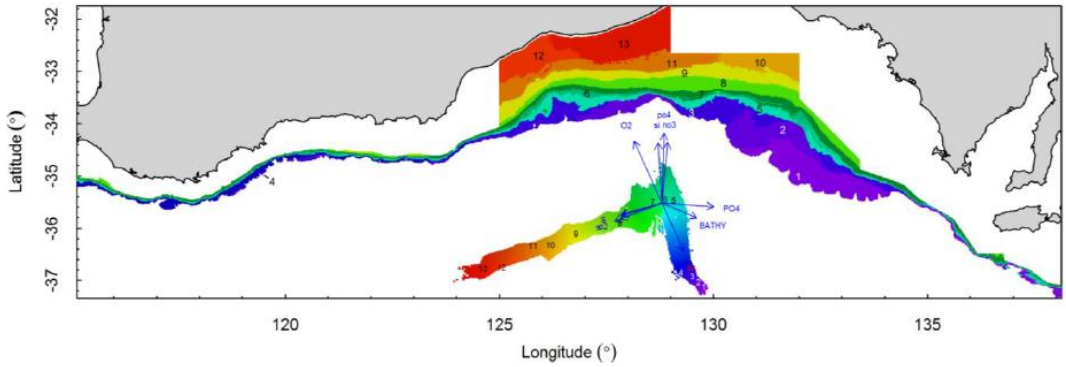


Figure 2.2. Map of the SESSF GAB region showing 13 assemblages derived by Pitcher et al. 2016 (Excerpt from Pitcher et al. 2016).

The previous ERAEF assessment of the gillnet fishery (Daley at al. 2006) found that the outer shelf habitats were most at risk. High risk habitats on the outer shelf were hard bottom types covered with erect or delicate epifauna and soft bottom habitats covered with large, erect, or delicate epifauna (Williams et al. 2011). Epifauna were sponges, crinoids, octocorals, sedimentary animals or mixed fauna (Williams et al. 2011). Since then, fishing occurs largely on

the inner shelf, <100 m where none of the high-risk habitats are found. The effort data for the gillnet fishery indicated that the greatest concentration of gillnetting was on the eastern Bass Strait continental shelf in depths less than 100 m particularly north of Flinders Island and on the south east shelf off Gippsland correlating to primarily SET assemblages 18, 11 and 13 (Table 2.7). The data indicated that some fishing occurred in SET assemblage 20 and 14 which did contain vulnerable habitats. While fishing occurred in the GAB region but at lesser concentrations than in the east, Pitcher et al. (2016) did not characterise any habitat assemblages within the fished areas.

Table 2.7. Benthic habitats that occur within the jurisdictional boundary of the SESSF GHAT gillnet sub-fishery. The details of these assemblages were not available at the time of assessment. While records suggest gillnetting ops occurred across the majority of these assemblages it was not possible to determine exactly the overlap with these assemblages.

BIOME	ASSEMBLAGE	HABITAT TYPE
SET	1	
	2	Relict stalked crinoid on shelf breaks, Tree-forming octocorals and black corals in steep upper-slope banks
	3	
	4	Bryozoans on shelf edge
	5	
	6	
	7	
	8	Tree-forming octocorals and black corals in steep upper-slope banks
	9	Bryozoans on shelf edge
	10	
	11	
	12	
	13	
	14	Bryozoans on shelf edge
	15	
	16	
	17	
	18	
	19	
	20	Sub-cropping friable sandstone supporting sponge gardens
GAB	1	
	2	
	3	
	5	
	6	
	7	

BIOME	ASSEMBLAGE	HABITAT TYPE
	8	Habitat–forming benthos
	9	
	10	

Scoping Document S2B2. Pelagic Habitats

Table 2.8. Pelagic habitats for the SESSF GHAT gillnet sub-fishery. Shading denotes habitats occurring within the jurisdictional boundary of the fishery. Bolded text refers to pelagic habitats where fishing effort has occurred.

ERAEF PELAGIC HABITAT NO.	PELAGIC HABITAT TYPE	DEPTH (M)	COMMENTS	SOURCE
P1	Eastern Pelagic Province - Coastal	0 – 200		ERA pelagic habitat database based on pelagic communities definitions
P2	Eastern Pelagic Province - Oceanic	0 – > 600	this is a compilation of the range covered by Oceanic Community (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P3	Heard/ McDonald Islands Pelagic Provinces - Oceanic	0 - >1000	this is a compilation of the range covered by Oceanic Community (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P4	North Eastern Pelagic Province - Oceanic	0 – > 600	this is a compilation of the range covered by Oceanic Community (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P5	Northern Pelagic Province - Coastal	0 – 200		ERA pelagic habitat database based on pelagic communities definitions
P6	North Western Pelagic Province - Oceanic	0 – > 800	this is a compilation of the range covered by Oceanic Community (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P7	Southern Pelagic Province - Coastal	0 – 200	this is a compilation of the range covered by Coastal pelagic Tas and GAB	ERA pelagic habitat database based on pelagic communities definitions
P8	Southern Pelagic Province - Oceanic	0 – > 600	this is a compilation of the range covered by Oceanic Communities (1, 2 and 3)	ERA pelagic habitat database based on pelagic communities definitions
P9	Southern Pelagic Province - Seamount Oceanic	0 – > 600	this is a compilation of the range covered by Seamount Oceanic Communities (1), (2), and (3)	ERA pelagic habitat database based on pelagic communities definitions
P10	Western Pelagic Province - Coastal	0 – 200		ERA pelagic habitat database based on pelagic communities definitions

ERAEF PELAGIC HABITAT NO.	PELAGIC HABITAT TYPE	DEPTH (M)	COMMENTS	SOURCE
P11	Western Pelagic Province - Oceanic	0 – > 400	this is a compilation of the range covered by Oceanic Community (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P12	Eastern Pelagic Province - Seamount Oceanic	0 – > 600	this is a compilation of the range covered by Seamount Oceanic Communities (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P13	Heard/ McDonald Islands Pelagic Provinces - Plateau	0 -1000	this is a the same as community Heard Plateau 0-1000m	ERA pelagic habitat database based on pelagic communities definitions
P14	North Eastern Pelagic Province - Coastal	0 – 200		ERA pelagic habitat database based on pelagic communities definitions
P15	North Eastern Pelagic Province - Plateau	0 – > 600	this is a compilation of the range covered by the Northeastern Seamount Oceanic (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions
P16	North Eastern Pelagic Province - Seamount Oceanic	0 – > 600		ERA pelagic habitat database based on pelagic communities definitions
P17	Macquarie Island Pelagic Province - Oceanic	0 – 250		ERA pelagic habitat database based on pelagic communities definitions
P18	Macquarie Island Pelagic Province - Coastal	0 - > 1500	this is a compilation of the range covered by Oceanic Community (1) and (2)	ERA pelagic habitat database based on pelagic communities definitions

Scoping Document S2C1. Demersal Communities

In ERAEF, communities are defined as the set of species assemblages that occupy the large-scale provinces and biomes identified from national bioregionalisation studies. The biota includes mobile fauna, both vertebrate and invertebrate, but excludes sessile organisms such as corals that are largely structural and are used to identify benthic habitats. The same community lists are used for all fisheries, with those selected as relevant for a particular fishery being identified based on spatial overlap with effort in the fishery. The spatial boundaries for demersal communities are based on IMCRA boundaries for the shelf, and on slope bioregionalisations for the slope (IMCRA 1998; Last et al. 2005). The spatial boundaries for the pelagic communities are based on pelagic bioregionalisations and on oceanography (Condie et al. 2003; Lyne and Hayes 2004). Fishery and region-specific modifications to these boundaries are described in detail in Hobday et al. (2007) and briefly outlined in the footnotes to the community Tables below.

Table 2.9. Demersal communities that underlie the pelagic communities in which fishing activity occurred in the SESSF GHAT gillnet sub-fishery (x). Shaded cells indicate all communities within the province. Bold crosses refer to communities where fishing actually occurred in the SESSF GHAT gillnet sub-fishery.

DEMERSAL COMMUNITY	CAPE	NORTH EASTERN TRANSITION	NORTH EASTERN	CENTRAL EASTERN TRANSITION	CENTRAL EASTERN	SOUTH EASTERN TRANSITION	CENTRAL BASS	TASMANIAN	WESTERN TAS TRANSITION	SOUTHERN	SOUTH WESTERN TRANSITION	CENTRAL WESTERN	CENTRAL WESTERN TRANSITION	NORTH WESTERN	NORTH WESTERN TRANSITION	TIMOR	TIMOR TRANSITION	HEARD AND MCDONALD IS	MACQUARIE IS
Inner Shelf 0 – 110m [1,2]					x	x	x	x	x	x									
Outer Shelf 110 – 250m [1,2,]					x	x		x	x	x									
Upper Slope 250 – 565m [3]					x	x		x	x	x									
Mid–Upper Slope 565 – 820m[3]								x	x	x									
Mid Slope 820 – 1100m[3]								x	x	x									
Lower slope/ Abyssal > 1100m[6]								x	x	x									
Reef 0 -110m[7, 8]																			
Reef 110-250m[8]																			
Seamount 0 – 110m																			
Seamount 110- 250m																			
Seamount 250 – 565m																			
Seamount 565 – 820m																			

DEMERSAL COMMUNITY	CAPE	NORTH EASTERN TRANSITION	NORTH EASTERN	CENTRAL EASTERN TRANSITION	CENTRAL EASTERN	SOUTH EASTERN TRANSITION	CENTRAL BASS	TASMANIAN	WESTERN TAS TRANSITION	SOUTHERN	SOUTH WESTERN TRANSITION	CENTRAL WESTERN	CENTRAL WESTERN TRANSITION	NORTH WESTERN	NORTH WESTERN TRANSITION	TIMOR	TIMOR TRANSITION	HEARD AND MCDONALD IS	MACQUARIE IS
Seamount 820 – 1100m																			
Seamount 1100 – 3000m																			
Plateau 0 – 110m																			
Plateau 110- 250m[4]																			
Plateau 250 – 565m[4]																			
Plateau 565 – 820m[5]																			
Plateau 820 – 1100m[5]																			

[1] Four inner shelf communities occur in the Timor Transition (Arafura, Groote, Cape York and Gulf of Carpentaria) and three inner shelf communities occur in the Southern (Eyre, Eucla and South West Coast). At Macquarie Is: [2]inner and outer shelves (0-250m), and [3]upper and midslope communities combined (250-1100m). At Heard/McDonald Is: [4]outer and upper slope plateau communities combined to form four communities: Shell Bank, inner and outer Heard Plateau (100-500m) and Western Banks (200-500m), [5]mid and upper plateau communities combined into 3 trough (Western, North Eastern and South Eastern), southern slope and North Eastern plateau communities (500-1000m), and [6] 3 groups at Heard Is: Deep Shell Bank (>1000m), Southern and North East Lower slope/abyssal, [7]Great Barrier Reef in the North Eastern Province and Transition and [8] Rowley Shoals in North Western Transition.

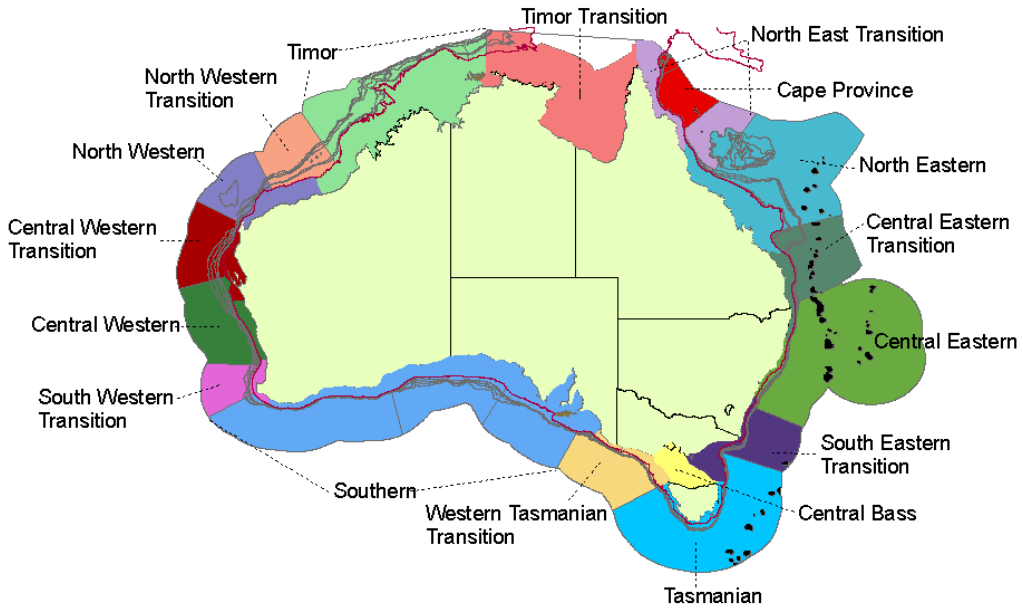
Scoping Document S2C2. Pelagic Communities

Table 2.10. Pelagic communities in which fishing activity occurs in the SESSF GHAT gillnet sub-fishery (black; x). Shaded cells indicate all communities that exist in the province.

PELAGIC COMMUNITY	NORTHEASTERN	EASTERN	SOUTHERN	WESTERN	NORTHERN	NORTHWESTERN	HEARD AND MCDONALD IS[2]	MACQUARIE IS
Coastal pelagic 0-200m[1,2]		x	x					
Oceanic (1) 0 – 600m								
Oceanic (2) >600m								
Seamount oceanic (1) 0 – 600m								
Seamount oceanic (2) 600–3000m								
Oceanic (1) 0 – 200m			x					
Oceanic (2) 200-600m			x					
Oceanic (3) >600m			x					
Seamount oceanic (1) 0 – 200m								
Seamount oceanic (2) 200 – 600m								
Seamount oceanic (3) 600–3000m								
Oceanic (1) 0-400m								
Oceanic (2) >400m								
Oceanic (1) 0-800m								
Oceanic (2) >800m								
Plateau (1) 0-600m								
Plateau (2) >600m								
Heard Plateau 0-1000m[3]								
Oceanic (1) 0-1000m								
Oceanic (2) >1000m								
Oceanic (1) 0-1600m								
Oceanic (2) >1600m								

[1] Northern Province has five coastal pelagic zones (NWS, Bonaparte, Arafura, Gulf and East Cape York) and Southern Province has two zones (Tas, GAB). [2] At Macquarie Is: coastal pelagic zone to 250m. [3] At Heard and McDonald Is: coastal pelagic zone broadened to cover entire plateau to maximum of 1000 m.

(a)



(b)

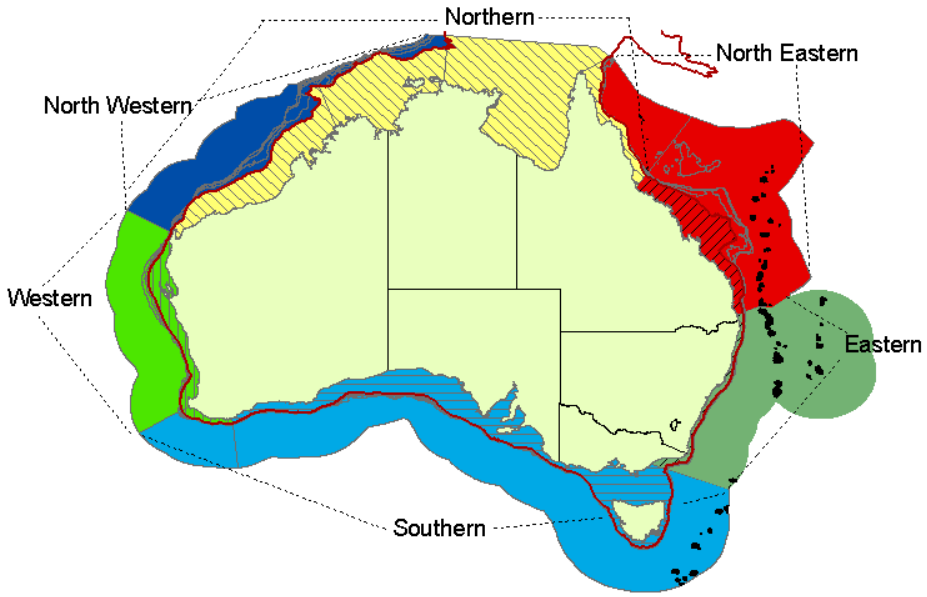


Figure 2.3 (a) Demersal communities around mainland Australia based on bioregionalisation schema. Some inshore (0-110 m) communities comprise more than one community e.g. Timor Transition comprises 4 distinct communities. (b) Australian pelagic provinces. Hatched areas indicate coastal epipelagic zones overlying the shelf. Offshore (oceanic) provinces comprise two or more overlaying pelagic zones as indicated in Table 2.10. Seamounts (black) and plateaux (light green) are illustrated in their demersal or pelagic provinces.

2.2.3 Identification of objectives for components and sub-components (Step 3)

Objectives are identified for each sub-fishery for the five ecological components (target, bycatch/byproduct, protected species, habitats, and communities) and sub-components, and are clearly documented. It is important to identify objectives that managers, the fishing industry, and other stakeholders can agree on, and that scientists can quantify and assess. The criteria for selecting ecological operational objectives for risk assessment are that they:

- be biologically relevant;
- have an unambiguous operational definition;
- be accessible to prediction and measurement; and
- that the quantities they relate to be exposed to the hazards.

For fisheries that have completed Ecological Sustainable Development (ESD) reports, use can be made of the operational objectives stated in those reports.

Each 'operational objective' is matched to example indicators. **Scoping Document S3** provides suggested examples of operational objectives and indicators. Where operational objectives are already agreed for a fishery (Existing Management Objectives; EMOs), those should be used (e.g. Strategic Assessment Reports). The objectives need not be exactly specified, with regard to numbers or fractions of removal/impact but should indicate that an impact in the sub-component is of concern/interest to the sub-fishery. The rationale for including or discarding an operational objective is a crucial part of the table and must explain why the particular objective has or has not been selected for in the (sub) fishery. Only the operational objectives selected for inclusion in the (sub) fishery are used for Level 1 analysis (**Level 1 SICA Document L1.1**).

Scoping Document S3. Components and sub-components identification of objectives

Table 2.11. Components and sub-components identification of operational objectives and rationale. Operational objectives that are eliminated are shaded out. EMO: Existing Management Objective; AMO: Existing AFMA Objective.

COMPONENT	CORE OBJECTIVE	SUB-COMPONENT	EXAMPLE OPERATIONAL OBJECTIVES	EXAMPLE INDICATORS	RATIONALE
Key Commercial and secondary commercial species	Avoid recruitment failure of the key/secondary commercial species Avoid negative consequences for species or population sub-components	1. Population size	1.1 No trend in biomass 1.2 Maintain biomass above a specified level 1.3 Maintain catch at specified level 1.4 Species do not approach extinction or become extinct	Biomass, numbers, density, CPUE, yield	1.1 Increases in biomass of the key/secondary commerical species would be acceptable. 1.2. To ensure that population at acceptable level by the assessment. 1.3. TAC levels are specified. 1.4. This is a general objective for all AFMA fisheries as per Fisheries Management Act 1991 (objective (b)). In general these objectives underlie the sustainable management of the Fishery, for both target bait and target species.
		2. Geographic range	2.1 Geographic range of the population, in terms of size and continuity does not change outside acceptable bounds	Presence of population across the known distribution range	2.1 Not currently monitored. No specific management objective based on the geographic range of key/secondary commercial species.
		3. Genetic structure	3.1 Genetic diversity does not change outside acceptable bounds	Frequency of genotypes in the population, effective population size (N_e), number of spawning units	3.1 Genetic studies have identified multiple sub-pupulations of gummy shark.
		4. Age/size/sex structure	4.1 Age/size/sex structure does not change outside acceptable bounds (e.g. more than X% from reference structure)	Biomass, numbers or relative proportion in age/size/sex classes Biomass of spawners Mean size, sex ratio	4.1 Covered in general by 1.2 EMO and AMO. The size range of key commercial species suggests that the fishery is not targeting recruitment or spawning grounds.
		5. Reproductive Capacity	5.1 Fecundity of the population does not change outside acceptable bounds (e.g. more than X% of reference population fecundity)	Egg production of population Abundance of recruits	5.1 Covered by 1.2 EMO and AMO. Reproductive capacity in terms of egg production may be easier to monitor via changes in Age/size/sex structure. 5.2 Covered by 1.2 EMO and AMO. May be easier to monitor via changes in Age/size/sex structure in the fishery.

COMPONENT	CORE OBJECTIVE	SUB-COMPONENT	EXAMPLE OPERATIONAL OBJECTIVES	EXAMPLE INDICATORS	RATIONALE
			2 Recruitment to the population does not change outside acceptable bounds		
		6. Behaviour /Movement	6.1 Behaviour and movement patterns of the population do not change outside acceptable bounds	Presence of population across space, movement patterns within the population (e.g. attraction to bait, lights)	6.1. Changes behaviour that are deleterious to the species and populations are to be avoided. Covered by 1.2 EMO and AMO.
Byproduct and Bycatch	Avoid recruitment failure of the byproduct and bycatch species Avoid negative consequences for species or population sub-components	1. Population size	1.1 No trend in biomass 1.2 Species do not approach extinction or become extinct 1.3 Maintain biomass above a specified level 1.4 Maintain catch at specified level	Biomass, numbers, density, CPUE, yield	1.1 Increases in biomass of the key/secondary commerical species would be acceptable. 1.2. To ensure that population at acceptable level by the assessment. Covered by EMO and AMO that ensures the fishery does not threaten bycatch species. 1.3. TAC levels are specified. EMO/AMO - annual reviews of all information on bycatch species with the aim of developing species specific bycatch limits. Use of 'move on provisions' to limit exploitation of bycatch stocks in localised areas. 1.4. This is a general objective for all AFMA fisheries as per Fisheries Management Act 1991 (objective (b)). Maintaining bycatch/byproduct levels not a specific objective. The protection of bycatch by TACs based on precautionary principles is the preferred method. "Move on provisions" are enforced if bycatch exceeds set limits.
		2. Geographic range	2.1 Geographic range of the population, in terms of size and continuity does not change outside acceptable bounds	Presence of population across space	2.1 Not currently monitored. No specific management objective based on the geographic range of byproduct/bycatch species. No specific management objective based on the geographic range of bycatch/byproduct species.
		3. Genetic structure	3.1 Genetic diversity does not change outside acceptable bounds	Frequency of genotypes in the population, effective population size (N_e), number of spawning units	3.1 Not currently monitored. No reference levels established. No specific management objective based on the genetic structure of bycatch species.

COMPONENT	CORE OBJECTIVE	SUB-COMPONENT	EXAMPLE OPERATIONAL OBJECTIVES	EXAMPLE INDICATORS	RATIONALE
		4. Age/size/sex structure	4.1 Age/size/sex structure does not change outside acceptable bounds (e.g. more than X% from reference structure)	Biomass, numbers or relative proportion in age/size/sex classes Biomass of spawners Mean size, sex ratio	4.1 EMO – move on provisions require that if bycatch in any one haul exceeds set limits then the vessel must not use that fishing method within 5 nm of that site for at least 5 days.
		5 Reproductive Capacity	5.1 Fecundity of the population does not change outside acceptable bounds (e.g. more than X% of reference population fecundity) Recruitment to the population does not change outside acceptable bounds	Egg production of population Abundance of recruits	5.1 Beyond the generality of the EMO "Fishing is conducted in a manner that does not threaten stocks of byproduct / bycatch species", reproductive capacity is not currently measured for bycatch/byproduct species and is largely covered by other objectives.
		6. Behaviour /Movement	6.1 Behaviour and movement patterns of the population do not change outside acceptable bounds	Presence of population across space, movement patterns within the population (e.g. attraction to bait, lights)	6.1 Trawling does not appear to attract bycatch species or alter their behaviour and movement patterns, resulting in the attraction of species to fishing grounds.
Protected species	Avoid recruitment failure of protected species Avoid negative consequences for protected species or population sub-components Avoid negative impacts on the population from fishing	1. Population size	1.1 Species do not further approach extinction or become extinct 1.2 No trend in biomass 1.3 Maintain biomass above a specified level 1.4 Maintain catch at specified level	Biomass, numbers, density, CPUE, yield	1.1 EMO - The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species. 1.2 A positive trend in biomass is desirable for protected species. 1.3 Maintenance of protected species biomass above specified levels not currently a fishery operational objective. 1.4 The above EMO states '.must avoid mortality/injury to protected species.
		2. Geographic range	2.1 Geographic range of the population, in terms of size and continuity does not change outside acceptable bounds	Presence of population across space, i.e. the Southern Ocean	2.1 Change in geographic range of protected species may have serious consequences e.g. population fragmentation and/or forcing species into sub-optimal areas.

COMPONENT	CORE OBJECTIVE	SUB-COMPONENT	EXAMPLE OPERATIONAL OBJECTIVES	EXAMPLE INDICATORS	RATIONALE
		3. Genetic structure	3.1 Genetic diversity does not change outside acceptable bounds	Frequency of genotypes in the population, effective population size (N_e), number of spawning units	3.1 Because population size of protected species is often small, protected species are sensitive to loss of genetic diversity. Genetic monitoring may be an effective approach to measure possible fishery impacts.
		4. Age/size/sex structure	4.1 Age/size/sex structure does not change outside acceptable bounds (e.g. more than X% from reference structure)	Biomass, numbers or relative proportion in age/size/sex classes Biomass of spawners Mean size, sex ratio	4.1 Monitoring the age/size/sex structure of protected species populations is a useful management tool allowing the identification of possible fishery impacts and that cross-section of the population most at risk.
		5. Reproductive Capacity	5.1 Fecundity of the population does not change outside acceptable bounds (e.g. more than X% of reference population fecundity) Recruitment to the population does not change outside acceptable bounds	Egg production of population Abundance of recruits	5.1 The reproductive capacity of protected species is of concern to this fishery because potential fishery induced changes in reproductive ability (e.g. reduction in prey items may critically affect seabird brooding success) may have immediate impact on the population size of protected species.
		6. Behaviour /Movement	6.1 Behaviour and movement patterns of the population do not change outside acceptable bounds	Presence of population across space, movement patterns within the population (e.g. attraction to bait, lights)	6.1 Trawling operations may attract protected species and alter behaviour and movement patterns, resulting in the habituation of protected species to fishing vessels. The overall effect may be to prevent juveniles from learning to fend for themselves therefore increasing the animals' reliance on fishing vessels. Subsequently this could substantially increase the risk of injury/mortality by collision, entrapment or entanglement with a vessel or fishing gear.
		7. Interactions with fishery	7.1 Survival after interactions is maximised 7.2 Interactions do not affect the viability of the population or its ability to recover	Survival rate of species after interactions Number of interactions, biomass or numbers in population	7.1, 7.2, EMO – The fishery is conducted in a manner that avoids mortality of, or injuries to, endangered, threatened or protected species. Includes the prohibition on discarding offal (bycatch, fish processing waste, unwanted dead fish), gear restrictions and reduced lighting levels to minimise interactions and attraction of the vessel to protected species.
Habitats	Avoid negative impacts on quality of environment	1. Water quality	1.1 Water quality does not change outside acceptable bounds	Water chemistry, noise levels, debris levels, turbidity levels,	1.1 EMO control the discharge or discarding of waste (fish offal) and limit lighting on the vessels. MARPOL regulations prohibit discharge of oils, discarding of plastics.

COMPONENT	CORE OBJECTIVE	SUB-COMPONENT	EXAMPLE OPERATIONAL OBJECTIVES	EXAMPLE INDICATORS	RATIONALE
	Avoid reduction in the amount and quality of habitat			pollutant concentrations, light pollution from artificial light	
		2. Air quality	2.1 Air quality does not change outside acceptable bounds	Air chemistry, noise levels, visual pollution, pollutant concentrations, light pollution from artificial light	2.1 Not currently perceived as an important habitat sub-component, trawling operations not believed to strongly influence air quality.
		3. Substrate quality	3.1 Sediment quality does not change outside acceptable bounds	Sediment chemistry, stability, particle size, debris, pollutant concentrations	3.1 EMO – The fishery is conducted, in a manner that minimises the impact of fishing operations on benthic habitat. Controls on bobbin and disc size requirements to minimise benthic impacts (EA Assessment 2002). The current MPA and conservation areas reserve large areas of the known habitat types from fishing disturbance.
		4. Habitat types	4.1 Relative abundance of habitat types does not vary outside acceptable bounds	Extent and area of habitat types, % cover, spatial pattern, landscape scale	4.1 Trawling activities may result in changes to the local habitat types on fishing grounds. The current MPA and conservation areas reserve large areas of the known habitat types from fishing disturbance.
		5. Habitat structure and function	5.1 Size, shape and condition of habitat types does not vary outside acceptable bounds	Size structure, species composition and morphology of biotic habitats	5.1 Trawling activities may result in local disruption to pelagic and benthic processes.
Communities	Avoid negative impacts on the composition/function/distribution/structure of the community	1. Species composition	1.1 Species composition of communities does not vary outside acceptable bounds	Species presence/absence, species numbers or biomass (relative or absolute) Richness Diversity indices Evenness indices	1.1 EMO – The fishery is conducted, in a manner that minimises the impact of fishing operations on the ecosystem generally.
		2. Functional group composition	2.1 Functional group composition does not change outside acceptable bounds	Number of functional groups, species per functional group (e.g. autotrophs, filter feeders, herbivores, omnivores, carnivores)	2.1 The presence/abundance of 'functional group' members may fluctuate widely, however in terms of maintenance of ecosystem processes it is important that the aggregate effect of a functional group is maintained.
		3. Distribution	3.1 Community range does not	Geographic range of the	3.1 Demersal trawling operations have unknown impacts on the benthos in the

COMPONENT	CORE OBJECTIVE	SUB-COMPONENT	EXAMPLE OPERATIONAL OBJECTIVES	EXAMPLE INDICATORS	RATIONALE
		of the community	vary outside acceptable bounds	community, continuity of range, patchiness	fishing grounds. The current MPA and conservation areas reserve large areas of the known habitat types from fishing disturbance.
		4. Trophic/size structure	4.1 Community size spectra/trophic structure does not vary outside acceptable bounds	Size spectra of the community Number of octaves, Biomass/ number in each size class Mean trophic level Number of trophic levels	4.1 Trawling activities for key/secondary commercial species have the potential to remove a significant component of the predator functional group. Increased abundance of the prey groups may then allow shifts in relative abundance of higher trophic level organisms.
		5. Bio- and geo-chemical cycles	5.1 Cycles do not vary outside acceptable bounds	Indicators of cycles, salinity, carbon, nitrogen, phosphorus flux	5.1 Trawling operations not perceived to have a detectable effect on bio and geochemical cycles but other activities might e.g. aquaculture.

2.2.4 Hazard Identification (Step 4)

Hazards are the activities undertaken in the process of fishing, and any external activities, which have the potential to lead to harm.

The effects of fishery/sub-fishery specific hazards are identified under the following categories:

- capture
- direct impact without capture
- addition/movement of biological material
- addition of non biological material
- disturbance of physical processes
- external hazards

These fishing and external activities are scored on a presence/absence basis for each fishery/sub-fishery. An activity is scored as a zero if it does not occur and as a one if it does occur. The rationale for the scoring is also documented in detail and must include if/how the activity occurs and how the hazard may impact on organisms/habitat.

Scoping Document S4. Hazard Identification Scoring Sheet

This table is completed once for each sub-fishery. See Table 2.13 provides a set of examples of fishing activities for the effects of fishing to be used as a guide to assist in scoring the hazards.

Fishery name: Southern Eastern Shark and Scalefish Fishery (Gillnet Hook and Trap Sector)

Sub-fishery name: Shark gillnet

Date completed: March 2018

Table 2.12. Hazard identification, score and rationale(s) for the SESSF GHAT gillnet sub-fishery.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	SCORE (0/1)	DOCUMENTATION OF RATIONALE
Capture	Bait collection	0	Not required by this fishery method.
	Fishing	1	Actual fishing, i.e. capture of species resulting from deployment and retrieval of gillnet including key commercial, bycatch, byproduct and protected species caught but not landed.
	Incidental behaviour	0	Activities such as recreational fishing are not permitted or occur rarely.
Direct impact without capture	Bait collection	0	Not required for this fishery method.
	Fishing	1	Gillnetting is most likely to impact benthic habitats and animals as the gear contacts seafloor. Unknown mortality on fish arising from net escapement. Birds, seals, and dolphins may also interact with gear at times resulting in injury or mortality.
	Incidental behaviour	0	Activities such as recreational fishing are not permitted or occur rarely.
	Gear loss	1	Major gear loss reported rarely and no information on minor components but likely to occur.
	Anchoring/ mooring	1	Vessels might anchor inshore when not fishing.
	Navigation/steaming	1	Steaming/navigation to fishing grounds may result in collisions (e.g. seabirds or whales vessel interactions), seabird collisions with night-time lights/navigation lights.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	SCORE (0/1)	DOCUMENTATION OF RATIONALE
Addition/ movement of biological material	Translocation of species	1	No bait used but vessels travel throughout the Fishery potentially translocation via hull, or net-cleaning but no known reports
	On board processing	1	FMP generally prohibits processing at sea unless specifially authorised and all fish must be landed whole or gilled, headed, and gutted, with special conditions for sharks and rays. Offal and offcuts would be discharged when appropriate.
	Discarding catch	1	Discarding is common.
	Stock enhancement	0	None occurs
	Provisioning	0	None occurs
	Organic waste disposal	0	Disposal of organic wastes should not occur under MARPOL regulations
Addition of non-biological material	Debris	0	Rubbish generated during general fishing vessel operations usually disposed of ashore.
	Chemical pollution	0	Waste discharge from vessels should not occur under MARPOL regulations. Leakage of substances such as fuel, oil, bilge discharges, natural decay of antifouling agents may occur in normal course of operations
	Exhaust	1	Vessel introduces exhaust into the environment.
	Gear loss	1	Major gear losses of whole nets rare and usually retrieved. no information on minor components loss
	Navigation/ steaming	1	Vessels navigate to and from fishing grounds introduces noise and visual stimuli into the environment. Depth sounders/ acoustic net positioning systems have potential to disturb marine species.
	Activity/ presence on water	1	Vessel introduces noise and visual stimuli into the environment.
Disturb physical processes	Bait collection	0	Bait not required by fishery.
	Fishing	1	Gillnetting may disturb seabed sediments and structure.
	Boat launching	0	Not applicable. Vessels in fishery come from designated ports.
	Anchoring/ mooring	1	Anchoring/mooring may affect the physical processes in the area where anchors and anchor chains contact the seafloor.
	Navigation/ steaming	1	Gillnetting operations involves navigating to and from fishing grounds. Navigation/steaming introduces noise, water turbulence to environment. Depth sounders/ acoustic net positioning systems have potential to disturb marine species.
External Hazards (specify the particular example within each activity area)	Other capture fishery methods	1	Other SESSF fisheries operating in the gillnet jurisdictions: CTS otter trawl and Danish seine; GHAT Scalefish Hook – demersal longline, auto-longline, dropline; trap; Shark demersal longline; Great Australian Bight Trawl. Also overlapping tuna fisheries- SBT, ETBF; squid jig; Bass Strait scallop; recreational, and state fisheries.
	Aquaculture	1	Salmon aquaculture occurs in inshore (state waters) in Tasmania and and mollusc aquaculture more broadly along the eastern seaboard. May change the water chemistry by adding nutrients and attract predators to the local regions.
	Coastal development	1	Sewage discharge, agricultural runoff, pollution from ports and coastal towns could impact shelf fisheries and may affect breeding grounds and nursery areas for some of the species in the fishery
	Other extractive activities	1	Ongoing development and expansion of oil and gas pipelines, oil and gas exploration and extraction drilling, and seismic survey for further oil and gas exploration occurs across southern Australia (notably Bass Strait).

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	SCORE (0/1)	DOCUMENTATION OF RATIONALE
	Other non-extractive activities	1	Major coastal shipping activity including defence. Submarine cables (Basslink) occurs in the fishery.
	Other anthropogenic activities	1	Tourist activities and charter fishing occurs in the fishery.

Table 2.13. Examples of fishing activities (Modified from Fletcher et al. 2002).

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	EXAMPLES OF ACTIVITIES INCLUDE
Capture		Activities that result in the capture or removal of organisms. This includes cryptic mortality due to organisms being caught but dropping out prior to the gear's retrieval (i.e. They are caught but not landed)
	Bait collection	Capture of organisms due to bait gear deployment, retrieval, and bait fishing. This includes organisms caught but not landed.
	Fishing	Capture of organisms due to gear deployment, retrieval, and actual fishing. This includes organisms caught but not landed.
	Incidental behaviour	Capture of organisms due to crew behaviour incidental to primary fishing activities, possible in the crew's down time, e.g. crew may line or spear fish while anchored, or perform other harvesting activities, including any land-based harvesting that occurs when crew are camping in their down time.
Direct impact, without capture		This includes any activities that may result in direct impacts (damage or mortality) to organisms without actual capture.
	Bait collection	Direct impacts (damage or mortality) to organisms due to interactions (excluding capture) with bait gear during deployment, retrieval, and bait fishing. This includes: damage/mortality to organisms through contact with the gear that doesn't result in capture, e.g. Damage/mortality to benthic species by gear moving over them, organisms that hit nets but aren't caught.
	Fishing	Direct impacts (damage or mortality) to organisms due to interactions (excluding capture) with fishing gear during deployment, retrieval, and fishing. This includes: damage/mortality to organisms through contact with the gear that doesn't result in capture, e.g. Damage/mortality to benthic species by gear moving over them, organisms that hit nets but are not caught.
	Incidental behaviour	Direct impacts (damage or mortality) without capture, to organisms due to behaviour incidental to primary fishing activities, possibly in the crew's down time; e.g. the use of firearms on scavenging species, damage/mortality to organisms through contact with the gear that the crew use to fish during their down time. This does not include impacts on predator species of removing their prey through fishing.
	Gear loss	Direct impacts (damage or mortality), without capture on organisms due to gear that has been lost from the fishing boat. This includes damage/mortality to species when the lost gear contacts them or if species swallow the lost gear.
	Anchoring/ mooring	Direct impact (damage or mortality) that occurs and when anchoring or mooring. This includes damage/mortality due to physical contact of the anchor, chain or rope with organisms, e.g. An anchor damaging live coral.
	Navigation/ steaming	Direct impact (damage or mortality) without capture may occur while vessels are navigating or steaming. This includes collisions with marine organisms or birds.
Addition/ movement of biological material		Any activities that result in the addition or movement of biological material to the ecosystem of the fishery.
	Translocation of species (boat movements, reballasting)	The translocation and introduction of species to the area of the fishery, through transportation of any life stage. This transport can occur through movement on boat hulls or in ballast water as boats move throughout the fishery or from outside areas into the fishery.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	EXAMPLES OF ACTIVITIES INCLUDE
	On board processing	The discarding of unwanted sections of target after on board processing introduces or moves biological material, e.g. heading and gutting, retaining fins but discarding trunks.
	Discarding catch	The discarding of unwanted organisms from the catch can introduce or move biological material. This includes individuals of target and byproduct species due to damage (e.g. shark or marine mammal predation), size, high grading and catch limits. Also includes discarding of all non-retained bycatch species. This also includes discarding of catch resulting from incidental fishing by the crew. The discards could be alive or dead.
	Stock enhancement	The addition of larvae, juveniles or adults to the fishery or ecosystem to increase the stock or catches.
	Provisioning	The use of bait or berley in the fishery.
	Organic waste disposal	The disposal of organic wastes (e.g. food scraps, sewage) from the boats.
Addition of non-biological material		Any activities that result in non-biological material being added to the ecosystem of the fishery, this includes physical debris, chemicals (in the air and water), lost gear, noise and visual stimuli.
	Debris	Non-biological material may be introduced in the form of debris from fishing vessels or mother ships. This includes debris from the fishing process: e.g. cardboard thrown over from bait boxes, straps and netting bags lost. Debris from non-fishing activities can also contribute to this e.g. Crew rubbish – discarding plastics or other rubbish. Discarding at sea is regulated by MARPOL, which forbids the discarding of plastics.
	Chemical pollution	Chemicals can be introduced to water, sediment and atmosphere through oil spills, detergents other cleaning agents, any chemicals used during processing or fishing activities.
	Exhaust	Exhaust can be introduced to the atmosphere and water through operation of fishing vessels
	Gear loss	The loss of gear will result in the addition of non-biological material, this includes hooks, line, sinkers, nets, otter boards, light sticks, buoys etc.
	Navigation /steaming	The navigation and steaming of vessels will introduce noise and visual stimuli into the environment. Boat collisions and/or sinking of vessels. Echo-sounding may introduce noise that may disrupt some species (e.g. whales, orange roughy)
	Activity /presence on water	The activity or presence of fishing vessels on the water will noise and visual stimuli into the environment.
Disturb physical processes		Any activities that will disturb physical processes, particularly processes related to water movement or sediment and hard substrate (e.g. boulders, rocky reef) processes.
	Bait collection	Bait collection may disturb physical processes if the gear contacts seafloor-disturbing sediment, or if the gear disrupts water flow patterns.
	Fishing	Fishing activities may disturb physical processes if the gear contacts seafloor-disturbing sediment, or if the gear disrupts water flow patterns.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	EXAMPLES OF ACTIVITIES INCLUDE
	Boat launching	Boat launching may disturb physical processes, particularly in the intertidal regions, if dredging is required, or the boats are dragged across substrate. This would also include foreshore impacts where fishers drive along beaches to reach fishing locations and launch boats. Impacts of boat launching that occurs within established marinas are outside the scope of this assessment.
	Anchoring /mooring	Anchoring/mooring may affect the physical processes in the area that anchors, and anchor chains contact the seafloor.
	Navigation /steaming	Navigation /steaming may affect the physical processes on the benthos and the pelagic by turbulent action of propellers or wake formation.
External hazards		Any outside activities that will result in an impact on the component in the same location and period that the fishery operates. The particular activity as well as the mechanism for external hazards should be specified.
	Other capture fishery methods	Take or habitat impact by other commercial, indigenous, or recreational fisheries operating in the same region as the fishery under examination
	Aquaculture	Capture of feed species for aquaculture. Impacts of cages on the benthos in the region
	Coastal development	Sewage discharge, ocean dumping, agricultural runoff
	Other extractive activities	Oil and gas pipelines, drilling, seismic activity
	Other non-extractive activities	Defense, shipping lanes, dumping of munitions, submarine cables
	Other anthropogenic activities	Recreational activities, such as scuba diving leading to coral damage, power boats colliding with whales, dugongs, turtles. Shipping, oil spills

2.2.5 Bibliography (Step 5)

All references used in the scoping assessment are included in the References section.

Key documents can be found on the AFMA web page at www.afma.gov.au and include the following:

- Management Plan and Regulation Guidelines
- Bycatch Action Plans
- Data Summary Reports (logbook and observer)

Other publications that provided information include

- ABARES Fishery Status Reports
- Strategic Plans

2.2.6 Decision rules to move to Level 1 (Step 6)

Any hazards that are identified at Step 4 Hazard Identification as occurring in the fishery are carried forward for analysis at Level 1.

In this case, 16 out of 26 possible internal activities were identified as occurring in this sub-fishery. All six external scenarios were also identified. Thus, a total of 21 activity-component scenarios will be considered at Level 1. This results in 105 (excluding the key commercial x direct impact by capture activity) total scenarios (of 160 possible) to be developed and evaluated using the unit lists (Key commercial/secondary, byproduct/bycatch, protected species, habitats, communities).

2.3 Level 1 Scale, Intensity and Consequence Analysis (SICA)

Level 1 aims to identify which hazards lead to a significant impact on any species, habitat or community. Analysis at Level 1 is for whole components (key/secondary commercial; bycatch and byproduct; protected species; habitat; and communities), not individual sub-components. Since Level 1 is used mainly as a rapid screening tool, a "worst case" approach is used to ensure that elements screened out as low risk (either activities or components) are genuinely low risk. Analysis at Level 1 for each component is accomplished by considering the most vulnerable sub-component and the most vulnerable unit of analysis (e.g. most vulnerable species, habitat type or community). This is known as credible scenario evaluation (Richard Stocklosa e-systems Pty Ltd (March 2003) Review of CSIRO Risk Assessment Methodology: ecological risk assessment for the effects of fishing) in conventional risk assessment. In addition, where judgments about risk are uncertain, the highest level of risk that is still regarded as plausible is chosen. For this reason, the measures of risk produced at Level 1 cannot be regarded as absolute.

At Level 1 each fishery/sub-fishery is assessed using a scale, intensity, and consequence analysis (SICA). SICA is applied to the component as a whole by choosing the most vulnerable sub-component (linked to an operational objective) and most vulnerable unit of analysis. The rationale for these choices must be documented in detail. These steps are outlined below. Scale, intensity, and consequence analysis (SICA) consists of thirteen steps. The first ten steps are performed for each activity and component and correspond to the columns of the SICA table. The final three steps summarise the results for each component.

Step1. Record the hazard identification score (absence (0) presence (1) scores) identified at Step 3 at the scoping level (Scoping Document S3) onto the SICA table

Step 2. Score spatial scale of the activity

Step 3. Score temporal scale of the activity

Step 4. Choose the sub-component most likely to be affected by activity

Step 5. Choose the most vulnerable unit of analysis for the component e.g. species, habitat type or community assemblage

Step 6. Select the most appropriate operational objective

Step 7. Score the intensity of the activity for that sub-component

Step 8. Score the consequence resulting from the intensity for that sub component

Step 9. Record confidence/uncertainty for the consequence scores

Step 10. Document rationale for each of the above steps

Step 11. Summary of SICA results

Step 12. Evaluation/discussion of Level 1

Step 13. Components to be examined at Level 2

2.3.1 Record the hazard identification score (absence (0) presence (1) scores) identified at step 3 in the scoping level onto the SICA Document (Step 1)

Record the hazard identification score absence (0) presence (1) identified at Step 3 at the scoping level onto the SICA sheet. A separate sheet will be required for each component (key/secondary commercial, bycatch and byproduct, and protected species, habitat and communities). Only those activities that scored a 1 (presence) will be analysed at Level 1.

2.3.2 Score spatial scale of activity (Step 2)

The greatest spatial extent must be used for determining the spatial scale score for each identified hazard. For example, if fishing (e.g. capture by longline) takes place within an area of 200 nm by 300 nm, then the spatial scale is scored as 4. The score is then recorded onto the SICA Document and the rationale documented.

Table 2.14. Spatial scale score of activity.

<1 NM	1-10 NM	10-100 NM	100-500 NM	500-1000 NM	>1000 NM
1	2	3	4	5	6

Maps and graphs may be used to supplement the information (e.g. sketches of the distribution of the activity relative to the distribution of the component) and additional notes describing the nature of the activity should be provided. The spatial scale score at Step 2 is not used directly, but the analysis is used in making judgments about level of intensity at Step 7. Obviously, two activities can score the same regarding spatial scale, but the intensity of each can differ vastly. The reasons for the score are recorded in the rationale column of the SICA spreadsheet.

2.3.3 Score temporal scale of activity (Step 3)

The highest frequency must be used for determining the temporal scale score for each identified hazard. If the fishing activity occurs daily, the temporal scale is scored as 6. If oil spillage occurs about once per year, then the temporal scale of that hazard scores a 3. The score is then recorded onto the SICA Document and the rationale documented.

Table 2.15. Temporal scale score of activity.

DECADAL (1 DAY EVERY 10 YEARS OR SO)	EVERY SEVERAL YEARS (1 DAY EVERY SEVERAL YEARS)	ANNUAL (1-100 DAYS PER YEAR)	QUARTERLY (100-200 DAYS PER YEAR)	WEEKLY (200-300 DAYS PER YEAR)	DAILY (300-365 DAYS PER YEAR)
1	2	3	4	5	6

It may be more logical for some activities to consider the aggregate number of days that an activity occurs. For example, if the activity “fishing” was undertaken by 10 boats during the

same 150 days of the year, the score is 4. If the same 10 boats each spend 30 non-overlapping days fishing, the temporal scale of the activity is a sum of 300 days, indicating that a score of 6 is appropriate. In the case where the activity occurs over many days, but only every 10 years, the number of days by the number of years in the cycle is used to determine the score. For example, 100 days of an activity every 10 years averages to 10 days every year, so that a score of 3 is appropriate.

The temporal scale score at Step 3 is not used directly, but the analysis is used in making judgments about level of intensity at Step 7. Obviously, two activities can score the same with regard to temporal scale, but the intensity of each can differ vastly. The reasons for the score are recorded in the rationale column.

2.3.4 Choose the sub-component most likely to be affected by activity (Step 4)

The most vulnerable sub-component must be used for analysis of each identified hazard. This selection must be made on the basis of expected highest potential risk for each 'direct impact of fishing' and 'fishing activity' combination and recorded in the 'sub-component' column of the SICA Document. The justification is recorded in the rationale column.

2.3.5 Choose the unit of analysis most likely to be affected by activity and to have highest consequence score (Step 5)

The most vulnerable 'unit of analysis' (i.e. most vulnerable species, habitat type or community) must be used for analysis of each identified hazard. The species, habitats, or communities (depending on which component is being analysed) are selected from **Scoping Document S2 (A – C)**. This selection must be made on the basis of expected highest potential risk for each 'direct impact of fishing' and 'fishing activity' combination and recorded in the 'unit of analysis' column of the SICA Document. The justification is recorded in the rationale column.

2.3.6 Select the most appropriate operational objective (Step 6)

To provide linkage between the SICA consequence score and the management objectives, the most appropriate operational objective for each sub-component is chosen. The most relevant operational objective code from **Scoping Document S3** is recorded in the 'operational objective' column in the SICA document. Note that SICA can only be performed on operational objectives agreed as important for the (sub) fishery during scoping and contained in **Scoping Document S3**. If the SICA process identifies reasons to include sub-components or operational objectives that were previously not included/eliminated, then these sub-components or operational objectives must be re-instated.

2.3.7 Score the intensity of the activity for the component (Step 7)

The score for intensity of an activity considers the direct impacts in line with the categories shown in the conceptual model (Figure 1.2) (capture, direct impact without capture, addition/movement of biological material, addition of non-biological material, disturbance to

physical processes, external hazards). The intensity of the activity is judged based on the scale of the activity, its nature and extent. Activities are scored as per intensity scores below.

Table 2.16. Intensity score of activity (Modified from Fletcher et al. 2002).

LEVEL	SCORE	DESCRIPTION
Negligible	1	remote likelihood of detection at any spatial or temporal scale
Minor	2	occurs rarely or in few restricted locations and detectability even at these scales is rare
Moderate	3	moderate at broader spatial scale, or severe but local
Major	4	severe and occurs reasonably often at broad spatial scale
Severe	5	occasional but very severe and localized or less severe but widespread and frequent
Catastrophic	6	local to regional severity or continual and widespread

This score is then recorded on the **Level 1 (SICA) Document** and the rationale documented.

2.3.8 Score the consequence of intensity for that component (Step 8)

The consequence of the activity is a measure of the likelihood of not achieving the operational objective for the selected sub-component and unit of analysis. It considers the flow on effects of the direct impacts from Step 7 for the relevant indicator (e.g. decline in biomass below the selected threshold due to direct capture). Activities are scored as per consequence scores defined below. A more detailed description of the consequences at each level for each component (key/secondary commercial, bycatch, and byproduct, protected species, habitats, and communities) is provided as a guide for scoring the consequences of the activities in the description of consequences table (Table 2.17).

Table 2.17. Consequence score for ERAEF activities (Modified from Fletcher et al. 2002).

LEVEL	SCORE	DESCRIPTION
Negligible	1	Impact unlikely to be detectable at the scale of the stock/habitat/community
Minor	2	Minimal impact on stock/habitat/community structure or dynamics
Moderate	3	Maximum impact that still meets an objective (e.g. sustainable level of impact such as full exploitation rate for a target species).
Major	4	Wider and longer-term impacts (e.g. long-term decline in CPUE)
Severe	5	Very serious impacts now occurring, with relatively long time period likely to be needed to restore to an acceptable level (e.g. serious decline in spawning biomass limiting population increase).
Intolerable	6	Widespread and permanent/irreversible damage or loss will occur-unlikely to ever be fixed (e.g. extinction)

The score should be based on existing information and/or the expertise of the risk assessment group. The rationale for assigning each consequence score must be documented. The conceptual model may be used to link impact to consequence by showing the pathway that was considered. In the absence of agreement or information, the highest score (worst case scenario) considered plausible is applied to the activity.

2.3.9 Record confidence/uncertainty for the consequence scores (Step 9)

The information used at this level is qualitative and each step is based on expert (fishers, managers, conservationists, scientists) judgment. The confidence rating for the consequence score is rated as 1 (low confidence) or 2 (high confidence) for the activity/component. The score is recorded on the SICA Document and the rationale documented. The confidence will reflect the levels of uncertainty for each score at steps 2, 3, 7 and 8 (see description; Table 2.18).

Table 2.18. Description of Confidence scores for Consequences. The confidence score appropriate to the rationale is used, and documented on the SICA Document.

CONFIDENCE	SCORE	RATIONALE FOR THE CONFIDENCE SCORE
Low	1	Data exists, but is considered poor or conflicting
		No data exists
		Disagreement between experts
High	2	Data exists and is considered sound
		Consensus between experts
		Consequence is constrained by logical consideration

2.3.10 Document rationale for each of the above steps (Step 10)

The rationale forms a logical pathway to the consequence score. It is provided for each choice at each step of the SICA analysis.

SICA steps 1-10. Tables of descriptions of consequences for each component and each subcomponent provide a guide for scoring the level of consequence (see Table above)

Level 1 (SICA) Document L1.1 Key commercial/secondary commercial species.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Capture	Bait collection	0									
	Fishing	1	6	6	Population size						There are no key or secondary commercial species that are not assessed. No further action required for this activity.
	Incidental behaviour	0									
Direct impact without capture	Bait collection	0									
	Fishing	1	6	6	Population size	Gummy shark	1.2	3	2	1	Fishing occurs throughout the year over the entire SESSF. Injury/mortality to this species as a result of passing through the demersal gillnet is expected to have highest potential risk for the population size sub-component. This species chosen as units of analysis because small ones could pass through nets. Intensity: moderate as fishing does not occur in nursery area. Consequence: minor, unlikely to affect long-term recruitment dynamics, or affect population size. Confidence: low because of lack of data on mortality of these fish species after they have escaped net.
	Incidental behaviour	0									

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	Gear loss	1	1	3	Population size	Gummy shark	1.2	2	1	2	Gear loss (demersal gillnet) rarely occurs. If a buoy-line or gillnet (headline, lead-line and webbing) break, the gillnet can be retrieved from the other end. If both ends break, the nets can be located using GPS and retrieved using grapnels. If a gillnet or section of gillnet is lost, it gradually rolls into a ball from the effects of tidal flow. The total area affected compared with the range of the fishery is small (<1nm2). Lost gear resulting in damage/mortality most likely to affect population size of this species. Intensity: minor - lost gear is considered to be rare. Consequence: negligible as impact considered unlikely to be measurable at the scale of this stock. Confidence: high because it is known that very little gear is lost, and if so, most are retrieved (AFMA Observer, pers. comm.) and interaction with this species is considered unlikely.
	Anchoring/ mooring	1	3	4	Population size	Gummy shark	1.2	2	1	2	Anchoring/mooring possible over this scale although probably only in bays. Direct impact (damage or mortality) that occurs when anchoring or mooring most likely to affect population size of this species. Juveniles may enter coastal bays and adults to spawn. Therefore, this species is considered most vulnerable to impact. Intensity: minor - occurs in restricted locations. Consequence: negligible, unlikely to detect impact on this species. Confidence: high because it is considered very unlikely for there to be damage or mortality to this species associated with anchoring/mooring.
	Navigation/ steaming	1	6	6	Population size	Gummy shark	1.2	3	1	2	Fishing activity hence navigation/steaming occurs throughout the year over the SESSF. Direct impact (damage or mortality) without capture due to navigation/steaming was considered most likely to affect population size of this species. Gummy sharks are demersal whereas vessels are at the surface. Intensity: moderate-navigation/steaming is a large component of SESSF operations. Consequence: negligible, as unlikely to be measurable. Confidence: high because it was considered unlikely for

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											there to be strong interactions between navigation/steaming and damage or mortality of this species.
Addition/ movement of biological material	Translocation of species	1	6	6	Population size	Gummy shark	1.2	1	1	1	Translocation of species could occur throughout the year over the entire SESSF. Indigenous (and occasionally exotic) invertebrate and vertebrate species caught in (or attached to) gillnets can be translocated up to several miles between shots of the gear and several hundred miles during a fishing trip. This occurs as a result of either resetting gillnets or discarding during hauling operations or between shots. This is unlikely to have a measurable impact on the gummy shark populations through direct effects or indirect effects of modification to habitats or associated communities. Translocation of species was considered most likely to affect population size of this species possibly through transmission of disease. Intensity: negligible as detection of impact was considered to have remote likelihood. Consequence: negligible; unlikely to be measurable. Confidence: low, based on lack of information on translocation of species by trawlers in the SESSF.
	On board processing	1	6	6	Behaviour/ movement	Gummy shark	6.1	3	2	2	On-board processing on vessels occurs by discarding of organic waster overboard (head and gutted fish). This is most likely to affect behaviour/movement of this species if scavengers are attracted. The extent to which gummy shark is attracted to or feed on this material is unknown, but it is unlikely that this additional food would have measurable effects on the gummy shark populations. This species is not known to feed on materials processed onboard. However, it is considered most likely of the unlikely species that could be a scavenger. Intensity: moderate because onboard processing is common (AFMA Observer database; AFMA Observer, pers.comm.). Consequence: minor

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											as impact is likely to be minimal. Confidence: high as onboard processing is considered widespread.
	Discarding catch	1	6	6	Behaviour/ movement	Gummy shark	6.1	3	2	1	Discarding is common over the SESSF and occurs frequently mostly likely along the shelf. Small quantities of live and dead fish are discarded if they are below the legal minimum length, damaged (devalued) by predation from fish, sea lice or mammals after capture in gillnets, or if they are bycatch species. This activity will most likely affect behaviour/movement of this species if scavengers are attracted. These species are considered most likely that could scavenge and feed on discarded catch. Intensity: moderate because these species are widespread. Consequence: minor as impact is likely to be minimal. Confidence: low due to lack of available data on movement behaviour of these species based on this activity.
	Stock enhancement	0									
	Provisioning	0									
	Organic waste disposal	0									
Addition of non-biological material	Debris	0									
	Chemical pollution	0									
	Exhaust	1	6	6	Behaviour/ movement	Gummy shark	6.1	1	1	2	Fishing activity hence exhaust emissions occur over SESSF. Exhaust emission is expected to pose the greatest potential risk for the behaviour/ movement of gummy shark resulting in repulsion. Impact is scored as negligible because, although the hazard occurs over a large range/scale, exhaust impacts only a small area and because gummy sharks are highly mobile with strong avoidance ability. In addition, gummy sharks are demersal, and exhaust is either directly to the atmosphere or surface waters. Exhaust emission is expected to pose

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											greatest potential risk for the behaviour/movement of this species due to repulsion. Intensity: negligible because although the hazard occurs over a large range/scale, impact area is only within metres of the vessel. Consequence: negligible fumes do not affect water. Confidence: high because localised exhaust unlikely to impact on behaviour/movement of this species.
	Gear loss	1	1	3	Population size	Gummy shark	1.2	2	1	2	Fishing occurs throughout the year over the SESSF. Gear loss believed to occur rarely. If a gillnet, or section of gillnet, is lost, it remains inert on the seabed gradually degrading. The total area affected compared with the range of the fishery would be small (<1nm2). Lost gear not resulting in damage/mortality most likely to affect population size of this species. Intensity: minor because lost gear–species interactions (if they occur) are considered rare. Consequence: considered unlikely to be measurable at the scale of squid stocks. Confidence: high because it is known that very little gear is lost, and interaction with species is considered unlikely.
	Navigation/ steaming	1	6	6	Behaviour/ movement	Gummy shark	6.1	4	1	1	Fishing activity hence navigation/steaming occurs throughout the year over the SESSF. Navigation/steaming of fishing vessels was expected to pose greatest potential risk for the behaviour/movement of this species resulting in disruption to feeding and/or movement by introducing noise into the environment. Intensity: major the hazard was considered over a large range/scale. Consequence: negligible with any consequence of navigation/steaming impacts unlikely to be measurable for this species. Confidence: low because addition of non-biological material due to navigation/steaming to impact and have consequences for the behaviour/movement of this species is unlikely, but not known.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Activity/ presence on water	1	6	6	Behaviour/ movement	Gummy shark	6.1	4	2	1	Fishing occurs throughout the year over the SESSF therefore vessels activity/present on water. Vessels in the area do attract (or avoid) animals. This species could have an avoidance reaction to acoustic signals and could use echolocation. Visual stimulus would be negligible because gummy sharks are demersal whereas the vessels are at the surface. The noise of engines or electromagnetic stimulus might cause the animals to move. Intensity: major. Consequence: minor as aggregations could be disturbed. Confidence: low because available data on acoustic disturbance on an aggregation on the behaviour/movement of this species is unknown.
Disturb physical processes	Bait collection	0	0	0							
	Fishing	1	6	6	Population size	Gummy shark	1.2	4	2	1	Fishing activity hence disturbance of physical processes occurs throughout the year over the SESSF. Disturbance of physical processes due to fishing considered most likely to affect population size of this species. Demersal gillnet fishing is passive and is judged to have minor impacts on physical processes. Anchors or metal weights and foot line can disturb sediments and move rocks. Rocks occasionally tangle in gillnets and brought to the surface where they are usually discarded back into the sea. This species considered most likely to be affected as they are bottom-dwellers and fishing may disturb sediments. Intensity: major as disturbance of sediment may occur often over broad spatial scale. Consequence: minor as sediment disturbance not likely to affect population size or dynamics of this species. Confidence: low because little information is available.
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Behaviour/ movement	Gummy shark	6.1	2	1	2	Fishing occurs throughout the year over the SESSF. Anchoring/mooring possible over this scale although probably only in bays. Disruption of the sediments may occur from anchoring through the contact with the

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											bottom. Disturbance to physical processes from anchoring or mooring most likely to affect behaviour/movement of this species. Juveniles enter coastal bays so considered most vulnerable to impact. Intensity: minor - occurs in restricted locations. Consequence: negligible. Confidence: high because it is considered very unlikely for there to be strong interactions between this species and disturbance to physical processes from anchoring/mooring.
	Navigation/steaming	1	6	6	Behaviour/ movement	Gummy shark	6.1	1	1	2	Navigation/steaming occurs throughout the year over the SESSF. Disturbance to physical processes due to Navigation/steaming of fishing vessels was expected to pose greatest potential risk for the Behaviour/movement of this species resulting in disruption to feeding. Intensity: negligible because although the hazard was considered over a large range/scale, navigation/steaming considered to only impact a small area (<1 nm). Consequence: negligible with any impact of navigation/steaming unlikely to be measurable for this species. Confidence: high because navigation/steaming unlikely to impact and have consequences for the behaviour/movement of this species.
External impacts	Other fisheries: SESSF-Otter trawl; GAB trawl; State fisheries	1	6	6	Population size	Gummy shark	1.2	3	4	1	Fishing occurs throughout the year over the SESSF. Capture of fish from trawl fisheries (SESSF Otter Trawl and GAB Trawl) and State fisheries most likely to affect population size of this species. The population status of this species in the SESSF is known and is subject to quota limits. Intensity: moderate as there is potential for severe impacts on population size if all quota is caught from this fishery. Consequence: major as population may not recover if overfished. Confidence: low because there is no current accepted quantitative assessment for this species within the SESSF.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Aquaculture	1	3	6	Behaviour/ movement	Gummy shark	6.1	2	2	1	Aquaculture occurs at sites throughout SE Australian in harbours, bays and estuaries (out of jurisdiction) adjacent to inner shelf habitats. Salmon aquaculture in Tasmanain waters could affect behaviour/movement of this species. This species selected as both juveniles and adults are known to occur in large marine embayments which could coincide with aquaculture sites. Intensity: minor as co-location of aquaculture sites and juveniles could occur rarely. Consequence: minor, as aquaculture expected to have minimal impact on gummy shark behaviour/movement. Confidence: low as there is little data on the co-location of aquaculture sites and juvenile gummy shark.
	Coastal development	1	6	6	Behaviour/ movement	Gummy shark	6.1	3	2	1	Coastal development occurs throughout the SESSF. Most likely to affect behaviour/movement of target species as available habitat is occupied. Most gummy shark stocks are well away from these developments. Neonates, young juveniles, and females in breeding condition are the most likely animals to be impacted. Intensity: moderate, both broad coastal development and localised centres. Consequence: minor as coastal development expected to have minimal impact on gummy shark behaviour/movement. Confidence: low as there is little data available.
	Other extractive activities	1	4	6	Behaviour/ movement	Gummy shark	6.1	3	2	1	Ongoing development and expansion of oil and gas pipelines, oil and gas exploration and extraction drilling, and seismic survey for further oil and gas exploration occurs across southern Australia (e.g. Bass Strait). Ongoing oil and gas exploration by seismic survey and expansion of pipelines in Bass Strait is potentially affecting behaviour and movement of chondrichthyan species. In particular, there is uncertainty of seismic survey effects on the auditory and lateral line sensory acuity of gummy shark. There is potential for impact to last weeks to months. Most likely to affect behaviour/movement of this species. The auditory and lateral line sensory acuity of this species could be affected by seismic survey. Intensity: moderate as local effects may be severe. Consequence: minor

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											as effect on population dynamics expected to be minimal. Confidence: low as potential effects are unknown for this species.
	Other non extractive activities	1	5	6	Behaviour/ movement	Gummy shark	6.1	3	2	1	Naval activities are likely to have minor effects on the movement and behaviour of this species. Less predictable are the effects of installation of high voltage direct current (HVDC) sub-sea cables (notably Bass link across Bass Strait) on the behaviour and movement of gummy shark; all chondrichthyan species have highly developed electroreception and magnetoreception. Intensity: moderate. Consequence: minor, as impact on behaviour/movement of this species is considered to be minimal. Confidence: low, little information on potential effects.
	Other anthropogenic activities	1	5	6	Behaviour/ movement	Gummy shark	6.1	2	1	1	Major shipping routes, tourism, recreational boating are likely to have minor effects on the behaviour and movement of this species. These effects are considered localized and only impact a small proportion of the population. Intensity: minor, activities could impact a wide range. Consequence: minor, as restricted area rare event short term effects. Confidence: low, limited available information.

Level 1 (SICA) Document L1.2 - Byproduct and Bycatch Component.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Capture	Bait collection	0									
	Fishing	1	6	6	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.1, 1.3, 1.4	4	3	1	Fishing occurs throughout the year over the SESSF. Population size likely to be affected before major changes in other sub-components. This species is endemic to southeastern Australia in shallow water (to at least 60 m) and is mostly commonly caught byproduct species due to high gillnet selectivity by 6 inch and 7 inch mesh sizes (which is mostly discarded (AFMA Logbooks). Current population size is unknown. While relative CPUE abundance indices (trawl caught draughtboard sharks) have not declined off southern New South Wales and eastern Victoria over the 1996–2006 period (Walker and Gason 2007), there are no such indices for gillnet caught draughtboard sharks within the assessment period. Intensity: major as mostly caught along central Bass Strait and South East Transition and species depth distribution (to ~136m) is within the permitted depth of fishing (<183m). Consequence: moderate as existing spatial closures may not adequately protect the stock (e.g., Upper slope Dogfish Management Strategy implemented in 2012). Also, population size is unknown. Confidence: low as there is no evidence for a declining resource.
	Incidental behaviour	0									
Direct impact without capture	Bait collection	0									
	Fishing	1	6	6	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	3	2	1	Fishing occurs throughout the year over the SESSF. Injury/mortality to bycatch species as a result of passing through the net is expected to have highest potential risk for the population size sub-component. This species was chosen as unit of analysis because it is believed to be a

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											species that could escape through the nets. Direct impacts on these populations are from cryptic fishing mortality caused by escapement of animals injured from encounters with gillnets after capture in gillnets. This cryptic fishing mortality is difficult to measure precisely but is small compared with the fishing mortality associated with the retained catch. However, it has been shown that these sharks are usually returned to the water alive and fishing mortality is low, due to its resilience; it can survive for considerable time out of water (Frick et al. 2009; Braccini et al. 2012). Intensity: major as smaller sharks escaping the net occurs at broader spatial scale or locally severe (mainly fished in waters <100 m depth along Bass Strait and South Eastern Transition region). Consequence: minor as impact unlikely to affect long-term recruitment dynamics. Confidence: low because of lack of data on mortality of fish that escape net.
	Incidental behaviour	0									
	Gear loss	1	1	3	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	2	1	2	Fishing occurs throughout the year over the SESSF. Gear loss occurs rarely and any lost gear resulting in damage/mortality most likely to affect population size of this species. If a buoy-line or gillnet (headline, lead-line and webbing) break, the gillnet can be retrieved from the other end. If both ends break, the nets can be located using GPS and retrieved using grapnels. If a gillnet or section of gillnet is lost, it gradually rolls into a ball from the effects of tidal flow. This species can occur near rocky reefs where gear most likely to be lost. Intensity: minor because gear loss is rare. Consequence considered unlikely to be measurable at the scale of bigeye ocean perch stocks. Confidence: high because it is known that very little gear is lost, and if so, most are

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											retrieved (AFMA Observer, pers. comm.) and interaction with this species is considered unlikely.
	Anchoring/ mooring	1	3	4	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	2	1	2	Fishing occurs throughout the year over the SESSF. Anchoring/ mooring possible over this scale although probably only in bays. Direct impact (damage or mortality) that occurs when anchoring or mooring most likely to affect population size of this species. This species inhabits coastal bays so considered most vulnerable to impact. Intensity: minor. Consequence: negligible, unlikey that this species coming into direct contact with anchors and impact unlikley to be detectable. Confidence: high because it is considered very unlikely for there to be damage or mortality to this species associated with this activity.
	Navigation/ steaming	1	6	6	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	4	1	2	Navigation/steaming occurs throughout the year over the entire SESSF. Direct impact (damage or mortality) without capture due to navigation/steaming was considered most likely to affect population size of this species. This species can be close to surface. Intensity: moderate. Navigation/steaming is a large component of the SESSF operations. Consequence: negligible as it is unlikely to be measurable. Confidence: high because it was considered unlikely for there to be strong interactions between navigation/steaming and damage or mortality of this species.
Addition/ movement of biological material	Translocation of species	1	6	6	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	1	1	1	Fishing activity hence Translocation of species could occur throughout the year over the SESSF. Translocation of species was considered most likely to affect population size of this species possibly through transmission of disease. This species mostly occurs in waters <136 m, but also near surface waters. Intensity: negligible as detection of impact was considered to have remote likelihood. Consequence: negligible as unlikely to be measurable. Confidence: low because there

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											is no information on translocation of species by gillnet fishers in the SESSF.
	On board processing	1	6	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	3	2	2	Onboard processing only occurs in parts of the fishery where animals are head and gutted and/or trunked. Sharks are beheaded and eviscerated at sea, and the heads and viscera are discarded at sea, usually near where the sharks are captured. The extent to which byproduct and bycatch species are attracted to or feed on this material is unknown, but this additional food could have measurable effects on the behaviour of byproduct and bycatch species. This is most likely to affect behaviour/movement of this species should they scavenge for such oragnic matter. This species considered most likely species that could be a scavenger. Intensity: moderate because onboard processing is common. Consequence: minor as impact is likely to be minimal. Confidence: high as onboard processing is known to occur (AFMA Observer pers. com. and AFMA Observer database).
	Discarding catch	1	6	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	3	2	1	Discarding is common over entire SESSF and occurs frequently. It is most likely to affect behaviour/movement of species should they be attracted to the discards. Small quantities of live and dead fish are discarded if they are of length below the legal minimum length, damaged (devalued) by predation from fish, sea lice or mammals after capture in gillnets, or if they are bycatch species. This species is considered most likely byproduct species that could be a scavenger. Intensity: moderate because this species is widespread. Consequence: minor as impact is likely to be minimal. Confidence: low due to lack of available data on movement behaviour of these species based on this activity.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Stock enhancement	0									
	Provisioning	0									
	Organic waste disposal	0									
Addition of non-biological material	Debris	0									
	Chemical pollution	0									
	Exhaust	1	6	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	1	1	2	Fishing activity hence exhaust emissions occur over SESSF. Exhaust emission is expected to pose greatest potential risk for the behaviour/movement of this species due to repulsion. This species considered most vulnerable as small individuals occur near surface waters. Intensity: negligible because although the hazard occurs over a large range/scale, impact area is only within metres of the vessel, either directly to the atmosphere or surface waters. Also, this species is highly mobile with strong avoidance ability. Consequence: negligible as any consequence on this species unlikely to be measurable. Confidence: high because localised exhaust unlikely to impact on behaviour/movement of this species.
	Gear loss	1	1	3	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	2	1	2	Fishing occurs throughout the year over the SESSF. Demersal gillnet loss believed to occur rarely. If a gillnet, or section of gillnet is lost, it remains inert on the seabed gradually degrading. Lost gear not resulting in damage/mortality most likely to affect population size of this species. Intensity: minor. Consequence: considered unlikely to be measurable at the scale of shark stocks. Confidence: high because it is

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											known that very little gear is lost, and interaction with species is considered unlikely.
	Navigation/ steaming	1	6	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	4	1	1	Fishing activity hence navigation/steaming occurs throughout the year over the SESSF. Navigation/steaming of fishing vessels was expected to pose greatest potential risk for the behaviour/movement of this species resulting in disruption to feeding and/or movement by introducing noise into the environment. This species considered most vulnerable as stock status is unknown andcan occur near surface waters. Intensity: major. Consequence: negligible with any consequence of navigation/steaming impacts unlikely to be measurable for this species. Confidence: low because addition of non-biological material due to navigation/steaming to impact and have consequences for the behaviour/movement of this species is unlikely, but not known.
	Activity/ presence on water	1	6	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	4	2	1	Activity/presence on water occurs over the SESSF. Vessels in the area do attract (or avoid) animals. This species could have an avoidance reaction to acoustic signals and could use echolocation. Intensity: major as presence of vessels occurs throughout. Consequence: minor as these animals could be disturbed. Confidence: low because available data on acoustic disturbance on a spawning on the behaviour/movement of this species is unknown.
	Bait collection	0									

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Disturb physical processes	Fishing	1	6	6	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	4	2	1	Fishing activity hence disturbance of physical processes occurs throughout the year over the SESSF. Demersal gillnet fishing is passive and is judged to have minor impacts on physical processes. Danforth anchors or metal weights and foot line can disturb sediments and move rocks. Rocks occasionally tangle in gillnets and brought to the surface where they are usually discarded. Disturbance of physical processes due to fishing considered most likely to affect population size of this species, as it is most likely to be affected as they are bottom-dwellers and fishing may disturb sediments. Intensity: moderate as disturbance of sediment may often occur. Consequence: minor as sediment disturbance not likely to affect population size or dynamics of this species. Confidence: low due to lack of available information.
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	2	1	2	Fishing occurs throughout the year over the SESSF. Anchoring/mooring possible over this scale although probably only in bays. Disruption of the sediments may occur from anchoring through the contact with the bottom. Disturbance to physical processes from anchoring or mooring most likely to affect behaviour/movement of this species. Intensity: minor, given that anchoring/mooring not likely to affect behaviour/movement of this species. Consequence: negligible. Confidence: high because it is considered very unlikely for there to be strong interactions between this species and disturbance to physical processes from anchoring/mooring.
	Navigation/ steaming	1	6	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	1	1	2	Navigation/steaming occurs throughout the year over the SESSF. Disturbance to physical processes due to navigation/steaming of fishing vessels was expected to pose greatest potential risk for the Behaviour/movement of this species resulting in disruption to feeding. This species considered most vulnerable as population status is

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											unknown. Intensity: negligible because although the hazard was considered over a large range/scale, navigation/steaming considered to only impact a small area (<1 nm). Consequence: negligible with any impact of navigation/steaming unlikely to be measurable for this species. Confidence: high because this activity is unlikely to impact and have consequences for the behaviour/movement of this species.
External impacts	Other fisheries	1	6	6	Population size	Draughtboard shark; Draughtboard sharks (mixed)	1.2	4	3	1	Fishing occurs throughout the year over the SESSF. Capture of fish from trawl fisheries (SESSF Otter Trawl and GAB Trawl) and State fisheries most likely to affect population size of this species. This species considered to be most vulnerable. The population status of this species in the SESSF is uncertain. Intensity: severe as there is potential for severe impacts on population size. Consequence: moderate as population may not recover if overfished. Confidence: low because there are no biomass estimates for this species within the SESSF.
	Aquaculture	1	3	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	2	2	1	Aquaculture occurs at sites throughout SE Australian in harbours, bays, and estuaries (out of jurisdiction) adjacent to inner shelf habitats. Salmon aquaculture in Tasmanain waters could affect behaviour/movement of this species. This species selected as juveniles can occur in large marine embayments which could coincide with aquaculture sites. Intensity: minor as co-location of aquaculture sites and juveniles could occur rarely. Consequence: minor, as aquaculture expected to have minimal impact on behaviour/movement of this species. Confidence: low as there is little data on the co-location of aquaculture sites and juveniles.
	Coastal development	1	6	6	Behaviour/ movement	Draughtboard shark;	6.1	3	2	1	Coastal development occurs throughout the SESSF. Most likely to affect behaviour/movement of target species as available habitat is occupied. This species selected as the juveniles occur along inshore waters which

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
						Draughtboard sharks (mixed)					could coincide with coastal development. Intensity: moderate. Consequence: minor as coastal development expected to have minimal impact on behaviour/movement of this species. Confidence: low as there is little data available.
	Other extractive activities	1	4	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	3	2	1	Ongoing development and expansion of oil and gas pipelines, oil and gas exploration and extraction drilling, and seismic survey for further oil and gas exploration occurs across southern Australia (e.g. Bass Strait). Most likely to affect behaviour/movement of these species. The auditory and lateral line sensory acuity of this species could be affected by seismic survey. Intensity: moderate as local effects are potentially severe. Consequence: minor as effect on population dynamics expected to be minimal. Confidence: low as potential effects are unknown for this species.
	Other non extractive activities	1	5	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	3	2	1	Ongoing shipping, naval activities and ocean dumping is likely to have minor effects on the movement and behaviour of these species. Intensity: minor, as detectability is considered to be rare. Consequence: moderate. Confidence: low, little information on potential effects.
	Other anthropogenic activities	1	5	6	Behaviour/ movement	Draughtboard shark; Draughtboard sharks (mixed)	6.1	2	1	1	Major shipping routes, tourism, recreational boating, and oil spills are likely to have minor effects on the behaviour and movement of this species. These effects are considered to be localized and only impact a small proportion of the population. Intensity: minor, activities could impact a wide range. Consequence: minor, as restricted area rare event short term effects. Confidence: low, limited available information.

Level 1 (SICA) Document L1.3 - Protected Species Component.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Capture	Bait collection	0									
	Fishing	1	6	6	Population size	Indo-Pacific bottlenose dolphins, Fur seals, Shortfin mako	1.1	4	3	1	Fishing occurred daily on the shelf and shelf break predominantly but throughout most of jurisdiction. Nearly 500 mako sharks caught at constant rate but no population information (possibly declining). Over 100 interactions with dolphins, nearly all fatal, rate has been constant but unknown population status. Over 100 fur seals also caught but the rate has increased in last 2 years. Fur seals are central placed foragers and their distribution relatively restricted by colony placement. Indo-Pacifc bottlenosed dolphin species are more coastal than other species and most likely to overlap with current gillnet footprints. Common dolphins thought to be most numerous. Intensity: major, fishing widespread in species distributional ranges. Consequence: moderate, popluation estimates for dolphins uncertain as are identifications, and sub-population structuring presents greater risk to structure of 'family groups' but population wide mortality probably low. Simialry colony-specific mortality of fur seals could be higher but total population impact small. i.e. about 0.1% p.a, unlikely to detect difference against background population variability. Mortality rate on mako could be higher but unknown population size. Confidence: low; all PS interactions reported to AFMA/DoEE published on website, but population estimates uncertain, and some populations of fur seals and dolphins appear to be declining.
	Incidental behaviour	0									
	Bait collection	0									

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Direct impact without capture	Fishing	1	6	6	Interactions with fishery	IndoPacific and Common bottlenose dolphins	7.1	4	2	2	Fishing occurred daily on the shelf and shelf break predominantly but throughout most of jurisdiction. Bottlenosed dolphins (both species) most at risk due to uncertainty of population sizes and attraction to all fishing activities to feed on discards and net feed. Fishing represents greatest risk to dolphin behaviour and movement. Intensity: major, fishing occurs throughout the year mostly on inner shelf where bottlenosed dolphins in particular are likely to be present. Consequence: minor, evidence of habituation to noise of fishing operations by sub-populations and learning to follow fishing vessels for feeding opportunities which exposes them to physical interactions. Confidence: high; all PS interactions reported to AFMA/DoEE.
	Incidental behaviour	0									
	Gear loss	1	1	3	Interactions with fishery	Australian fur seal	7.1	2	1	1	Gear loss occurs rarely (~1 per year) but not verified and is usually retrieved. Major gear loss may modify fur seal behaviour by attracting them to lost catches and/or entangle them however minor losses not likely to impact. Intensity: minor, but gear loss not reported. Consequence: negligible if gear loss is rare. Confidence: low, major gear losses not reported.
	Anchoring/ mooring	1	3	4	Behaviour/ movement	Syngnathids	6.1	2	1	2	Anchoring/ mooring may occur in SET inner shelf where fishing effort highest but probably most occurs in sheltered bays in state waters. Some syngnathids may be disturbed or displaced from habitat by anchoring of vessel in shallow waters and distributions may be disrupted briefly. Intensity: minor occurs in a few restricted locations. Consequence: negligible. Confidence: high because very unlikely for there to be lasting effect from anchoring/mooring logical.
	Navigation/ steaming	1	6	6	Population size	Albatrosses	6.1	3	2	2	Vessels navigate and steam throughout the SESSF and year. Albatrosses may be attracted to the vessel and strike superstructure causing death or injury. Dolphins may also be attracted to vessels but strikes unknown. Intensity: moderate, navigation/steaming is a large component of the fishing operations.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											Consequence: minor - all strikes recorded <2 albatross mortlaity recorded per year. Confidence: high - all interactions must be recorded.
Addition/ movement of biological material	Translocation of species	1	6	6	Population size	Syngnathids	1.1	1	1	1	Translocation of species such as introduced habitat-modifying invasive species, might affect habitat-dependent species such as syngnathids. Potentially species may be moved relatively short distances within normal distributional range and discards from fishing operations as nets are cleaned. Intensity: negligible as unlikely to be detected. Consequence: negligible, no known pathogen transmitssion. Introductions and range extensions of invasive species such as NZ screw shell, *Centrostephanus*, starfish, have occurred in past but not attributed to fishing operations. Confidence: low, no evidence.
	On board processing	1	6	6	Behaviour/ movement	Bottlenose dolphins, Australian fur seals	6.1	3	2	1	On board processing attracts birds, dolphins, and seals in response to discarded offal from processing. Bottlenose dolphins and common dolphins at higher risk of interaction based on reported interactions with trawls and bycatch mortality in Australia and internationally (EP Report 2014) but likely similar or slightly lower for gillnetters. Indo-Pacific bottlenose dolphins are behaviourally plastic and able to adapt to feeding in association with various fisheries. Intensity: moderate, onboard processing is common. Consequence: minor, change in behaviour temporary. Confidence: low, evidence of behavioural modification although not local.
	Discarding catch	1	6	6	Behaviour/ movement	Bottlenose dolphins, Australian fur seals	6.1	3	2	1	Discarding attracts dolphins and seals to feed on discarded catches. Bottlenose dolphins and common dolphins at higher risk of interaction based on reported interactions with trawls and bycatch mortality in Australia and internationally (EP Report 2014) but likely similar or slightly lower for gilnetters. Indo-Pacific bottlenose dolphins are behaviourally plastic and able to adapt to feeding in association with various fisheries. Intensity: moderate, common throughout the fishery. Consequence: minor, changes in behaviour temporary although coudl be localised behavioural changes in some areas. Confidence: low, no data

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Stock enhancement	0									
	Provisioning	0									
	Organic waste disposal	0									
Addition of non-biological material	Debris	0									
	Chemical pollution	0									
	Exhaust	1	6	6	Population size	Albatrosses	1.1	1	1	1	Exhaust emitted throughout the fishery daily. Birds most likely to be imacted by fumes. Intensity: negligible because although the hazard occurs over a large range/scale, impact area is only within metres of the vessel. Consequence: negligible, effect on free-flying birds impossible to detect. Confidence: low.
	Gear loss	1	1	3	Behaviour/ movement	Fur seals	6.1	2	1	1	Gear loss occurs rarely (1 per year?) on fishing grounds and is usually retrieved. If a gillnet or section of gillnet was lost, it gradually rolls into a ball from the effects of tidal flow. Abandoned gear may modify fur seal behaviour by attracting them to potentially entangled fish. Intensity: minor, major gear loss rare although minor losses may ensnare animals potentially impeding their livelihoods. Consequence: negligible, unlikely to detect variation in behaviour. Confidence: low, gear losses not reported.
	Navigation/ steaming	1	6	6	Behaviour/ movement	IndoPacific bottlenose dolphins, Australian fur seals	6.1	4	2	1	Noise and echosounding from fishing operations represents greatest risk to IP bottlenosed dolphin and Australian fur seals behaviour and movement as they become habitutated to fishing vessel noise or disturbed by acoustics (McCauley and Cato 2003). Intensity: major, vessels operate throughout the area all year and overlap with distribution of coastal dolphin species and fur seals. Consequence: minor, unlikely to have had more than minimal impact on stock although evidence of habituation to noise of fishing operations leading to

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											physical interactions. Confidence: low; physical PS interactions reported to AFMA/DoEE but not all observable and unknown effects.
	Activity/ presence on water	1	6	6	Population size	Albatrosses	1.1	4	2	2	Potential for collision of birds, in particualr albatross with superstructure of vessel. Vessel collisions resulting in injury or death of whales and some other cetaceans are thought to be relatively common in Australian waters but are not well documented (EP Report 2014). Intensity: major fishing vessels present throughout range and year. Consequence: minor, minor cause of fatal interaction therefore mortality rates low. Unreported strike of cetaceans more concerning. Confidence: high, all interactions with PS are recorded although uncertainty on cetacean vessel strike.
Disturb physical processes	Bait collection	0									
	Fishing	1	6	6	Population size	Syngnathids	1.1	4	2	1	Fishing effort greatest occurs in shallower areas such as inner shelf and in Bass Strait. Mechanical action of gillnets may disturb sediments or remove structure-forming habitat for dependent species and epibenthos. A few syngnathids may occur within fishery footprint and may be disturbed or displaced. Intensity: major but unknown how much overlap between fishery effort and distribution. Consequence: minor, unlikely to detect variation in distribution. Confidence: low, no data on synathid distributions in fishery footprint.
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Population size	Syngnathids	1.1	2	1	1	Anchoring/mooring may occur in inner shelf areas and in sheltered bays. Benthic processes may be disturbed from anchoring altering critical habitat e.g. some syngnathids may be displaced if site -specific habitat altered. Intensity: minor occurs in a few restricted locations. Consequence: negligible, unlikely to detect. Confidence: high because very unlikely for there to be lasting effect from anchoring/mooring logical.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Navigation/steaming	1	6	6	Behaviour/ movement	Bottlenose and Common dolphins	6.1	2	2	1	Navigation / steaming producing bow waves modifies dolphin behaviour as they ride bow waves and may strike the vessel causing death or injury. Bottlenose dolphins and common dolphins at higher risk of interaction based on reported interactions with trawls and bycatch mortality in Australia and internationally (EP Report 2014) so possibly similar or slightly lower for gilnetters. Indo-Pacific bottlenose dolphins are considered to be behaviourally plastic and able to adapt to feeding in association with various fisheries and therefore attracted to vessels transiting. Intensity: minor, vessels transiting widespread occurrence but bow waves localised effect. Consequence: minor, normal behaviour/movement would return to normal on the scale of hours. Confidence: low, all interactions must be recorded but unlikley bow-riding is recorded.
External impacts	Other fisheries	1	6	6	Population size	Australian fur seals	1.1	4	4	2	Other SESSF fisheries - trawl, shark, auto-longline; SPF imteract with furseasl and and therefore likely to have had a severe impact on population size. Intensity: major as occurs often at a broad scale. Consequence: major as cumulative effects should be considered. Confidence: high, logical considering cumulative effects.
	Aquaculture	1	3	6	Behaviour/ movement	Australian fur seals, dolphins	6.1	2	2	2	Aquaculture occurs at sites throughout SE Australian in harbours, bays, and estuaries (out of jurisdiction) adjacent to inner shelf habitats. Salmon aquaculture in Tasmanian waters known to attract seals although dolphins often killed in fish farm protection nets. Mollusc aquaculture more frequent on mainland coast but unattractive to seals. Intensity: minor, habituation possible locally. Consequence: minor. Confidence: high.
	Coastal development	1	6	6	Population size	Australian fur seals, IP bottlnose dolphins	1.1	3	3	1	Coastal development occurs across the range of the fisher but most likely to affect fursels and inshore dolphins due to large population. Frequent, local impacts from pollution, toxins, agricultural run-off, and sewrage even at small spatial scales could have obvious impact on the health of fur seals and dolphin species. Intensity: moderate, moderate at broader spatial scale, or severe but local. Consequence: moderate, greatest impacts likely to be inshore including

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											waters less than 25m, and unlikely to extend to entire coastal demersal/pelagic communities however evidence suggests fur seals suffering from accumulation of toxic chemical pollutants. Confidence: low because of a lack of data.
	Other extractive activities	1	4	6	Behaviour/ movement	Australian fur seals, Common dolphins	6.1	3	2	1	Ongoing development and expansion of oil and gas pipelines, oil and gas exploration and extraction drilling, and seismic survey for further oil and gas exploration occurs across southern Australia (notably Bass Strait) most likely to affect distribution of the fur seals and offhosre dolphin species as sounds from air guns used in seismic surveys may affect distribution and behaviour. Intensity: moderate as local effects are potentially severe but confined to small area. Consequence: minor as long-term effect on expected to be minimal if detectable at all. Confidence: low as effects are unknown
	Other non extractive activities	1	5	6	Behaviour/ movement	Common dolphins	6.1	3	2	1	Shipping occurs throughout the area daily and considerd to impact distribution of small cetaceans such as dolphins. Intensity: moderate, shipping routes are busy. Consequence: minor as long-term effects on dolphins probably undetectable. Confidence: low because of a lack of information on shipping-animal interactions
	Other anthropogenic activities	1	4	6	Behaviour/ movement	Bottlenose and Common dolphins	6.1	2	2	1	Small cetaceans such as dolphins may be disturbed by charter boats associated with general recreational activities, and tourism (e.g. whale watching, fishing tours, anchoring, recreational diving etc). Intensity: minor as most activities are relatively close to coasts and unlikley to detect long-term impacts. Consequence: minor. Confidence: low, no information.

Level 1 (SICA) Document L1.4 - Habitat Component (demersal)

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Capture	Bait collection	0									
	Fishing	1	6	6	Habitat structure and function	Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	5.1	3	2	1	Fishing occurs throughout the year over the entire GHAT. Demersal gillnets of 150-165mm mesh-size are deployed throughout the range of the fishery. Most effort is concentrated within 70-100m, but to 183m. There is a tendency to set the gear over 'hard' ground, e.g. low outcrop or subcropping sedimentary substrates, or sediments next to patches of more complex habitat, where fish tend to aggregate. Habitats (assemblages) most vulnerable to impact by highest levels of effort were chosen from Pitcher et al 2014. Although there is no data that shows actual impact. Nets may move on the bottom, can drag and roll up, dislodging/entangling fragile, rugose, and erect octocorals, sponges, tunicates, hydroids and bryozoan corals. Occasionally on retrieval, nets have been noted to contain quantites of mixed fauna. Intensity: moderate at a local scale, as these habitats may be less common, and patchily distributed but minor on a broader scale. Consequence: minor, long regeneration times of fauna at these depths (years), frequent targeting of certain features/reefs will delay recovery. Confidence: low, no data on vulnerable habitat, requires visual validation.
	Incidental behaviour	0									
Direct impact without capture	Bait collection	0									
	Fishing	1	6	6	Habitat structure and function	Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	5.1	3	2	1	Fishing occurs throughout the year over the entire GHAT. There is a tendency to set the gear over 'hard' ground, e.g. low outcrop or subcropping sedimentary substrates, or sediment. next to patches of more complex habitat, where fish tend to aggregate. Most vulnerable babitats (assemblages) potentially impacted from highest levels of effort

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											were chosen from Pitcher et al. 2014. Although there is no data that shows actual impact and effort not in the outer shelf vulnerable habitats. Nets may move on the bottom, can drag and roll up, effectively 'scrubbing' the benthos. This may damage fragile, rugose, and erect octocorals, sponges, tunicates, hydroids and bryozoan corals. The impact on attached fauna is unknown but is probable given the patchiness of habitat over the length of nets (worse case ~ 4km). Intensity: likely to be moderate at a local scale, as these habitats may be less common, and patchily distributed, and effort not concentrated in these rugged areas. Consequence: minor due to regeneration times of fauna at these depths (years) and possible frequent targeting of certain features/ reefs. Confidence: low, anecdotal data supports judgement, requires visual validation.
	Incidental behaviour										
	Gear loss	1	1	3	Habitat structure and function	Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	5.1	2	2	2	Fishery management plan requires operators to take all reasonable steps to minimise loss of gear, but gear lost very occasionally, and retrieval may be impossible. High relief reef is avoided when targeting shark as encounter with this terrain can cause costly damage to the gear, however it is possible encounters occur with low outcropping reef/ rock inadvertently. Attempted retrieval of snagged gillnets may result in damage to rugose habitat using force required to extract net. If a gillnet or section of gillnet was lost, it gradually rolls into a ball from the effects of currents collecting some fauna in the process. Intensity: minor, the total area affected compared with the fishery range is small (<1nm^2). Consequence: Minor entrainment of upright fauna may occur with net rolling up. Confidence: high, retrieved nets balled up.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Anchoring/ mooring	1	3	4	Habitat structure and function	Inner shelf soft sediments with large sponges = friable sandstone (20)	5.1	2	2	1	Fishing occurs throughout the year over the entire GHAT therefore anchoring/mooring possible over this scale although probably mostly in sheltered bays and further offshore weekly. Anchoring and mooring can disturb inner shelf sediments and associated fauna. Habitat structure and function likely to be affected if flora and fauna are noted to be removed with the retrieval of anchors. Intensity: minor, although anchoring and mooring are undertaken throughout the range of the fishery. Consequence: minor, the area of seabed affected is small (<1 nm^2), and effects likely to be undetectable against background of natural disturbance. Confidence: low, requires validation.
	Navigation/steaming	1	6	6	Water quality	Southern Oceanic Pelagic provinces (P7)	1.1	3	1	2	Fishing therefore navigation/steaming occurs throughout the year over the entire GHAT. Navigation/steaming was considered to influence water quality by disrupting the water column. Intensity: moderate. Consequence: negligible because it was considered unlikely that there would be detectable impacts on pelagic habitat water quality. Confidence: high because negative interactions between navigation/steaming and pelagic habitat were considered very unlikely.
Addition/ movement of biological material	Translocation of species	1	6	6	Habitat structure and function	Fine sediments of inner shelf assemblage 1, 20, 18	5.1	2	1	1	Fishing activity occurs throughout the year over the entire GHAT sector. Indigenous (and occasionally exotic) invertebrate and vertebrate species caught in (or attached to) gillnets may be translocated during course of net retrieval eg., introduced NZ screw shell prefer the fine sediments and mud such as on the inner shelf and assemblages 1, 18, 20 therefore chosen as vulnerable assemblages. Although gillnets tend to be hauled and not dragged, it is likely that any translocation is localised and undetectable, therefore Intensity: minor. Consequence: negligible but there is the potential for impacts to be very large. Confidence: low as it not known to what extent gillnetting contributes to spread of species.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	On board processing	1	6	6	Substrate quality	Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	3.1	3	2	2	Sharks are headed and gutted at sea, and the heads and viscera are discarded at sea, usually near where the sharks are captured. The discarded material from on board processing expected to be eaten by birds, mammals, fish, and sea lice. Substrate quality and biogeochemistry is likely only to be affected if localised accumulations of discards occur. Intensity: moderate as onboard processing heading and gutting common. Consequence: minor, short term increases in nutrient levels at substrate. Confidence: high logical consideration, volume and distribution of discards, rate of degradration/scavenging, although effects on substrate processes have not been measured.
	Discarding catch	1	6	6	substrate quality	Shelf assemblages of fine sediments and friable sandstone (20)	3.1	3	2	2	Small quantities of live and dead fish are discarded if they are of length below the legal minimum length, damaged (devalued) by predation from fish, sea lice or mammals after capture in gillnets, or if they are bycatch species. Intensity: moderate over the scale of the fishery, waste expected to be taken up quickly by opportunistic scavengers. Consequence: minor, short term increases in nutrient levels at substrate. Localised accumulations of organic matter possible but unlikley in these depths. Confidence: high, logical consideration, volume and distribution of discards, rate of degradration/scavenging, although the effects on substrate processes have not been measured.
	Stock enhancement	0									
	Provisioning	0									
	Organic waste disposal	0									
	Debris	0									

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Addition of non-biological material	Chemical pollution	0									
	Exhaust	1	6	6	Air quality	Southern Oceanic Pelagic provinces (P7)	2.1	1	1	2	Exhaust from running engines may impact the air quality of the species within Southern Oceanic Pelagic habitat (e.g. birds). Intensity: negligible because although the hazard occurs over a large range/scale, impact area is only within metres of the vessel. Consequence: negligible due to rapid dispersal of pollutants in winds, and likely to be physically undetectable over very short time frames. Confidence: high because effect of exhaust was considered to be very localised.
	Gear loss	1	1	3	Habitat structure and function	Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	5.1	2	2	2	Fishing occurs throughout the year over the entire SESSF but gillnet loss is a rare event; the high price of gillnets creates a high incentive not to lose them. Fishery management plan requires operators to take all reasonable steps to minimise loss of gear, and to retrieve if necessary. If a gillnet or section of gillnet was lost, it gradually rolls into a ball from the effects of tidal flow. Intensity: minor gear loss is rare, and the total area affected compared with the range of the fishery would be small (<1nm^2). Consequence: minor entrainment of upright fauna may occur whilst net rolling up. Confidence: high, retrieved nets balled up.
	Navigation/ steaming	1	6	6	Water quality	Southern Oceanic Pelagic provinces (P7)	1.1	2	1	2	Fishing activity hence navigation/ steaming occurs throughout the year over the entire GHAT Vessels navigate to and from fishing grounds introduces noise and visual stimuli into the environment. Noise not known to affect water column or sediment processes. Intensity: minor as activity is moderate but effect is localised. Consequence: negligible due to remote likelihood of detection at any spatial or temporal scale, and interactions that may be occurring are not detectable against natural variation. Confidence: high, logical.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Activity/ presence on water	1	6	6	Habitat structure and function	Southern Oceanic Pelagic provinces (P7)	5.1	3	1	2	Fishing occures throughout the GHAT therefore boats active and present on the water. Pelagic/air habitats will be impacted by noise and visual stimuli, birds and seals may be attracted to fishing operations. Intensity: moderate as boats present thorughout year and GHAT. Consequence: negligible unlikely to have any detectable, or effect will be temporary. Confidence: high.
Disturb physical processes	Bait collection	0									
	Fishing	1	6	6	Substrate quality	Fine sediments, Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	3.1	3	2	1	Substrate processes are considered vulnerable to disturbance by the mechanical action of gillnets which stir up sediments and epibenthos. Subcropping or surface slabs provide attachment points for organisms (habitat), which may be dislodged or overturned by gear if entangled. Fragile bryozoan crusts in these regions can be converted from hard to soft grounds with substratum disturbance (4, 14, 9), altering the way the habitat may be utilised by fauna. Intensity: moderate, gillnetting throughout GHAT. Consequence: minor, sediments may be locally disturbed increasing water turbidity, and although coarser sediments will resettle rapidly, finer sediments may remain suspended for some time. Confidence: low, effects on benthos require validation.
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Habitat structure and function	Inner shelf fine sediments, large sponges possibly Friable sandstone (20)	5.1	2	1	2	Fishing occurs throughout the year over the entire GHAT therefore anchoring/mooring possible although probably only in bays on weekly temporal scale. Direct impact (damage or mortality) that occurs when anchoring or mooring most likely to affect habitat structure and function. Inner-shelf sponge beds most likely to be damaged by physical contact with anchor (20). Intensity: minor as anchoring/mooring is not daily, and more likely to occur on soft bottom. Consequence: negligible

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											as anchoring considered to affect only a very small percentage of the area of the habitat, that has a reasonably rapid regenerative capacity and impossible to detect. Confidence: high because it is considered very unlikely for there to be lasting damage to a significant area of inner-shelf habitat from anchoring/mooring.
	Navigation/ steaming	1	6	6	Habitat structure and function	Southern Oceanic Pelagic provinces (P1)	5.1	2	1	2	Fishing hence navigation/steaming occurs throughout the year over the entire GHAT. Disturbance of physical processes will occur during the normal course of steaming throughout the fishing zone. Noise, turbulence, and disturbance of pelagic water quality is unlikely to affect normal water column processes. Studies show seismic activity may have consequences on benthic fauna composition on seabed, however no evidence to show that normal navigation of fishing vessels has deleterious effects. Intensity: minor as activity is moderate but effect is localised. Consequence: negligible due to remote likelihood of detection at any spatial or temporal scale, and interactions that may be occurring are not detectable against natural variation. Confidence: high, logical.
External impacts	Other fisheries	1	6	6	Habitat type, structure, and function	Friable sandstone (20), stalked crinoids (2), bryozoans (4, 14, 9), habitat-forming benthos in GAB (8)	4.1, 5.1	4	3	1	Other fisheries operating over same grounds with potential to impact benthos include otter trawl, Danish seine, autolongline, dredge and, to a lesser degree, trap, demersal longline, and ocassionally midwater trawl gears. Fishing activity of these fisheries occurs over a large spatial range, over which there can be daily fishing activity. Cumulative effects on habitat type and habitat structure and function are a concern for all habitats, but particularly those at depths>100m which may be trawled or netted. Sediment-based habitats supporting large sponges are likely to be most subject to effort (20). Intensity: major as all methods work over these grounds. Consequence: moderate, as majority of gears have very small seafloor footprint but trawl fishery is large. Confidence: low; little data is available on the age, growth and regeneration rates of

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											temperate sponge habitats in depths 100m - 200m nor on damage attributable to fishing methods.
	Aquaculture	1	3	6	Water quality, substrate quality	Inner shelf sediments e.g adjacent to assemblage 6, 14, 20	1.1, 3.1	2	1	2	Aquaculture occurs at sites throughout SE Australian in harbours, bays and estuaries (out of jurisdiction) adjacent to inner shelf habitats. Salmon aquaculture in Tasmanain waters known to impact local habitat from input of waste affecting the water and substrate quality leading to impacts on habitat type and structure and function. Management implements fallowing protocols although recovery rates not well known. Mollusc aquaculture more frequent on mainland coast and has a nutrient depletion effect. Intensity: minor, local effects quickly dispersed and unlikley to be detected against natural variability. Consequence: negligible as impacts unlikley to detect variability against natural variability except where seagrass habitat important to different life stages of a variety species-no evidence. Confidence: high, e.g. nutrient inputs of D'entrecasteaux Channel, Huon River into Derwent Estuary are quickly dispersed into Storm Bay but impacts, if any, are difficult to measure against other anthopogenic sources (Wild-Allen and Andrewartha 2016).
	Coastal development	1	6	6	Water quality, substrate quality, habitat types, habitat structure and function	Inner shelf sediments e.g. Assemblages 1, 20	1.1, 2.1 3.1, 4.1, 5.1	3	2	1	Coastal development can affect inner shelf habitats such as assemblage 1, 20 where the largest population centres occur. Frequent, local impacts at small spatial scales are likely to have most obvious impact on the habitat composition, structure and function, water quality and substratum state. Intensity: moderate, range of activities likely to have local effects such as removal or degradation of inshore habitats, particularly nursery habitats. Consequence: minor, greatest impacts likely to be inshore including waters in less than 25 m (not within fishery boundary) but detection further out onto the inner shelf unknown. Confidence: low, little data on the cumulative effects

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Other extractive activities	1	4	6	Substrate quality, habitat types, habitat structure and function	Outer shelf mud in Assemblage 11	2.1, 3.1, 4.1, 5.1	3	2	1	Ongoing development and expansion of oil and gas pipelines, oil and gas exploration and extraction drilling, and seismic survey for further oil and gas exploration occurs across southern Australia (notably Bass Strait). Infrasctructure impacts seafloor locally, but oil leaks/spills may impact water and substrate quality in immeditate area. Intensity: moderate; may be pollution and disturbance during development and operational stages. Consequence: minor as localised but extensive and through zones of high biodiversity. Confidence: low, little information on effects of pipelines on surrounding habitats although modeling suggests very contracted impact area.
	Other non extractive activities	1	5	6	Water quality	Southern and Eastern Oceanic Pelagic provinces (P1 P7)	1.1	3	2	1	Major shipping acitivity throughout fishery daily and considerd to impact the water quality of the pelagic habitat through turbulence, leaking of pollutants, etc. Intensity: moderate, east coast shipping routes busy. Consequence: minor, spatial areas very small and unlikley to detect variability. Confidence: low, little information on effects.
	Other anthropogenic activities	1	4	6	Water and air quality, substrate quality, habitat types, structure and function	shelf: inner, outer, and break (assemblages 1,20,12,17,5,12,7,10, 16,13,18)	1.1, 2.1 3.1, 4.1, 5.1	2	2	1	Tourism and recreational activity could increase noise, pollutants, into the pelagic habitat particularly. Some activities could impact habitats such as recreational fishing/diving with certain gear. Intensity: minor although difficult to assess cumulative effects. Consequence: minor, restricted area rare event short term effects although no information to assess cumulative effects. Confidence: low, limited information.

Level 1 (SICA) Document L1.5 - Community Component.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Capture	Bait collection	0									
	Fishing	1	6	6	Trophic size/structure	SET outer shelf; SET upper slope	4.1	4	3	2	Capture by fishing most likely to affect trophic structure and size of communities as some species may be showing evidence of change in size structure e.g. tiger flathead which may affect the trophodynamics of the community foodweb. SET outer shelf and upper slope chosen because these communities have the highest proportion of area fished, smallest area of heavily fished, the second highest average catch. Intensity: major as fishing occurs in 84% and 89% of 1km grids over the shelf and slope, respectively. Consequence: moderate as most key species populations appear to be sustainable or improving over past decade after decrease in effort. Confidence: high as many annual stock assessments conducted on the key commercial and bycatch species.
	Incidental behaviour	0									
Direct impact without capture	Bait collection	0									
	Fishing	1	6	6	Trophic size/structure	SET outer shelf	4.1	4	3	1	Direct impact without captures most likely to affect trophic size/structure from post-capture mortality. SET outer shelf and upper slope chosen because these communities have the highest proportion of area fished, smallest area of heavily fished, the second highest average catch and logically highest escapement and post-capture mortality. Intensity: major as fishing occurs in 84% and 89% of 1km grids over the shelf and slope, respectively. Consequence: moderate as most key species populations are becoming stable or improving over past decade after decrease in effort and now considered sustainable. Confidence: low, cannot demonstrate changes due to post-escapement mortality.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	Incidental behaviour	0									
	Gear loss	1	1	3	Species composition	SET outer shelf; SET upper slope	1.1	2	1	2	SET outer shelf and upper slope chosen as most gear loss is likely to occur there. Dropped nets might contain catch which would be lost. Intensity: minor as little gear is lost and usually retrieved. Consequence: negligible as any effect on communities due to gear loss immeasurable. Confidence: high, gear loss reported.
	Anchoring/ mooring	1	3	4	Distribution of the community	SET inner shelf	3.1	2	1	2	Anchoring/ mooring may occur in SET inner shelf where fishing effort highest but probably most occurs in sheltered bays in state waters. Some sedentary fish may be disturbed by presence of vessel in very shallow waters and distributions may be disrupted briefly. Intensity: minor, occurs in a few restricted locations. Consequence: negligible. Confidence: high because very unlikely to be lasting logical effect from anchoring/mooring.
	Navigation/ steaming	1	6	6	Species composition	SET outer shelf; SET upper slope	1.1	4	1	2	SET outer shelf and upper slope chosen because these communities have the highest proportion of area fished, smallest area of heavily fished, the second highest average catch. Intensity: major as fishing occurs in 84% and 89% of 1km grids over the shelf and slope, respectively, and navigation/steaming is a large component of SESSF operations. Consequence: negligible, it is unlikely to detect any measurable effect on communities. Confidence: high (logic).
Addition/ movement of biological material	Translocation of species	1	6	6	Species composition	SET inner shelf	1.1	1	1	1	Translocation of species most likely to affect species composition of the community if new species are added. SET inner shelf chosen as translocation of species most likely to occur there close to ports. Intensity: negligible, no impacts detectable. Consequence: negligible, no evidence of translocations although potential for impacts to be very large. Confidence: low as there is no data on current translocation of species by trawlers in the SESSF.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
	On board processing	1	6	6	Distribution of the community	SET outer shelf; SET upper slope	3.1	3	1	2	SET outer shelf and upper slope chosen as onboard processing most likely to occur there and likely to attract scavengers temporarily changing the distribution of the community. Intensity: moderate, onboard processing (heading and gutting) common. Consequence: negligible as impact on communities is unlikely to be measurable against natural variation and not persistent. Confidence: high as onboard processing is not widespread.
	Discarding catch	1	6	6	Trophic size/structure	SET outer and inner shelf	4.1	3	2	1	Discarding catch could affect energy flow through the community foodweb if scavengers are heavily dependent on discards. SET outer and inner shelf communities chosen as most effort occurs there. Intensity: moderate as discarding is common over SESSF. Consequence: minor as localized accumulations of waste rapidly dispersed so species are unlikely to become habituated to using discards as a food source as they are opportunistic. Confidence: low due to lack of data.
	Stock enhancement	0									
	Provisioning	0									
	Organic waste disposal	0									
Addition of non-biological material	Debris	0									
	Chemical pollution	0									
	Exhaust	1	6	6	Distribution of the community	SET outer shelf; SET upper slope	3.1	1	1	2	Exhaust emissions most likely to affect distributions of communities by affecting distribution of birds in the vicinity of vessels. SET outer shelf and upper slope chosen as most fishing occurs there. Intensity: negligible as although exhaust emissions occur over a large range, impact area is only

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											within metres of the vessel. Consequence: negligible as exhaust is rapidly dissipated and unlikely to be detectable. Confidence: high (logic).
	Gear loss	1	1	3	Distribution of the community	SET outer shelf; SET upper slope	3.1	2	1	2	SET outer shelf and upper slope chosen as most fishing occurs there. Lost gear may alter the immediate habitat and consequently the immediate distribution of species. Intensity: minor as lost gear is rare. Consequence: negligible as any effect on communities unlikely to be immeasurable. Confidence: high, gear loss is reported.
	Navigation/ steaming	1	6	6	Distribution of the community	SET outer shelf; SET upper slope; Tasmanian mid-slope	3.1	4	2	1	Navigation/steaming introduces noise such as engine noise and echo sounding during fish finding/trawling considered to have most effect on distribution of communities by disturbing fish. SET upper slope, outer shelf and Tasmanian mid-slope chosen as these areas most intensely fished and where aggregating species maybe most vulnerable to disturbance (e.g. orange roughy on St. Helens hill, blue grenadier on west coast). Intensity: major: echosounders and engines of vessels would be running for duration of fishing trips and shelf communities constantly fished; less on deeper water communities such as localized grenadier and roughy aggregations. Consequence: minor as disturbance unlikely to be detected against other factors and unlikely to detect disturbance in deeper water. Confidence: low, not known whether disturbance of aggregations caused by echo sounding.
	Activity/ presence on water	1	6	6	Distribution of the community	SET outer shelf; SET upper slope	3.1	4	2	1	Activity/presence on water of fishing vessels widespread on SET upper slope, outer shelf where most intensely fished. May affect the functional group composition by changing behaviour and distribution of cetaceans, scavengers, marine mammals. Intensity: major; vessels in heavily fished areas constantly present. Consequence: minor, any change to community distribution would be undetectable against background variation except for short duration of fishing operation. Confidence: low.
	Bait collection	0									

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
Disturb physical processes	Fishing	1	6	3	Distribution of the community	Tasmanian midslope; Tasmanian seamount 565-820;	3.1	2	2	2	Removal of habitat (structure) can disrupt underpinning physical processes e.g. removal of corals on heavily fished seamounts caused significant changes to species composition and distribution of the seamount community (Koslow and Gowlett-Holmes 1998). Seamounts on the Tasmanian midslope, Cascade Plateau are particularly vulnerable to effects of fishing as species are generally long-lived and slow growing, easily depleted and have a localized distribution. Intensity: minor, fishing in deep water habitats has declined; many of the seamounts are partially protected by MPAs and deepwater fishery closures have stopped fishing occurring on vulnerable habitats supporting communities. Consequence: minor as any impact probably not detectable against previous damage and assessment. Confidence: high, impact on benthic communities believed to be significant (Koslow and Gowlett-Holmes 1998) and recovery rates believed to be slow in disturbed communities (Bruce et al. 2002).
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Distribution of the community	SET inner shelf	3.1	2	1	2	Anchoring/mooring may occur in SET inner shelf where fishing effort highest but probably most occurs in sheltered bays in state waters. Some sedentary fish may be disturbed by anchor disturbance of sediments smothering some community components. Intensity: minor as it occurs in a few restricted locations. Consequence: negligible, impossible to detect. Confidence: high because very unlikely to be logical lasting effect from anchoring/mooring.
	Navigation/steaming	1	6	6	Bio- and geo-chemical cycles	SET upper slope	5.1	1	1	2	Navigation /steaming occurred on the continental shelf and shelf break throughout the whole jurisdiction, but more concentrated SET upper slope, outer shelf and Tasmanian mid-slope chosen as these areas most intensely fished. Possible Impact on bio- and geo-chemical cycles of pelagic waters by disturbing mixed depth layer. Intensity: negligible, navigation/steaming is a large component of the trawling operations but localised impact within

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											immediate vicinity of the vessel. Consequence: negligible because impact considered likely undetectable against natural levels of mixing and re-mixing. Confidence: high, logical consideration.
External Impacts	Other fisheries	1	6	6	Species composition	SET outer shelf	4.1	4	4	2	Other SESSF fisheries - gillnet, shark, auto-longline; SPF; State and recreational fisheries affect the same communities and therefore likely to have had a severe impact on species composition. Intensity: major as occurs often at a broad scale. Consequence: major as cumulative effects could be large. Confidence: high, logical to consider cumulative effects of variety of fishing methods.
	Aquaculture	1	3	6	Bio- and geo-chemical cycles	Tasmanian inner shelf	5.1	2	1	2	Waste input from salmon aquaculture in Tasmanian waters affecting water and substrate quality leading to alteration of bio-geochemical cycles locally. Management implements fallowing protocols although recovery rates not well-known. Mollusc aquaculture more frequent on mainland coast and has a nutrient depletion effect. Intensity: minor, local effects quickly dispersed and unlikely to be detected against natural variability. Consequence: negligible as impacts on community unlikely to detect variability against natural variability except where seagrass habitat important to different life stages of a variety species-no evidence. Confidence: high, e.g. nutrient inputs of D'Entrecasteaux Channel, Huon River into Derwent estuaries are quickly dispersed into Storm Bay but impacts if any difficult to measure against other anthropogenic sources (Wild-Allen and Andrewartha 2016).
	Coastal development	1	6	6	Species composition	Central Eastern Province inner shelf, Eastern pelagic-coastal	1.1	3	2	1	Coastal development occurs across the range of the fishery but most likely to affect Central Eastern Province inner shelf community due to large population in this area. Frequent, local impacts at small spatial scales should have most obvious impact on the species composition of the areas affected, the impacts should be local and their consequences only minor to the communities. Intensity: moderate, minor both broad coastal development and localised centres. Consequence: minor, greatest impacts likely to be inshore including waters less than 25m, and unlikely to extend to entire

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	PRESENCE (1) ABSENCE (0)	SPATIAL SCALE OF HAZARD (1-6)	TEMPORAL SCALE OF HAZARD (1-6)	SUB-COMPONENT	UNIT OF ANALYSIS	OPERATIONAL OBJECTIVE (S2.1)	INTENSITY SCORE (1-6)	CONSEQUENCE SCORE (1-6)	CONFIDENCE SCORE (1-2)	RATIONALE
											coastal demersal/pelagic communities. Confidence: low because of a lack of data.
	Other extractive activities	1	4	6	Distribution of the community	Central Bass inner shelf; Southern coastal	3.1	3	2	1	Ongoing development and expansion of oil and gas pipelines, oil and gas exploration and extraction drilling, and seismic survey for further oil and gas exploration occurs across southern Australia (notably Bass Strait) most likely to affect distribution of the community as sounds from air guns used in seismic surveys thought to affect fish behaviour possibly causing them to migrate out of fishing grounds. Effect of seismic surveys on scallops found. Intensity: moderate as local effects are potentially severe but confined to small area. Consequence: minor as long-term effect on communities expected to be minimal if detectable at all. Confidence: low as effects are unknown.
	Other non-extractive activities	1	5	6	Distribution of the community	Central Bass inner shelf; Southern coastal	3.1	3	2	1	Shipping occurs throughout the area daily and considered to impact distribution of pelagic communities through disturbance particularly on marine mammals. Intensity: moderate as local effects but temporary. Consequence: minor as long-term effects on communities undetectable. Confidence: low because of a lack of information on shipping-animal interactions.
	Other anthropogenic activities	1	4	6	Distribution of the community	SET outer shelf; SET upper slope; Central East	3.1	2	2	1	Communities may be disturbed by charter boats associated with general recreational activities, and tourism (e.g. whale watching, fishing tours, anchoring, recreational diving etc.). Most common off SET and Central East shelf. Intensity: minor unlikely to detect direct and indirect impacts on pelagic or demersal communities. Consequence: minor. Confidence: low, no information.

2.3.11 Summary of SICA results

Table 2.19. Level 1 (SICA) Document L1.6. Summary table of consequence scores for all activity/component combinations. Those that scored ≥3 are highlighted blue and bolded if high confidence. * existing stock assessment –assessment not required. Note: external hazards are not considered at Level 2.

DIRECT IMPACT	ACTIVITY	KEY/SECONDARY COMMERCIAL SPECIES	BYPRODUCT AND BYCATCH SPECIES	PROTECTED SPECIES	HABITATS	COMMUNITIES
Capture	Bait collection					
	Fishing	*	3	**3**	2	2
	Incidental behaviour					
Direct impact without capture	Bait collection					
	Fishing	2	2	2	2	2
	Incidental behaviour					
	Gear loss	1	1	1	2	1
	Anchoring/ mooring	1	1	1	2	1
	Navigation/ steaming	1	1	2	1	1
Addition/ movement of biological material	Translocation of species	1	1	1	1	1
	On board processing	2	2	2	2	1
	Discarding catch	2	2	2	2	2
	Stock enhancement					
	Provisioning					
	Organic waste disposal					
Addition of non-biological material	Debris					
	Chemical pollution					
	Exhaust	1	1	1	1	1
	Gear loss	1	1	1	1	1
	Navigation/ steaming	1	1	2	1	2
	Activity/ presence on water	2	2	2	1	2
Disturb physical processes	Bait collection					
	Fishing	2	2	2	**2**	2
	Boat launching					
	Anchoring/mooring	1	1	1	1	1
	Navigation/ steaming	1	1	2	1	1
External Impacts	Other fisheries	4	3	**4**	**3**	**4**
	Aquaculture	2	2	2	1	1
	Coastal development	2	2	3	2	2
	Other extractive activities	2	2	2	2	2
	Other non-extractive activities	2	2	2	2	2
	Other anthropogenic activities	1	1	2	2	2

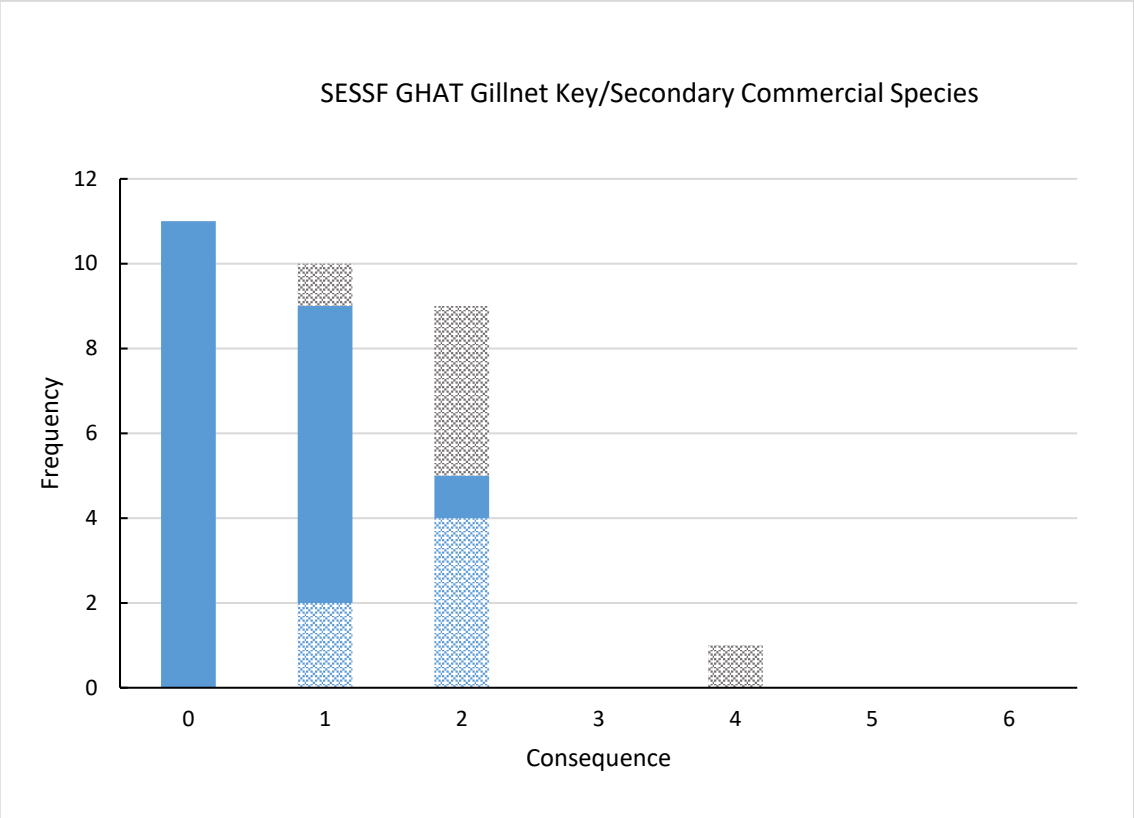

Figure 2.4. Key/secondary commercial species: Frequency of consequence score by high and low confidence.

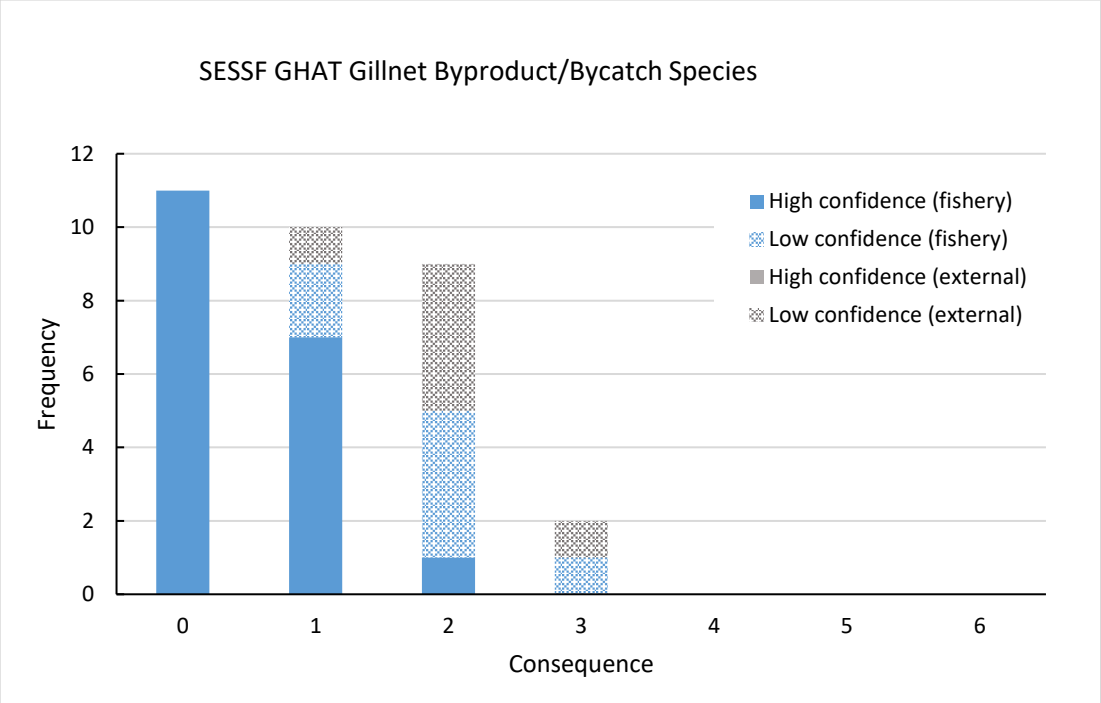

Figure 2.5. Byproduct and bycatch species: Frequency of consequence score by high and low confidence.

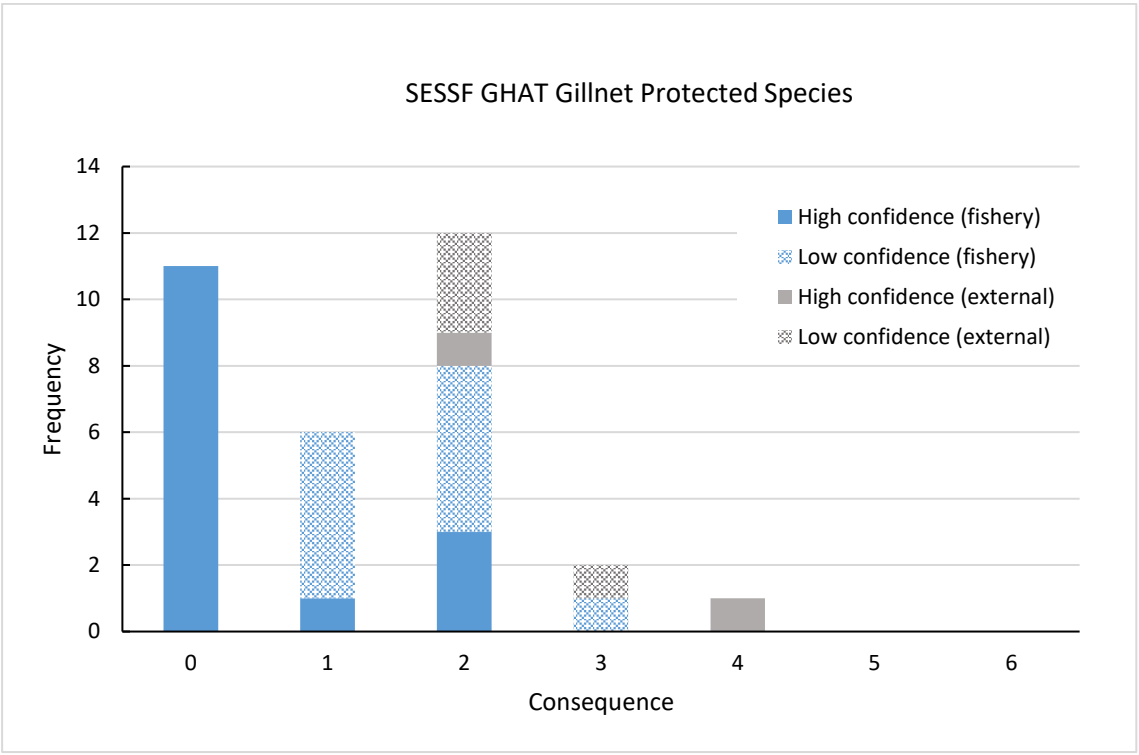

Figure 2.6. Protected species: Frequency of consequence score by high and low confidence.

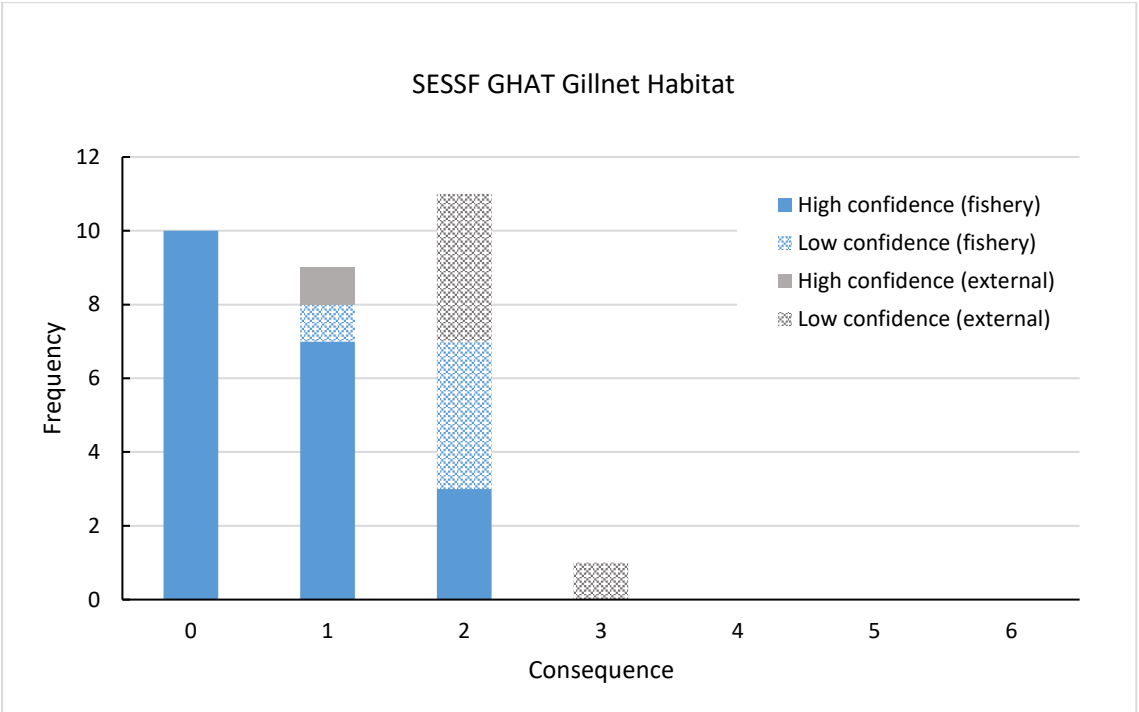

Figure 2.7. Habitat: Frequency of consequence score by high and low confidence.

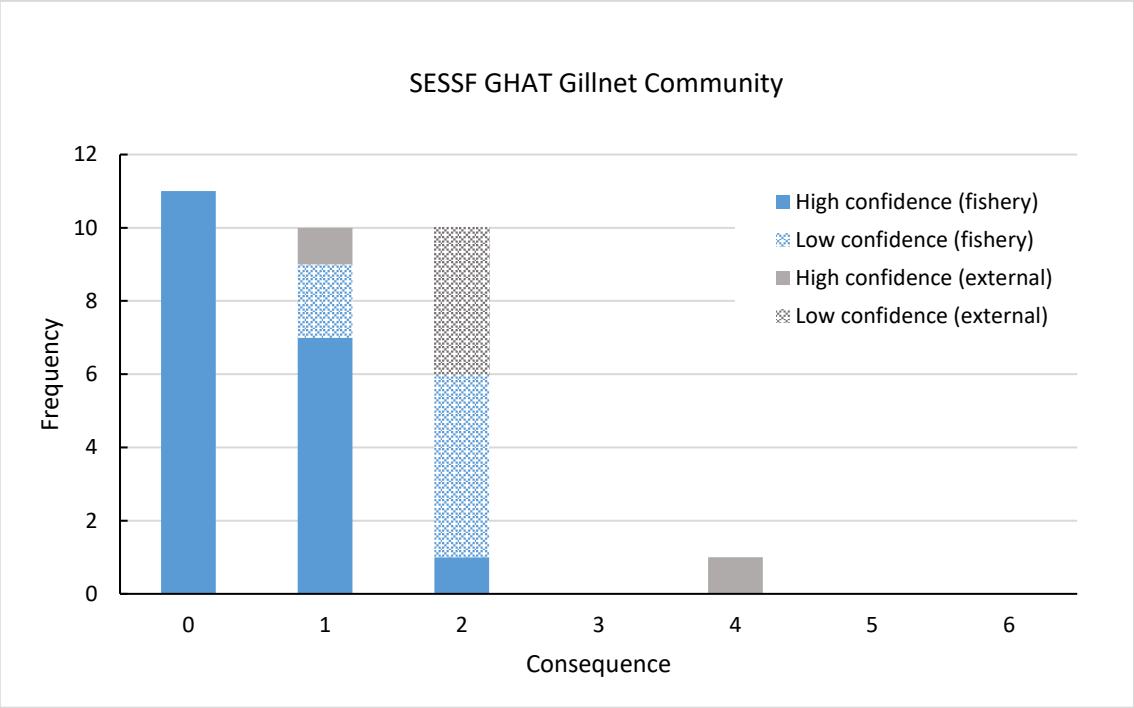

Figure 2.8. Communities: Frequency of consequence score by high and low confidence.

2.3.12 Evaluation/discussion of Level 1

Three ecological components were eliminated at Level 1 (i.e. no components with risk scores of 3 – moderate – or above).

A number of hazards (fishing activities) were eliminated at Level 1 (i.e. no components with risk scores of 3 – moderate – or above). Those remaining included:

- Fishing (direct capture impacts on 2 ecological components)

As a result of direct capture by fishing, the most vulnerable byproduct species, draughtboard shark and draughtboard sharks (mixed) are mostly discarded (AFMA logbooks) were assessed at moderate risk largely due to unknown population size within this assessment period. Given their high post capture survival (Braccini et al. 2012), these sharks are likely to survive. However, given the uncertainty regarding population size the risk score remained moderate.

Shortfin mako were considered a moderate risk as it was the most caught of all protected species and has an unknown population but believed to be declining world-wide. IndoPacific bottlenosed dolphins were also assessed at moderate risk, also due largely to the uncertainty of its population size and substructuring. Australian and Longnosed fur seals may have the lowest mortality, but the most recent capture rates increased possibly as a result of implementation of the Electronic Monitoring System and greater detection ability. The fur seals populations are currently stable or declining (Shaughnessy et al. 2014) there is a risk that some colonies might be incurring greater impact from these mortalities more than others.

The impact of fishing did not represent a signficiant risk to habitats largely due to a shift in location of the concentration of effort away from area with highly vulnerable fauna. Communities were also not considered at risk from the gillnet fishery as the biomass of landed sharks was relatively low although from a higher trophic order perhaps exposing the structure of the community at risk at greater evels of effort.

Significant external hazards included other fisheries in the region on all components and coastal development on protected species. Only external fisheries were rated at major or above risk (scores 4) on key commercial, protected species and communities.

2.3.13 Components to be examined at Level 2

As a result of the SICA analysis, the components that are to be examined at Level 2 are those with any consequence scores of 3 or above. These components are:

- Byproduct/bycatch
- Protected species

Therefore, a Level 2 examiniation is required.

2.4 Level 2 Productivity and Susceptibility Analysis (PSA)

When the risk of an activity at Level 1 (SICA) on a component is moderate or higher and no planned management interventions that would remove this risk are identified, an assessment is required at Level 2. The PSA approach is a method of assessment which allows all units within any of the ecological components to be effectively and comprehensively screened for risk. The units of analysis are the complete set of species habitats or communities identified at the scoping stage. The PSA results in sections 2.4.2 and 2.4.3 of this report measure risk of direct impacts of fishing only. Future iterations of the methodology will include PSAs modified to measure the risk due to other activities, such as gear loss.

The PSA approach is based on the assumption that the risk to an ecological component will depend on two characteristics of the component units: (1) the extent of the impact due to the fishing activity, which will be determined by the susceptibility of the unit to the fishing activities (Susceptibility) and (2) the productivity of the unit (Productivity), which will determine the rate at which the unit can recover after potential depletion or damage by the fishing. It is important to note that the PSA analysis essentially measures potential for risk, hereafter denoted as "risk". A measure of absolute risk requires some direct measure of abundance or mortality rate for the unit in question, and this information is generally lacking at Level 2.

The PSA approach examines attributes of each unit that contribute to or reflect its productivity or susceptibility to provide a relative measure of risk to the unit. The following section describes how this approach is applied to the different components in the analysis. Full details of the methods are described in Hobday et al. (2007).

Species

The following Table outlines the seven attributes that are averaged to measure productivity, and the four aspects that are multiplied to measure susceptibility for all the species components.

Table 2.20. Attributes that measure productivity and suscepability.

	ATTRIBUTE
Productivity	Average age at maturity
	Average size at maturity
	Average maximum age
	Average maximum size
	Fecundity
	Reproductive strategy
	Trophic level
Susceptibility	Availability considers overlap of fishing effort with a species distribution
	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)

	ATTRIBUTE
	Selectivity considers the potential of the gear to capture or retain species
	Post capture mortality considers the condition and subsequent survival of a species that is captured and released (or discarded)

The productivity attributes for each species are based on data from the literature or from data sources such as FishBase. The four aspects of susceptibility are calculated in the following way:

Availability considers overlap of effort with species distribution. For species without distribution maps, availability is scored based on broad geographic distribution (global, southern hemisphere, Australian endemic). Where more detailed distribution maps are available (e.g. from BIOREG data or DEH protected species maps), availability is scored as the overlap between fishing effort and the portion of the species range that lies within the broader geographical spread of the fishery. Overrides can occur where direct data from independent observer programs are available.

Encounterability is the likelihood that a species will encounter fishing gear deployed within its range. Encounterability is scored using habitat information from FishBase, modified by bathymetric information. Higher risk corresponds to the gear being deployed at the core depth range of the species. Overrides are based on mitigation measures and fishery independent observer data.

For species that do encounter gear, **selectivity** is a measure of the likelihood that the species will be caught by the gear. Factors affecting selectivity will be gear and species dependent, but body size in relation to gear size is an important attribute for this aspect. Overrides can be based on body shape, swimming speed and independent observer data.

For species that are caught by the gear, **post capture mortality** measures the survival probability of the species. Obviously, for species that are retained, survival will be zero. Species that are discarded may or may not survive. This aspect is mainly scored using independent filed observations or expert knowledge.

Overall susceptibility scores for species are a product of the four aspects outlined above. This means that susceptibility scores will be substantially reduced if any one of the four aspects is considered to be low risk. However, the default assumption in the absence of verifiable supporting data is that all aspects are high risk.

Habitats

Similar to species, PSA methods for habitats are based around a set of attributes that measure productivity and susceptibility. Productivity attributes include speed of regeneration of fauna, and likelihood of natural disturbance. The susceptibility attributes for habitats are described in the following Table.

Table 2.21. Description of susceptibility attributes for habitats.

ASPECT	ATTRIBUTE	CONCEPT	RATIONALE
Susceptability			
Availability	General depth range (Biome)	Spatial overlap of sub fishery with habitat defined at biomic scale	Habitat occurs within management area
Encounterability	Depth zone and feature type	Habitat encountered at the depth and location at which fishing activity occurs	Fishing takes place where habitat occurs
	Ruggedness (fractal dimension of substratum and seabed slope)	Relief, rugosity, hardness, and seabed slope influence accessibility to different sub-fisheries	Rugged substratum is less accessible to mobile gears. Steeply sloping seabed is less accessible to mobile gears.
	Level of disturbance	Gear footprint and intensity of encounters	Degree of impact is determined by the frequency and intensity of encounters (inc. size, weight, and mobility of individual gears)
Selectivity	Removability/ mortality of fauna/ flora	Removal/ mortality of structure forming epifauna/ flora (inc. bioturbating infauna)	Erect, large, rugose, inflexible, delicate epifauna and flora, and large or delicate and shallow burrowing infauna (at depths impacted by mobile gears) are preferentially removed or damaged.
	Areal extent	How much of each habitat is present	Effective degree of impact greater in rarer habitats: rarer habitats may maintain rarer species.
	Removability of substratum	Certain size classes can be removed	Intermediate sized clasts (~6 cm to 3 m) that form attachment sites for sessile fauna can be permanently removed.
	Substratum hardness	Composition of substrata	Harder substratum is intrinsically more resistant
	Seabed slope	Mobility of substrata once dislodged; generally higher levels of structural fauna	Gravity or latent energy transfer assists movement of habitat structures, e.g. turbidity flows, larger clasts. Greater density of filter feeding animals found where currents move up and down slopes.
Productivity			
	Regeneration of fauna	Accumulation/ recovery of fauna	Fauna have different intrinsic growth and reproductive rates which are also variable in different conditions of temperature, nutrients, productivity.
	Natural disturbance	Level of natural disturbance affects intrinsic ability to recover	Frequently disturbed communities adapted to recover from disturbance.

Communities

There are seven steps for the PSA undertaken for each component brought forward from Level 1 analysis (see Hobday et al. 2006 for full details).

Step 1. Identify the units excluded from analysis and document the reason for exclusion
Step 2. Score units for productivity
Step 3. Score units for susceptibility
Step 4. Plot individual units of analysis onto a PSA Plot
Step 5. Ranking of overall risk of each unit
Step 6. Evaluation of the PSA analysis
Step 7. Decision rules to move from Level 2 to Level 3

2.4.1 Units excluded from analysis (Step 1)

Table 2.22. Species/species groups/taxa excluded from the PSA and SAFE because they were either not identified at the species level, not interacted in the fishery or outside the fishery's jurisdictional boundary. No obs/ints: No observations or interactions. These entries have been excluded from the protected species list since the last ERA assessment because they have not been observed within the fishery and/or occur outside the depth range of the fishery.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BP	Chondrichthyan	Alopiidae	*Alopias pelagicus*	Pelagic thresher	37012003	Misidentification: Outside fishery range
BC	Chondrichthyan	Orectolobidae	*Orectolobus ornatus*	Ornate wobbegong	37013001	Misidentification: Outside fishery range
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus falciformis*	Silky shark	37018008	Misidentification: Outside fishery range; Last and Stevens (2009)
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus coatesi*	Whitecheek shark	37018009	Misidentification: Outside fishery range
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus leucas*	Bull shark	37018021	Misidentification: Outside fishery range; Last and Stevens (2009)
BC	Chondrichthyan	Carcharhinidae	*Galeocerdo cuvier*	Tiger shark	37018022	Misidentification: Outside fishery range; Last and Stevens (2009)
BC	Chondrichthyan	Carcharhinidae	*Negaprion acutidens*	Lemon shark	37018029	Misidentification: Outside fishery range; Last and Stevens (2009)
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus limbatus*	Blacktip shark	37018039	Misidentification: Outside fishery range; Last and Stevens (2009)
BC	Chondrichthyan	Sphyrnidae	*Sphyrna lewini*	Scalloped hammerhead	37019001	Misidentification: Outside fishery range; Last and Stevens (2009)
BC	Chondrichthyan	Rhinobatidae	*Rhinobatos sainsburyi*	Goldeneye shovelnose ray	37027003	Misidentification: Outside fishery range; Last et al. (2016)
BC	Chondrichthyan	Trygonorrhinidae	*Trygonorrhina fasciata*	Eastern fiddler ray	37027006	Misidentification: Outside fishery range; Last et al. (2016)
BC	Chondrichthyan	Rajidae	*Dentiraja australis*	Sydney skate	37031002	Misidentification: Outside fishery range; Last et al. (2016)
BC	Teleost	Clupeidae	*Spratelloides delicatulus*	Delicate round herring	37085029	Misidentification: Outside fishery range
BC	Teleost	Carangidae	*Caranx lugubris*	Black trevally	37337053	Misidentification: Outside fishery range
BC	Teleost	Lutjanidae	*Pristipomoides filamentosus*	Rosy snapper	37346032	Misidentification: Outside fishery range
BC	Teleost	Lethrinidae	*Lethrinus laticaudis*	Grass emperor	37351006	Misidentification: Outside fishery range
BC	Teleost	Scombridae	*Acanthocybium solandri*	Wahoo	37441024	Misidentification: Outside fishery range
BC	Chondrichthyan	Hexanchidae	Hexanchidae - undifferentiated	Sixgill and sevengill sharks unspecified	37005000	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Chondrichthyan	Alopiidae	Alopiidae - undifferentiated	Thresher sharks	37012000	Insufficient taxonomic resolution
BC	Chondrichthyan	Alopiidae	*Alopias* spp.	Thresher sharks (mixed)	37012901	Insufficient taxonomic resolution
BC	Chondrichthyan	Brachaeluridae	Brachaeluridae and related families - undifferentiated	Wobbegongs blind nurse carpet and zebra sharks	37013000	Insufficient taxonomic resolution
BC	Chondrichthyan	Orectolobidae	Orectolobidae	Wobbegong (mixed)	37013900	Insufficient taxonomic resolution
BC	Chondrichthyan	Scyliorhinidae	Scyliorhinidae - undifferentiated	Catsharks	37015000	Insufficient taxonomic resolution
BC	Chondrichthyan	Scyliorhinidae	Cephaloscyllium spp.	Draughtboard sharks (mixed)	37015906	Insufficient taxonomic resolution
BC	Chondrichthyan	Triakidae	Triakidae - undifferentiated	Hound sharks	37017000	Insufficient taxonomic resolution
BC	Chondrichthyan	Triakidae	*Mustelus sp B*	Gummy shark sp B	37017004	EM data suggest 2 animals ret. Non-active code - a hound shark.
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus*, *Loxodon* and *Rhizoprionodon* spp	Blacktip shark (mixed)	37018901	Insufficient taxonomic resolution
BC	Chondrichthyan	Sphyrnidae	Sphyrnidae - undifferentiated	Hammerhead sharks	37019000	Insufficient taxonomic resolution
BC	Chondrichthyan	Centrophoridae, Dalatiidae, Squalidae, Somniosidae, Etmopteridae	Centrophoridae, Dalatiidae, Squalidae, Somniosidae and Etmopteridae - undifferentiated	Gulper sharks, sleeper sharks, dogfishes	37020000	Insufficient taxonomic resolution
BC	Chondrichthyan	Squalidae	*Squalus* spp	Greeneye dogfishes (mixed)	37020901	Insufficient taxonomic resolution
BC	Chondrichthyan	Etmopteridae	*Etmopterus* spp.	Lantern sharks (mixed)	37020907	Insufficient taxonomic resolution
BC	Chondrichthyan	Pristiophoridae	Pristiophoridae - undifferentiated	Sawsharks	37023000	Insufficient taxonomic resolution
BC	Chondrichthyan	Pristiophoridae	*Pristiophorus* spp	Sawshark (mixed)	37023900	Insufficient taxonomic resolution
BC	Chondrichthyan	Squatinidae	Squatinidae - undifferentiated	Angel sharks	37024000	Insufficient taxonomic resolution
BC	Chondrichthyan	Squatinidae	*Squatina* spp	Angel shark (mixed)	37024900	Insufficient taxonomic resolution
BC	Chondrichthyan	Rhinidae	Rhinidae - undifferentiated	Guitarfishes unspecified	37026000	Insufficient taxonomic resolution
BC	Chondrichthyan	Rhinobatidae	Rhinobatidae - undifferentiated	Shovelnose rays	37027000	Insufficient taxonomic resolution
BC	Chondrichthyan	Trygonorrhinidae	*Trygonorrhina* spp.	Fiddler rays unspecified	37027999	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Chondrichthyan	Torpedinidae, Narcinidae, Hypnidae	Torpedinidae, Narcinidae, Hypnidae - undifferentiated	Torpedo rays coffin rays and numbfishes	37028000	Insufficient taxonomic resolution
BC	Chondrichthyan	Rajidae	Rajidae - undifferentiated	Skates	37031000	Insufficient taxonomic resolution
BC	Chondrichthyan	Rajidae	*Raja* spp.	Skate (mixed)	37031900	Insufficient taxonomic resolution
BC	Chondrichthyan	Dasyatidae	Dasyatidae - undifferentiated	Stingrays	37035000	Insufficient taxonomic resolution
BC	Chondrichthyan	Dasyatidae	*Dasyatis* spp	Pelagic stingrays	37035999	Insufficient taxonomic resolution
BC	Chondrichthyan	Urolophidae, Plesiobatidae	Urolophidae, Plesiobatidae - undifferentiated	Stingarees and giant stingarees	37038000	Insufficient taxonomic resolution
BC	Chondrichthyan	Myliobatidae	Myliobatidae - undifferentiated	Eagle rays	37039000	Insufficient taxonomic resolution
BC	Chondrichthyan	Chimaeridae	Chimaeridae - undifferentiated	Ghostsharks	37042000	Insufficient taxonomic resolution
BC	Chondrichthyan		Sharks - other	Sharks (mixed)	37990003	Insufficient taxonomic resolution
BC	Chondrichthyan		Orectolobiformes	Carpet sharks	37990029	Insufficient taxonomic resolution
BC	Chondrichthyan		Order Rajiformes - undifferentiated	Skates and rays (mixed)	37990030	Insufficient taxonomic resolution
BC	Invertebrate		Porifera - undifferentiated	Sponges	10000000	Insufficient taxonomic resolution
BC	Invertebrate		Spongiidae - undifferentiated	Spongiid sponges	10114000	Insufficient taxonomic resolution
BC	Invertebrate		Scyphozoa spp - undifferentiated	Jellyfish	11120000	Insufficient taxonomic resolution
BC	Invertebrate		Order Alcyonacea - undifferentiated	Octocorals and gorgonians	11173000	Insufficient taxonomic resolution
BC	Invertebrate		Order Scleractinia - undifferentiated	Stony corals	11290000	Insufficient taxonomic resolution
BC	Invertebrate		Phylum Mollusca - undifferentiated	Molluscs	23000000	Insufficient taxonomic resolution
BC	Invertebrate		Order Mytiloida - undifferentiated	Mussels	23219000	Insufficient taxonomic resolution
BC	Invertebrate	Pteriidae	*Pinctada* spp.	Pearl oysters and pearl shell	23236901	Insufficient taxonomic resolution
BC	Invertebrate	Pectinidae	Pectinidae - undifferentiated	Scallops	23270000	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Invertebrate	Sepiidae	*Sepia* spp	Cuttlefish (mixed)	23607901	Insufficient taxonomic resolution
BC	Invertebrate		Order Teuthoidea - undifferentiated	Squids	23615000	Insufficient taxonomic resolution
BC	Invertebrate	Loliginidae	Loliginidae - undifferentiated	Calamari	23617000	Insufficient taxonomic resolution
BC	Invertebrate	Octopodidae	Octopodidae - undifferentiated	Octopuses	23659000	Insufficient taxonomic resolution
BC	Invertebrate		Shells	Shells	23999999	Insufficient taxonomic resolution
BC	Invertebrate		Class Gastropoda - undifferentiated	Gastropods	24000000	Insufficient taxonomic resolution
BC	Invertebrate	Volutidae	Volutidae - undifferentiated	Bailer shells	24207000	Insufficient taxonomic resolution
BC	Invertebrate	Volutidae	Zidoninae spp	Bailer shell (mixed)	24207900	Insufficient taxonomic resolution
BC	Invertebrate		Subclass Opisthobranchia - undifferentiated	Sea Slugs	24299000	Insufficient taxonomic resolution
BC	Invertebrate		Order Nudibranchia - undifferentiated	Nudibranchs	24420000	Insufficient taxonomic resolution
BC	Invertebrate		Crinoidea - undifferentiated	Crinoids	25001000	Insufficient taxonomic resolution
BC	Invertebrate		Class Asteroidea - undifferentiated	Starfish	25102000	Insufficient taxonomic resolution
BC	Invertebrate		Class Echinoidea - undifferentiated	Sea urchins	25200000	Insufficient taxonomic resolution
BC	Invertebrate		Subclass Malacostraca - undifferentiated	Crabs, lobsters, prawns	28000000	Insufficient taxonomic resolution
BC	Invertebrate		Astacidea and Palinura - undifferentiated	Lobsters	28784000	Insufficient taxonomic resolution
BC	Invertebrate	Palinuridae	Palinuridae - undifferentiated	Spiny lobsters	28820000	Insufficient taxonomic resolution
BC	Invertebrate	Palinuridae	*Panulirus* spp except *P. cygnus*	Tropical rocklobsters	28820901	Insufficient taxonomic resolution
BC	Invertebrate	Diogenidae	Diogenidae - undifferentiated	Hermit crabs (left-handed)	28827000	Insufficient taxonomic resolution
BC	Invertebrate	Lithodidae	Lithodidae - undifferentiated	King crabs	28836000	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Invertebrate	Lithodidae	Lithodidae - undifferentiated	King crabs	28836000	Insufficient taxonomic resolution
BC	Invertebrate		Brachyura - undifferentiated	Crabs	28850000	Insufficient taxonomic resolution
BC	Invertebrate	Majidae	Majidae and related families - undifferentiated	Spider crabs (All families)	28880000	Insufficient taxonomic resolution
BC	Invertebrate	Polybiidae	*Ovalipes* spp	Sand crab	28911901	Insufficient taxonomic resolution
BC	Phaeophyciae		Phaeophyceae	Brown algae	54000000	Plant
BC	Phaeophyciae		Rhodophyceae	Red algae	55000000	Plant
BC	Teleost	Majidae	Majidae - undifferentiated	Spider crabs (Majidae)	28880911	Insufficient taxonomic resolution
BC	Teleost	Somniosidae	*Centroscymnus* spp	Sleeper sharks (mixed)	37020906	Insufficient taxonomic resolution
BC	Teleost	Melanonidae, Moridae, Euclichthyidae	Melanonidae, Moridae, Euclichthyidae - undifferentiated	Pelagic morid and eucla cods	37224000	Insufficient taxonomic resolution
BC	Teleost	Moridae	*Lotella* and *Pseudophycis* spp	Southern rock cod	37224900	Insufficient taxonomic resolution
BC	Teleost	Ophidiidae	Genypterus spp	Ling (mixed)	37228901	Insufficient taxonomic resolution
BC	Teleost	Macrouridae, Bathygadidae	Macrouridae and Bathygadidae - undifferentiated	Whiptails	37232000	Insufficient taxonomic resolution
BC	Teleost	Belonidae	*Tylosurus crocodilus*	Crocodile longtom	37235005	Outside fishery range - Cape York to Townsville
BC	Teleost	Trachichthyidae	Trachichthyidae - undifferentiated	Roughies	37255000	Insufficient taxonomic resolution
BC	Teleost	Zeidae, Cyttidae	Zeidae, Cyttidae - undifferentiated	Dories and lookdown dories	37264000	Insufficient taxonomic resolution
BC	Teleost	Lampridae	*Lampris guttatus* and *Lampris immaculatus*	Moonfish (mixed)	37268900	Insufficient taxonomic resolution
BC	Teleost	Synbranchidae	*Monopterus albus*	Belut	37285001	Outside fishery range - Cape York to Townsville
BC	Teleost	Triglidae, Peristediidae	Triglidae and Peristediidae - undifferentiated	Searobins and armour gurnards	37288000	Insufficient taxonomic resolution
BC	Teleost	Triglidae	Triglidae	Searobins	37288900	Insufficient taxonomic resolution
BC	Teleost	Triglidae	*Lepidotrigla* spp	Butterfly gurnard (mixed)	37288901	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Teleost	Platycephalidae	Platycephalidae - undifferentiated	Flatheads	37296000	Insufficient taxonomic resolution
BC	Teleost	Percichthyidae, Serranidae	Percichthyidae, Serranidae - undifferentiated	Temperate Basses and Rockcods	37311000	Insufficient taxonomic resolution
BC	Teleost	Serranidae	*Variola albimarginata*	White-edge coronation trout	37311026	Outside fishery range
BC	Teleost	Percichthyidae	*Maccullochella macquariensis*	Trout cod	37311087	1 kg ret. (Log; 2012-2016). Unliklely.
BC	Teleost	Lethrinidae	*Aethaloperca* and *Anyperodon* spp	Rockcod (Aethaloperca and Anyperodon)	37311901	Both Aethaloperca and Anyperdodan spp are outside fishery range according to Fishers of Australia website, Fishbase and CAAB distribution
BC	Teleost	Polyprionidae	*Polyprion americanus* and *Polyprion oxygeneios*	Hapuku and bass groper	37311902	Insufficient taxonomic resolution
BC	Teleost	Serranidae	*Epinephelus* spp	Grouper	37311911	Insufficient taxonomic resolution
BC	Teleost	Sillaginidae	Sillaginidae - undifferentiated	Whitings	37330000	No logbook data to apportion to species within list.
BC	Teleost	Carangidae	Carangidae - undifferentiated	Trevallies and scads	37337000	Insufficient taxonomic resolution
BC	Teleost	Arripidae	*Arripis trutta* and *Arripis truttaceus*	Australian salmon	37344900	Insufficient taxonomic resolution
BC	Teleost	Emmelichthyidae	*Plagiogeneion* spp	Rubyfish (mixed)	37345900	No logbook data to apportion to species within list.
BC	Teleost	Emmelichthyidae	*Emmelichthys* spp	Redbait (mixed)	37345901	Insufficient taxonomic resolution
BC	Teleost	Lutjanidae	Lutjanus spp	Sea perch	37346905	No logbook data to apportion to species within list.
BC	Teleost	Haemulidae	*Plectorhinchus* spp.	Sweetlips	37350903	Insufficient taxonomic resolution
BC	Teleost	Mullidae	Mullidae - undifferentiated	Goatfishes	37355000	No logbook data to apportion to species within list.
BC	Teleost	Pentacerotidae	Pentacerotidae - undifferentiated	Boarfishes	37367000	Insufficient taxonomic resolution
BC	Teleost	Oplegnathidae	Oplegnathidae - undifferentiated	knifejaws	37369000	Insufficient taxonomic resolution
BC	Teleost	Cheilodactylidae	*Nemadactylus macropterus* and *Nemadactylus* sp.	Morwong (mixed)	37377901	No logbook data to apportion to species within list.
BC	Teleost	Latridae	*Latridopsis* spp	Trumpeters	37378900	Insufficient taxonomic resolution
BC	Teleost	Labridae	Labridae - undifferentiated	Wrasses	37384000	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Teleost	Labridae	Labridae spp. - except Cheilinus trilobatus	Wrasses (mixed)	37384901	Insufficient taxonomic resolution
BC	Teleost	Scaridae	Scaridae - undifferentiated	Parrotfishes unspecified	37386000	Insufficient taxonomic resolution
BC	Teleost	Uranoscopidae	Uranoscopidae - undifferentiated	Stargazers	37400000	Insufficient taxonomic resolution
BC	Teleost	Ammodytidae	Ammodytidae - undifferentiated	sandlances	37425000	Insufficient taxonomic resolution
BC	Teleost	Trichiuridae	Trichiuridae - undifferentiated	Ribbonfishes and cutlassfishes	37440000	Insufficient taxonomic resolution
BC	Teleost	Scombridae	Scombridae - undifferentiated	Mackerels	37441000	Insufficient taxonomic resolution
BC	Teleost	Scombridae	Scombridae spp (tribes Scomberomorini and Scombrini)	Mackerel (mixed)	37441911	Insufficient taxonomic resolution
BC	Teleost	Scombridae	Scombridae spp (tribes Sardini and Thunnini)	Tuna (mixed)	37441912	Insufficient taxonomic resolution
BC	Teleost	Ariommatidae	Ariomma spp.	Butterfish (Mixed)	37447900	Insufficient taxonomic resolution
BC	Teleost	Balistidae, Monacanthidae	Balistidae, Monacanthidae - undifferentiated	Leatherjackets	37465000	Insufficient taxonomic resolution
BC	Teleost	Monacanthidae	Monacanthidae	Leatherjacket	37465903	Insufficient taxonomic resolution
BC	Teleost	Diodontidae	Diodontidae - undifferentiated	Porcupine fish	37469000	Insufficient taxonomic resolution
BC	Teleost	Bothidae, Psettodidae and Pleuronectidae	Bothidae, Psettodidae and Pleuronectidae (all spp)	Flounders (mixed all types)	37990009	Insufficient taxonomic resolution
BC	Teleost	Cynoglossidae, Soleidae	Cynoglossidae and Soleidae spp	Sole (mixed)	37990015	Insufficient taxonomic resolution
BC	Teleost		Skates and rays, unspecified	Skates and rays	37990018	Insufficient taxonomic resolution
BC	Teleost		Mixed reef fish	Fish (mixed)	37999999	Insufficient taxonomic resolution
BC	Unknown		Various bits of the sea floor which may be alive	Benthos	99000001	Benthos
BC	Unknown		Substrate or rocks: non-living	Substrate or rocks	99000002	Benthos
BC	Unknown		Identity unknown or bad data	Unknown or other	99999999	Insufficient taxonomic resolution

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
PS	Marine bird		Avians	Birds	40000000	Insufficient taxonomic resolution
PS	Marine mammal	Otariidae, Phocidae	Otariidae and Phocidae	Seals	41132999	Insufficient taxonomic resolution
PS	Marine bird	Diomedeidae	Diomedeidae - undifferentiated	Albatrosses	40040000	Insufficient taxonomic resolution
PS	Marine bird	Procellariidae	Procellariidae - undifferentiated	Petrels prions and shearwaters	40041000	Insufficient taxonomic resolution
PS	Marine bird	Procellariidae	Puffinus spp. - undifferentiated	Shearwaters	40041050	Insufficient taxonomic resolution
PS	Marine bird	Procellariidae	Puffinus spp.	Shearwaters (mixed old AFMA code)	40041999	Insufficient taxonomic resolution
PS	Marine bird	Phalacrocoracidae	Phalacrocoracidae - undifferentiated	Cormorants	40048000	Insufficient taxonomic resolution
PS	Marine mammal	Delphinidae	Delphinidae - undifferentiated	Dolphins	41116000	Insufficient taxonomic resolution
PS	Marine mammal	Otariidae	Sealions	Sealions	41131999	Insufficient taxonomic resolution

2.4.2 Level 2 PSA (Steps 2 and 3)

The results in the Tables below provide details of the PSA assessments for each species, separated by role in the fishery, and by taxa where appropriate. These assessments are limited to direct impacts from fishing, and the operational objective is to avoid over-exploitation due to fishing, either as over-fishing or becoming over-fished. The risk scores and categories (high, medium, or low) reflect potential rather than actual risk using the Level 2 (PSA) method. For species assessed at Level 2, no account is taken of the level of catch, the size of the population, or the likely exploitation rate. To assess actual risk for any species requires a Level 3 assessment which does account for these factors. However, recent fishing effort distributions are considered when calculating the availability attribute for the Level 2 analysis, whereas the entire jurisdictional range of the fishery is considered at Level 1.

The PSA analyses do not fully take account of management actions already in place in the fishery that may mitigate for high-risk species. Some management actions or strategies, however, can be accounted for in the analysis where they exist. These 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). Management strategies that are not reflected in the PSA scores include limits to fishing effort, use of catch limits (such as TACs), and some other controls such as seasonal closures.

It should be noted that the PSA method is likely to generate more false positives for high risk (species assessed to be high risk when they are actually low risk) than false negatives (species assessed to be low risk when they are actually high risk). This is due to the precautionary approach to uncertainty adopted in the PSA method, whereby attributes are set at high risk levels in the absence of information. It also arises from the nature of the PSA method assessing potential rather than actual risk, as discussed above. Thus, some species will be assessed at high risk because they have low productivity and are exposed to the fishery, even though they are rarely if ever caught and are relatively abundant.

In the PSA Tables below, the “Comments” column is used to provide information on one or more of the following aspects of the analysis for each species: use of overrides to alter susceptibility scores (for example based on use of observer data or taking account of specific management measures or mitigation); data or information sources or limitations; and information that supports the overall scores. The use of over-rides is explained more fully in Hobday et al. (2007).

The PSA Tables also report on “missing information” (the number of attributes with missing data that therefore score at the highest risk level by default). There are seven attributes used to score productivity and four aspects (availability, encounterability, selectivity and post capture mortality) used to score susceptibility (though encounterability is the average of two attributes). An attribute or aspect is scored as missing if there are no data available to score it, and it has defaulted to high risk for this reason. For some species, attributes may be scored on information from related species or other supplementary information, and even though this information is indirect and less reliable than if species specific information was available, this is not scored as a missing attribute.

There are differences between analyses for protected species and the other species components. Target, by-product and by-catch species are included on the basis that they are known to be caught by the fishery (in some cases only very rarely). However protected species are included in the analysis on the basis that they occur in the area of the fishery, whether or not there has ever been an interaction with the fishery recorded. For this reason, there may be a higher proportion of false positives for high vulnerability for protected species, unless there is a robust observer program that can verify that species do not interact with the gear.

Observer data and observer expert knowledge are important sources of information in the PSA analyses, particularly for the bycatch and protected components. The level of observer data for this fishery is regarded as medium. An AFMA observer program has been operating since July 2003, and coverage varies depending on the fishing location. Information on target and byproduct species is well collected, and bycatch attempts are made, but may be compromised by taxonomic difficulties. Interactions with protected species are recorded, although again, taxonomic resolution is weak for some taxa (e.g. whales and seabirds).

Summary of Habitat PSA results

The Habitat component was eliminated at Level 1.

Summary of Community PSA results

The Community component was eliminated at Level 1.

2.4.3 PSA results for individual units of analysis (Step 4-6)

The average productivity and susceptibility scores for each unit of analysis (e.g. for each species) are then used to place the individual units of analysis on 2D plots (as below). The relative position of the units on the plot will determine relative risk at the unit level as per PSA plot below. The overall risk value for a unit is the Euclidean distance from the origin of the graph. Units that fall in the upper third of the PSA plots are deemed to be at high risk. Units with a PSA score in the middle are at medium risk, while units in the lower third are at low risk regarding productivity and susceptibility attributes. The divisions between these risk categories are based on dividing the area of the PSA plots into equal thirds. If all productivity and susceptibility scores (scale 1-3) are assumed to be equally likely, then 1/3rd of the Euclidean overall risk values will be greater than 3.18 (high risk), 1/3rd will be between 3.18 and 2.64 (medium risk), and 1/3rd will be lower than 2.64 (low risk).

The PSA output allows identification and prioritization (via ranking the overall risk scores) of the units (e.g. species, habitat types, communities) at greatest risk to fishing activities. This prioritization means units with the lowest inherent productivity or highest susceptibility, which can only sustain the lowest level of impact, can be examined in detail. The overall risk of an individual unit will depend on the level of impact as well its productivity and susceptibility.

The overall risk value for each unit is the Euclidean distance from the origin to the location of the species on the PSA plot. The units are then divided into three risk categories, high, medium, and low, according to the risk values described above.

2.4.4 Uncertainty analysis ranking of overall risk (Step 5)

The final PSA result for a species is obtained by ranking overall risk value resulting from scoring the productivity and susceptibility attributes. Uncertainty in the PSA results can arise when there is imprecise, incorrect or missing data, where an average for a higher taxonomic unit was used (e.g. average genera value for species units), or because an inappropriate attribute was included. The number of missing attributes, and hence conservative scores, is tallied for each unit of analysis. Units with missing scores will have a more conservative overall risk value than those species with fewer missing attributes, as the highest score for the attribute is used in the absence of data. Gathering the information to allow the attribute to be scored may reduce the overall risk value. Identification of high-risk units with missing attribute information should translate into prioritisation of additional research (an alternative strategy).

A second measure of uncertainty is due to the selection of the attributes. The influence of particular attributes on the final result for a unit of analysis (e.g. a habitat unit) can be quantified with an uncertainty analysis, using a Monte Carlo resampling technique. A set of productivity and susceptibility scores for each unit is calculated by removing one of the productivity or susceptibility attributes at a time, until all attribute combinations have been used. The variation (standard deviation) in the productivity and susceptibility scores is a measure of the uncertainty in the overall PSA score. If the uncertainty analysis shows that the unit would be treated differently regarding risk, it should be the subject of more study.

The validity of the ranking can also be examined by comparing the results with those from other data sources or modelling approaches that have already been undertaken in specific fisheries. For example, the PSA results of the individual species (target, byproduct and bycatch and protected) can be compared against catch rates for any species or against completed stock assessments. These comparisons will show whether the PSA ranking agrees with these other sources of information or more rigorous approaches.

2.4.5 PSA results and discussion

a) Key/secondary commercial species

Under the revised ERAEF (AFMA 2017), key/secondary commercial species that undergo Tier 1 stock assessments are not assessed at Level 2.

b) Commercial bait species

There are no commercial bait species in this sub-fishery.

c) Byproduct species

There were no byproduct species considered in a PSA. Instead, all BP species were assessed using the bSAFE method.

d) Bycatch species

There were eight bycatch teleost species considered in this PSA because they were unassessable in bSAFE (Table 2.23). Of these eight species, two were high risk, three were medium risk and three were low risk. Of other 16 invertebrate BC species assessed in this PSA, six were high risk, three medium risk and seven low risk (Table 2.23, Figure 2.9). A residual risk analysis was performed on all high-risk species (see Section 2.9, Table 2.23).

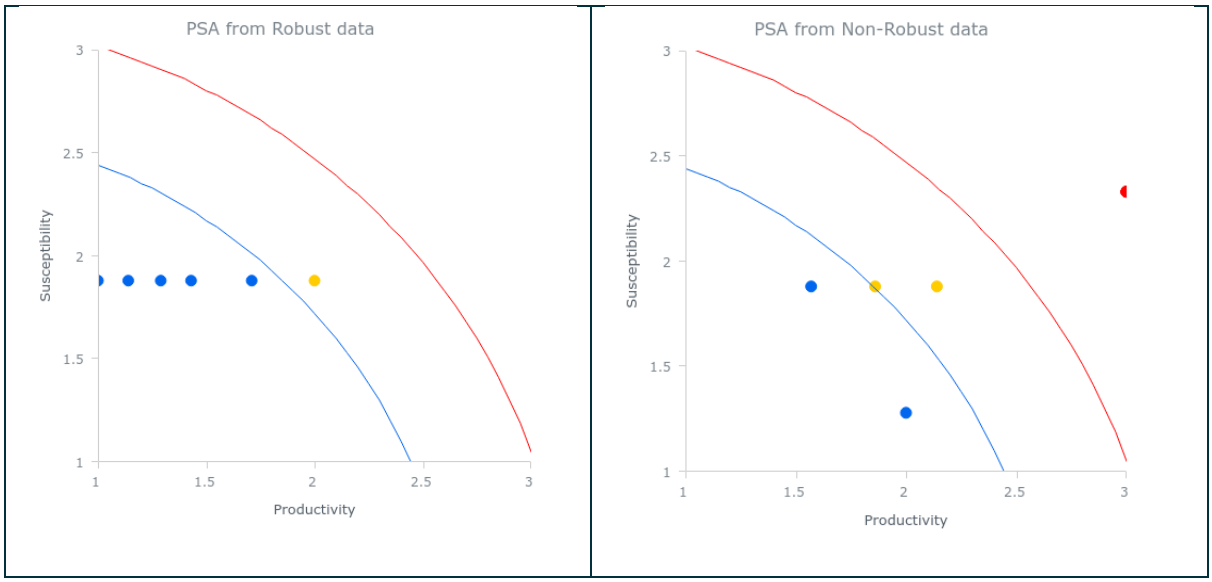

Figure 2.9. PSA plot for bycatch species in the SESSF GHAT gillnet sub-fishery for a) robust [left] and (b) data deficient [right] species. Note many species fall on some points.

Table 2.23. Summary of the PSA scores on the set of productivity and susceptibility attributes for bycatch species and residual risk (RR) for high risk species. Note: Key commercial, secondary commercial, byproduct and bycatch component PSAs not examined for this sub-fishery, if the overall risk score was not extreme. Productivity attributes (P1-P7) are listed in Table 2.25 (in report). Susceptibility attributes (S1-S4) are listed in Susceptibility attributes Table 2.26 (in report). Missing attributes are highlighted (red). Productivity score (Prod. score); Susceptibility score (Susc. score). No. interactions (No. Int. 2012-2016) reported for high risk scores only (source: Commonwealth logbook (Log) and observer (Obs) databases). Residual risk guidelines drawn from document "Revision of residual risk guidelines to reflect updated Ecological Risk Assessment Methodology – version Oct 12, 2016. See numbers at the foot of this table. R: retained. NE: not entered.

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. OR CATCH(2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
Following 8 BC species were unassessable in bSAFE and analysed in PSA:																					
37042001	*Chimaera ogilbyi*	Ogilby's Ghostshark	3	3	3	3	2	3	3	1	3	3	2	2.86	1.43	6	3.2	High	14 kg ret. (Log) of 37042000 (Chimaeridae).	3- low interaction/capture. Risk reduced to low.	Low
37296036	*Platycephalus grandispinis*	Longspine flathead	3	3	3	3	3	3	3	1.6	3	3	2	3	1.67	9	3.43	High	23 kg ret. (Log)	3- low interaction/capture. Risk reduced to low.	Low
37022001	*Echinorhinus brucus*	Bramble shark	3	3	3	2	3	3	3	1	3	1	2	2.71	1.13	2	2.94	Medium	NE	No RR required	Medium
37287004	*Neosebastes bougainvillii*	Gulf gurnard perch	3	3	3	1	2	3	3	1	3	2	2	2.57	1.28	4	2.87	Medium	NE	No RR required	Medium
37287005	*Neosebastes scorpaenoides*	Common gurnard perch	3	3	3	1	2	1	3	1.03	3	2	2	2.29	1.28	3	2.62	Medium	NE	No RR required	Medium
37287003	*Neosebastes pandus*	Bighead gurnard perch	3	3	3	1	2	1	3	1	3	2	2	2.29	1.28	3	2.62	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. OR CATCH(2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37466003	*Aracana aurita*	Shaw's cowfish	3	3	3	1	1	1	3	1	3	2	2	2.14	1.28	3	2.49	Low	NE	No RR required	Low
37287006	*Neosebastes thetidis*	Thetis fish	3	3	3	1	1	1	3	1	3	2	2	2.14	1.28	3	2.49	Low	NE	No RR required	Low
Other BC species:																					
23257002	*Ostrea angasi*	Native oyster	3	3	3	3	3	3	3	3	3	3	2	3	2.33	9	3.8	High	63 kg dis. (Obs).	Endemic to southern Australia 3- low interaction/capture. Risk reduced to low.	Low
28911003	*Ovalipes australiensis*	Common sand crab	3	3	3	3	3	3	3	3	3	3	2	3	2.33	10	3.8	High	28911003 - *Ovalipes* spp - sand crab: 1 animal ret. (Electronic Monitoring) No other sand crab in species list. 28911003 was chosen to represent this species.	3- low interaction/capture. Risk reduced to low.	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. OR CATCH(2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
28880009	*Notomithrax minor*	Decorator crab - N minor	3	3	3	3	3	3	3	3	3	3	2	3	2.33	10	3.8	High	2 kg dis. (Obs).	3- low interaction/capture. Risk reduced to low.	Low
28821003	*Ibacus novemdentatus*	Balmain bug	3	3	3	3	3	3	3	3	3	3	2	3	2.33	10	3.8	High	2 kg dis. (Obs).	3- low interaction/capture. Risk reduced to low.	Low
24207072	*Melo miltonis*	Southern bailer shell	3	3	3	3	3	3	3	3	3	3	2	3	2.33	10	3.8	High	54 kg ret., 4 kg dis. (Obs). 1 animal dis. (Electronic Monitoring)	3- low interaction/capture. Risk reduced to low.	Low
23607001	*Sepia apama*	Giant cuttlefish	3	3	3	3	3	3	3	3	3	3	2	3	2.33	10	3.8	High	2 kg dis. (Obs).	3- low interaction/capture. Risk reduced to low.	Low
25154011	*Coscinasterias muricata*	Eleven-arm seastar	3	3	3	1	1	1	3	3	3	2	2	2.14	1.88	5	2.85	Medium	NE	No RR required	Medium
24207001	*Livonia mammilla*	False bailer shell	3	3	3	1	1	2	1	3	3	2	2	2	1.88	2	2.74	Medium	NE	No RR required	Medium
28821004	*Ibacus peronii*	Eeastern Balmain bug	3	3	2	1	1	2	1	3	3	2	2	1.86	1.88	3	2.64	Medium	NE	No RR required	Medium
28915002	*Pseudocarcinus gigas*	Giant crab	2	3	1	1	1	2	2	3	3	2	2	1.71	1.88	2	2.54	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. OR CATCH(2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
23270006	*Mimachlamys asperrima*	Doughboy scallop	3	3	1	1	1	1	1	3	3	2	2	1.57	1.88	3	2.45	Low	NE	No RR required	Low
28820001	*Jasus edwardsii*	Southern rock lobster	2	2	1	1	1	2	1	3	3	2	2	1.43	1.88	1	2.36	Low	NE	No RR required	Low
28880010	*Leptomithrax gaimardii*	Great spider crab	3	3	3	1	1	2	1	1	3	2	2	2	1.28	3	2.37	Low	Expanded from Brachyura - undifferentiated (28850000), based on information from AFMA Observers. 23 t dis. (Obs).	No RR required	Low
23636004	*Nototodarus gouldi*	Gould's squid	1	1	1	1	1	2	2	3	3	2	2	1.29	1.88	1	2.28	Low	NE	No RR required	Low
23270007	*Pecten fumatus*	commercial scallop	1	2	1	1	1	1	1	3	3	2	2	1.14	1.88	1	2.2	Low	NE	No RR required	Low
28711026	*Metapenaeus endeavouri*	Blue endeavour prawn	1	1	1	1	1	1	1	3	3	2	2	1	1.88	1	2.13	Low	NE	No RR required	Low

Risk ranking guidelines:

1	Risk rating due to missing, incorrect or out of date information	4	Effort and catch management arrangements for target and byproduct species
2	At risk due to external factors (cumulative risks)	5	Management arrangements to mitigate against the level of bycatch
3	At risk in regards to level of interaction/capture with a zero or negligible level of susceptibility	6	Management arrangements relating to seasonal, spatial and depth closures

e) Protected species

There were 56 protected species assessed in this PSA. Of these species, 27 were high risk (22 marine birds, five marine mammals), 23 medium risk (16 birds, seven marine mammals,) and six species low risk (five marine birds, one marine mammal) (Table 2.24; Figure 2.10a, b).

A residual risk analysis was performed on the 27 high risk species (see Section 2.9, Table 2.24).

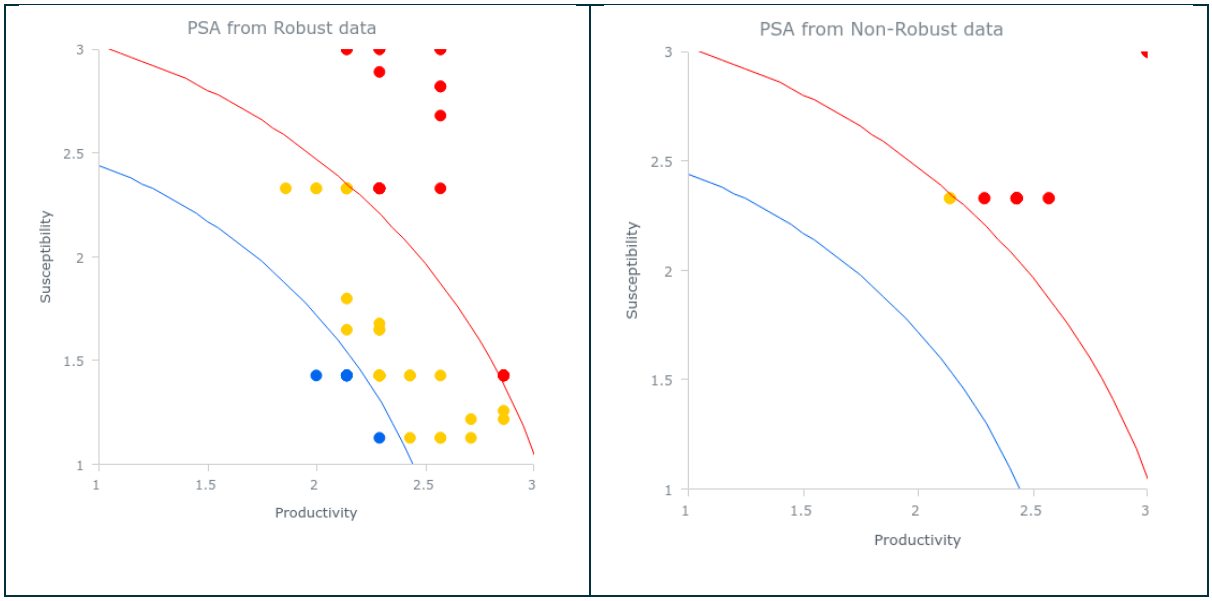

Figure 2.10. PSA plot for protected species in the SESSF GHAT gillnet sub-fishery for (a) robust [left] and (b) data deficient [right] species. Note many species fall on some points.

Table 2.24. Summary of the PSA scores on the set of productivity and susceptibility attributes for protected species and residual risk (RR) for high risk species. Note: Key commercial, secondary commercial, byproduct and bycatch component PSAs not examined for this sub-fishery, if the overall risk score was not extreme. Productivity attributes (P1-P7) are listed in Table 2.25 (in report). Susceptibility attributes (S1-S4) are listed in Susceptibility attributes Table 2.26 (in report). Missing attributes are highlighted (red). Productivity score (Prod. score); Susceptibility score (Susc. score). No. interactions (No. Int. 2012-2016) reported for high risk scores only (source: Commonwealth logbook (Log) and observer (Obs) databases). Residual risk guidelines drawn from document "Revision of residual risk guidelines to reflect updated Ecological Risk Assessment Methodology – version Oct 12, 2016. See numbers at the foot of this table. R: retained. NE: not entered. Note: Birds – Avians recorded: 1 alive, 5 dead (Log) within assessment period.

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
40041012	*Pachyptila salvini*	Salvin's prion	3	3	3	3	3	3	3	3	3	3	3	3	3	9	4.24	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species.	Population stable – assumed to exceed 12 million (BirdLife Internartional, 2017). Risk reduced to low	Low
40040010	*Diomedea gibsoni*	Gibson's albatross	2	3	3	2	2	3	3	3	3	3	3	2.57	3	1	3.95	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Rarely sighted. Risk reduced to low	Low
40040013	*Thalassarche impavida*	Campbell albatross	2	3	3	2	2	3	3	3	3	3	3	2.57	3	1	3.95	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Common along continental shelf. Risk remains the same	High
40040005	*Diomedea epomophora*	Southern Royal albatross	2	3	3	2	2	3	3	2.73	3	3	3	2.57	2.82	1	3.82	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Vulnerable species. Breeds on NZ sub-Antarctic Islands (mostly Campbell Is).	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																				Regular over continental slope and pelagic waters off east Tas. Unlikely to occur during fishery operations. Risk reduced to low.	
40040012	*Diomedea sanfordi*	Northern Royal albatross	2	3	3	2	2	3	3	2.73	3	3	3	2.57	2.82	1	3.82	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Does not breed in Aus. Uncommon over slope and pelagic waters off east Tas. Risk reduced to low	Low
40040002	*Thalassarche cauta*	Shy albatross	2	3	3	1	1	3	3	3	3	3	3	2.29	3	1	3.77	High	4 alive, 3 dead alive. Expanded from Albatrosses	Near threatened. Very common in both inshore and offshore waters to continental slope of s-e Aus., extending to s-WA. Population trend for largest colongy on Mewstone unknown. Total Aus popn est ~15,350 breeding pairs.	High

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
40040011	*Diomedea antipodensis*	Antipodean albatross	2	3	3	2	2	3	3	2.52	3	3	3	2.57	2.68	1	3.71	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Mostly breeds in NZ sub-Antarctic Is. Biennial breeder. Population trend decreasing based on 9050 breeding pairs. Risk reduced to medium	Medium
40040004	*Thalassarche chrysostoma*	Grey-headed albatross	2	3	3	1	1	3	3	2.84	3	3	3	2.29	2.89	1	3.69	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Circumpolar distribution – most likely south of the sub-tropical convergence. Largely restricted to deep pelagic waters, occasional to continental shelf. Population trend is decreasing. Risk reduced to medium.	Medium
40048002	*Phalacrocorax carbo*	Great cormorant	1	2	3	2	2	3	3	3	3	3	3	2.29	3	2	3.77	High	Cormorants: 17 dead (Log): Also, 5 kg dis; 1 animal dead (Obs).	3- low interaction/capture. Occurs coastal waters. Risk	Medium

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																			Species expanded from 40048000 - Phalacrocoracidae	reduced to medium.	
40048003	*Phalacrocorax fuscescens*	Black-faced cormorant	1	3	3	1	1	3	3	3	3	3	3	2.14	3	1	3.69	High	2 dead animals (Obs). Also, Cormorants: 17 dead (Log). Also, 5 kg dis. (Obs). 1 animal dead (Obs).	3- low capture. Very coastal. Risk reduced to medium.	Medium
40047002	*Morus serrator*	Australasian gannet	1	3	3	1	1	3	3	3	3	3	3	2.14	3	1	3.69	High	1 alive	3- low capture Therefore Risk category reduced to low.	Low
40041008	*Macronectes halli*	Northern giant-petrel	1	3	3	1	1	3	3	3	3	3	3	2.14	3	1	3.69	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	Frequent of waters in southern Aus. Breeds at Macquarie Is. Population trend is increasing. This species is a giant petrel and more likely to be identified to species level.	Medium
40041007	*Macronectes giganteus*	Southern giant-petrel	1	3	3	1	1	3	3	3	3	3	3	2.14	3	1	3.69	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	Frequent of waters in southern Aus. Breeds at	Medium

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																				Macquarie Is. Population trend is increasing. This species is a giant petrel and more likely to be identified to species level.	
40040006	*Diomedea exulans*	Wandering albatross	2	3	3	2	2	3	3	3	3	2	3	2.57	2.33	1	3.47	High	4 alive, 3 dead alive: Albatrosses. Expanded species.	Vulnerable. Current population trend is decreasing	High
40041005	*Halobaena caerulea*	Blue petrel	3	3	3	1	1	3	3	3	3	2	3	2.43	2.33	3	3.37	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	Ranges to South Australia Aug-Oct. Regular off Tas. Breeds at Kerguelen Is. Global population is ~3 million. Population stable. Risk category remains high.	High
40040001	*Thalassarche bulleri*	Buller's albatross	2	3	3	1	1	3	3	3	3	2	3	2.29	2.33	1	3.27	High	4 alive, 3 dead alive: Albatrosses. Expanded species	Endemic to NZ. Overall population across breeding islands is ~32134 pairs.	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																				Visiting birds are adults. Common off east Tas (Jan-Aug). To west of Bass Strait. RR category reduced to low	
40128014	*Larus pacificus*	Pacific gull	2	2	3	1	2	3	3	3	3	2	3	2.29	2.33	1	3.27	High	1 dead	3 - low interaction/capture RR category reduced to low	Low
40041047	*Puffinus tenuirostris*	Short-tailed shearwater	2	3	3	1	1	3	3	3	3	2	3	2.29	2.33	1	3.27	High	I dead (AFMA verified data). Also, 2 ret. (Obs). Also, 7 alive, 69 dead: Petrels, Prions and Shearwaters Also, 1 alive, 10 dead: Shearwaters.	3-interaction/capture low for this species. RR category reduced to low Breeds along small islands in Bass Strait	Low
40041032	*Pterodroma mollis*	Soft-plumaged petrel	2	2	3	1	2	3	3	3	3	2	3	2.29	2.33	1	3.27	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	Common winter-spring visitor (May-Aug) along southern Australia within this sub-fishery. Year round in Tas waters. Global	High

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																				popn >5 million individuals.	
40041028	*Pterodroma inexpectata*	Mottled petrel	2	2	3	1	2	3	3	3	3	2	3	2.29	2.33	2	3.27	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	Rare to uncommon. Occurs sporadically Oct-Feb over deep pelagic waters most well beyond the continental off eastern seaboard. RR reduced to low.	Low
40041009	*Pachyptila belcheri*	Slender-billed prion	2	3	3	1	1	3	3	3	3	2	3	2.29	2.33	3	3.27	High	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	Common non-breeding visitor to south Aus waters from ~ Perth to about Eden, NSW. Generally near or at continental shelf. Popn trend stable. Global popn >7 million (Brooke 2004). Risk reduced to low.	Medium
40041004	*Fulmarus glacialoides*	Southern fulmar	2	3	3	1	1	3	3	3	3	2	3	2.29	2.33	2	3.27	High	7 alive, 69 dead: Petrels, Prions	Wide ranging in southern hemisphere. Inhabits Aus.	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																			and Shearwaters. Expanded species	waters in late winter-early spring. Breeds in Antarctica. Global population ~4 million. Risk reduced to low.	
41116002	*Feresa attenuata*	Pygmy killer whale	2	3	3	3	3	3	3	3	3	1	2	2.86	1.43	0	3.2	High	4 alive, 78 dead: Dolphins. Expanded species from Delphinidae	Rarely sighted species. More warm water in oceanic habitats. Risk reduced to low.	Low
41116020	*Tursiops aduncus*	Indian Ocean bottlenose dolphin	2	3	3	3	3	3	3	3	3	1	2	2.86	1.43	0	3.2	High	4 alive, 78 dead: Dolphins. Expanded species from Delphinidae	Uncertain sub-population size within fishery area. Mainly coastal distribution. Small population sub-structuring exists. Risk remains high	High
41116019	*Tursiops truncatus*	Common bottlenose dolphin	2	3	3	3	3	3	3	3	3	1	2	2.86	1.43	0	3.2	High	2 dead. Also, 4 alive, 78 dead: Dolphins-Delphinidae.	Uncertain population size and/or trend. Resident sub-populations exist. Risk remains high	High

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
41116011	*Orcinus orca*	Killer whale	2	3	3	3	3	3	3	3	3	1	2	2.86	1.43	0	3.2	High	4 alive, 78 dead: Dolphins-Delphinidae. Expanded species from Delphinidae.	Unlikely to be this species, as it is the largest delphinidae species and likelihood of Misidentification is low. Risk reduced to medium.	Medium
41116005	*Grampus griseus*	Risso's dolphin	2	3	3	3	3	3	3	3	3	1	2	2.86	1.43	0	3.2	High	4 alive, 78 dead: Dolphins-Delphinidae. Expanded species from Delphinidae.	Data deficient. No estimates of global population abundance or trends. Few or no records in Aus. Occur primarily along continental slope/outer shelf (esp. steep bottom topography), typically > 400 m (Woinarski et al. 2014). Risk reduced to medium (unlikely to interact with gillnet fishery)	Medium
40041011	*Pachyptila desolata*	Antarctic prion	1	3	3	1	1	3	3	3	3	2	3	2.14	2.33	3	3.16	Medium	7 alive, 69 dead: Petrels, Prions and Shearwaters.	No RR required	Medium

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																			Expanded species (Procellariidae)		
40041043	*Puffinus huttoni*	Hutton's shearwater	1	3	3	1	1	3	3	3	3	2	3	2.14	2.33	2	3.16	Medium	4 ret. (Obs). 1 alive 10 dead: Shearwaters. Also, 7 alive, 69 dead: Petrels, Prions and Shearwaters	No RR required	Medium
40041042	*Puffinus griseus*	Sooty shearwater	1	3	3	1	1	3	3	3	3	2	3	2.14	2.33	1	3.16	Medium	1 alive 10 dead: Shearwaters. Also, 7 alive, 69 dead: Petrels, Prions and Shearwaters	No RR required	Medium
40041040	*Puffinus gavia*	Fluttering shearwater	1	3	3	1	1	3	3	3	3	2	3	2.14	2.33	2	3.16	Medium	1 alive 10 dead: Shearwaters. Also, 7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Medium
40041018	*Procellaria aequinoctialis*	White-chinned petrel	1	3	3	1	1	3	3	3	3	2	3	2.14	2.33	2	3.16	Medium	15 kg ret. (Obs). Also, Also, 7 alive, 69 dead: Petrels, Prions and Shearwaters.	No RR required	Medium
41116013	*Pseudorca crassidens*	False killer whale	2	3	3	3	3	3	3	1.87	3	1	2	2.86	1.26	1	3.13	Medium	4 alive, 78 dead: Dolphins. Expanded species from Delphinidae	No RR required	Medium
41116004	*Globicephala melas*	Long-finned pilot whale	2	3	3	3	3	3	3	1.64	3	1	2	2.86	1.22	0	3.11	Medium	4 alive, 78 dead: Dolphins.	No RR required	Medium

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																			Expanded species from Delphinidae		
40001008	*Eudyptula minor*	Little penguin	1	2	3	1	1	3	3	3	3	2	3	2	2.33	1	3.07	Medium	6 alive 3 dead.	No RR required	Medium
40042007	*Pelagodroma marina*	White-faced storm-petrel	1	2	3	1	1	3	3	3	3	2	3	2	2.33	1	3.07	Medium	1 alive. Also 7 alive, 69 dead: Petrels, Prions, Shearwaters.	No RR required	Medium
40041017	*Pelecanoides urinatrix*	Common diving-petrel	1	1	3	1	1	3	3	3	3	2	3	1.86	2.33	1	2.98	Medium	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Medium
41116009	*Lissodelphis peronii*	Southern right whale dolphin	2	3	3	2	3	3	3	1.64	3	1	2	2.71	1.22	1	2.97	Medium	4 alive, 78 dead: Dolphins. Expanded species from Delphinidae	No RR required	Medium
40040007	*Thalassarche melanophrys*	Black-browed albatross	2	3	3	1	1	3	3	1	3	3	3	2.29	1.65	1	2.82	Medium	4 alive, 3 dead alive: Albatrosses. Species expanded from Diomedeidae	No RR required	Medium
41131005	*Neophoca cinerea*	Australian sea lion	2	2	3	2	2	3	3	3	3	1	2	2.43	1.43	0	2.82	Medium	1 alive, 11 dead	No RR required	Medium
41131001	*Arctocephalus forsteri*	New Zealand fur seal	2	2	3	2	2	3	3	3	3	1	2	2.43	1.43	0	2.82	Medium	1 alive, 14 dead. Also, 8 alive, 33 dead: Seals	No RR required	Medium

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
40040009	*Phoebetria palpebrata*	Light-mantled albatross; Light-mantled Sooty albatross	2	3	3	1	1	3	3	1	3	3	3	2.29	1.65	1	2.82	Medium	4 alive, 3 dead alive: Albatrosses. Species expanded from Diomedeidae	No RR required	Medium
40040008	*Phoebetria fusca*	Sooty albatross	2	2	3	1	1	3	3	1.22	3	3	3	2.14	1.8	1	2.8	Medium	4 alive, 3 dead alive: Albatrosses. Species expanded from Diomedeidae	No RR required	Medium
40040014	*Thalassarche carteri*	Indian yellow-nosed albatross	1	3	3	1	1	3	3	1	3	3	3	2.14	1.65	1	2.7	Medium	4 alive, 3 dead alive: Albatrosses. Species expanded from Diomedeidae	No RR required	Medium
41131003	*Arctocephalus pusillus doriferus*	Australian fur seal	1	2	3	2	2	3	3	3	3	1	2	2.29	1.43	1	2.7	Medium	3 alive, 25 dead. Also, 8 alive, 33 dead: Seals.	No RR required	Medium
41116001	*Delphinus delphis*	Common dolphin	1	2	3	2	2	3	3	3	3	1	2	2.29	1.43	0	2.7	Medium	2 alive, 25 dead. Also, 4 alive, 78 dead: Dolphins.	No RR required	Medium
40041035	*Pterodroma solandri*	Providence petrel	2	2	3	1	2	3	3	1	3	2	3	2.29	1.43	1	2.7	Medium	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Medium
40041031	*Pterodroma macroptera*	Great-winged petrel	2	2	3	1	2	3	3	1	3	2	3	2.29	1.43	1	2.7	Medium	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Medium

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
40041030	*Pterodroma leucoptera*	Gould's petrel	2	2	3	1	2	3	3	1	3	2	3	2.29	1.43	1	2.7	Medium	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Medium
40041029	*Pterodroma lessonii*	White-headed petrel	2	2	3	1	2	3	3	1	3	2	3	2.29	1.43	1	2.7	Medium	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Medium
40041003	*Daption capense*	Cape petrel	2	2	3	1	1	3	3	1	3	2	3	2.14	1.43	1	2.57	Low	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Low
40041013	*Pachyptila turtur*	Fairy prion	1	3	3	1	1	3	3	1	3	2	3	2.14	1.43	2	2.57	Low	1 dead	No RR required	Low
40041019	*Procellaria cinerea*	Grey petrel	2	2	3	1	1	3	3	1	3	2	3	2.14	1.43	1	2.57	Low	7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Low
40041038	*Puffinus carneipes*	Flesh-footed shearwater	1	3	3	1	1	3	3	1	3	2	3	2.14	1.43	1	2.57	Low	1 alive 10 dead: Shearwaters Also, 7 alive, 69 dead: Petrels, Prions and Shearwaters. Expanded species	No RR required	Low
41131004	*Arctocephalus tropicalis*	Subantarctic fur seal	1	2	3	2	2	3	3	1	3	1	2	2.29	1.13	0	2.55	Low	8 alive, 33 dead expanded from Seals	No RR required	Low
40042004	*Oceanites oceanicus*	Wilson's storm petrel (subantarctic)	1	2	3	1	1	3	3	1	3	2	3	2	1.43	1	2.46	Low	5 animals ret. (Log).	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	PROD. SCORE	SUSC. SCORE	MISSING ATTRIB-UTES	PSA 2D	RISK CATEGORY	NO. INT. (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
																			7 alive, 69 dead: Petrels, Prions and Shearwaters		

Risk ranking guidelines:

1	Risk rating due to missing, incorrect or out of date information	4	Effort and catch management arrangements for target and byproduct species
2	At risk due to external factors (cumulative risks)	5	Management arrangements to mitigate against the level of bycatch
3	At risk in regards to level of interaction/capture with a zero or negligible level of susceptibility	6	Management arrangements relating to seasonal, spatial and depth closures

Productivity attributes

Table 2.25. Productivity attribute names and cutoff scores for the ERAF L2 PSA method. These cutoffs have been determined from analysis of the distribution of attribute values for species in the ERAF database, and are intended to divide the attribute values into low, medium and high productivity categories.

ATTRIBUTE NUMBER	ATTRIBUTE NAME	LOW PRODUCTIVITY (RISK SCORE: 3)	MEDIUM PRODUCTIVITY (RISK SCORE: 2)	HIGH PRODUCTIVITY (RISK SCORE: 1)
P1	Average age at maturity	> 15 years	5 – 15 years	< 5 years
P2	Average max age	> 25 years	10-25 years	< 10 years
P3	Fecundity	< 100 eggs per years	100-20,000 eggs per year	> 20,000 eggs per year
P4	Average max size	> 300 cm	100-300 cm	< 100 cm
P5	Average size at Maturity	> 200 cm	40-200 cm	< 40 cm
P6	Reproductive strategy	Taxa is “Marine bird" or "Marine mammal"	Family is : "Syngnathidae" or "Solenostomidae" Or Reproductive Strategy is: “Demersal Spawner” Or “Brooder”	Reproductive Strategy is “Broadcast Spawner”
P7	Trophic level	> 3.25	2.75-3.25	< 2.75

Susceptibility attributes

Table 2.26. Susceptibility attribute names and cutoff scores for the ERAF L2 PSA method. These cutoffs have been determined from analysis of the distribution of attribute values for species in the ERAF database, and are intended to divide the attribute values into low, medium and high susceptibility categories.

ATTRIBUTE NUMBER	ATTRIBUTE NAME	LOW SUSCEPTIBILITY (RISK SCORE: 1)	MEDIUM SUSCEPTIBILITY (RISK SCORE: 2)	HIGH SUSCEPTIBILITY (RISK SCORE: 3)
S1	Availability	< 10% overlap	Continuous [1,3]	> 30% overlap
S2	Encounterability (habitat and bathymetry based)	Fishery Specific	Fishery Specific	Fishery Specific
S3	Selectivity (size based)	Fishery Specific	Fishery Specific	Fishery Specific
S4	Post-Capture Mortality (role in fishery based, protected species based)	Some Protected (Live)	Byproduct or bycatch Some protected (generally alive)	Key or secondary commercial Some protected (likely to be dead)

Post Capture Mortality

The following rules were used to assign a risk score to Post Capture Mortality (PCM), based on each species ERAEF classification (see also Table 2.27):

- Commercial, secondary commercial, commercial bait, or byproduct species: score is 3.
- Bycatch species: score is 2
- Protected species (which are discarded), PCM is based on taxa, i.e.,
    - marine birds and marine reptiles: score is 3
    - marine mammals and chondricthyans: score is 2
    - syngnathids: score is 1

Table 2.27. Post capture mortality attribute risk score for the Gillnet subfishery for the ERAEF L2 PSA and bSAFE methods. High: H; M: medium; Low: L. Risk scores that are not assigned by taxa (not specific) for each ERAEF classification are shaded.

ROLE IN FISHERY	TAXA	RATIONALE	RISK CATEGORY	RISK SCORE
Key commercial	Not specific	Retained, therefore dead	H	3
Secondary commercial	Not specific	Retained, therefore dead	H	3
Commercial bait	Not specific	Retained, therefore dead	H	3
Byproduct	Not specific	Retained, therefore dead	H	3
Bycatch	Not specific	Discarded alive or dead	M	2
Protected Species	Marine birds	long duration set, if caught, highly likely to drown	H	3
	Marine reptiles	long duration set, if caught, highly likely to drown	H	3
	Marine mammals	large enough/strong swimming to have a chance of survival	M	2
	Chondrichthyans	large enough/strong swimming to have a chance of survival	M	2
	All others e.g. syngnathids, invertebrates (if any)	Do not get hooked/trapped	L	1

2.5 bSAFE results and discussion

Each of the reference points (MSM, LIM, and CRASH) were evaluated. If the biological reference point mean was higher than the estimated F attributed to this sub-fishery, then the species was categorised as 'Below'. When the biological reference point mean was lower than the estimated F attributed to the sub-fishery, then the species was categorised as 'Above' for that species and reference point measure. The overall risk is a summary of the three reference point measures (Table 2.28). If all reference points are categorised as 'Below', then the overall risk is low. The intensity of fishing effort and gear affected area were used to estimate F, instead of gridded effort.

Table 2.28 Overall risk summary against each of the three reference point measures.

MSM	LIM	CRASH	OVERALL RISK
Below	Below	Below	Low
Above	Below	Below	Medium
Above	Above	Below	High
Above	Above	Above	Extreme

2.5.1 bSAFE – Key/secondary commercial species

Under the revised ERAEF (AFMA 2017), key commercial species that undergo Tier 1 stock assessments are not assessed at Level 2.

2.5.2 bSAFE - Commercial bait species

There were no commercial bait species in this sub-fishery.

2.5.3 bSAFE - Byproduct species

There were 29 byproduct species considered in this SAFE (Table 2.29, Figure 2.11a, b). All 29 species were below the three reference points (low risk) and do not need to be considered further.

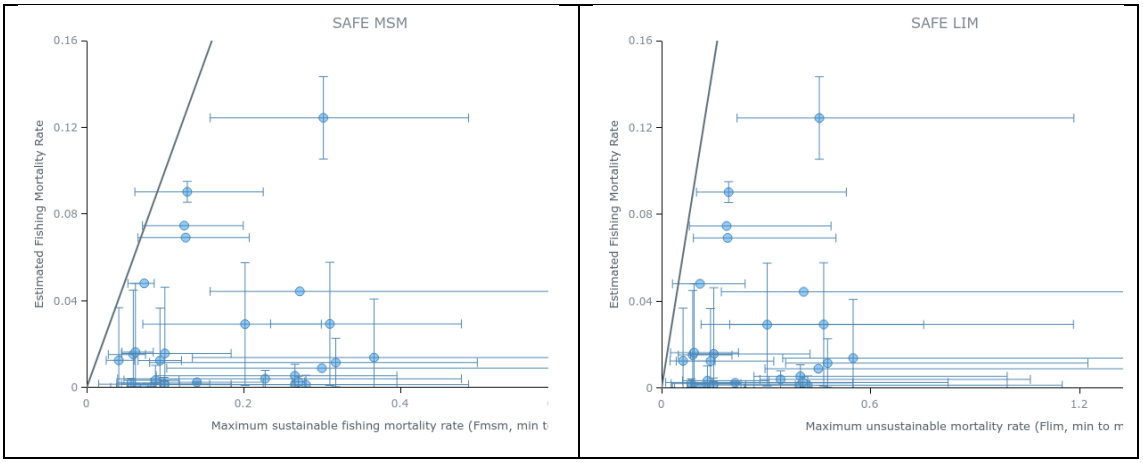

Figure 2.11. SAFE plot for byproduct species in the SESSF GHAT gillnet sub-fishery for (a) SAFE-MSM reference point [left] and (b) SAFE limit (LIM) reference point [right].

Table 2.29. bSAFE risk categories for byproduct species ecological component for F_MSM, F_Lim and F_Crash. A residual risk (RR) analysis conducted for high and medium risk species. Catch from Commonwealth logbook (Log) and observer (Obs) databases. Residual risk guidelines drawn from document "Revision of residual risk guidelines to reflect updated Ecological Risk Assessment Methodology – version Oct 12, 2016. See numbers at the foot of this table. R: retained. NE: not entered. Ret: retained; dis: discarded. ^ Tiered species in this sub-fishery.

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEP-TIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37015001	*Cephaloscyllium laticeps*	Draughtboard shark	0.09	0.1	Below	0.16	Below	0.21	Below	Low	NE	No RR required	Low
37024001	*Squatina australis*	Australian angel shark	0.048	0.07	Below	0.11	Below	0.15	Below	Low	NE	No RR required	Low
37023001	*Pristiophorus nudipinnis*	Southern sawshark^	0.075	0.12	Below	0.19	Below	0.25	Below	Low	NE	No RR required	Low
37020006	*Squalus megalops*	Piked spurdog; spikey dogfish	0.002	0.06	Below	0.09	Below	0.12	Below	Low	NE	No RR required	Low
37005001	*Heptranchias perlo*	Sharpnose sevengill shark	0.002	0.1	Below	0.15	Below	0.2	Below	Low	NE	No RR required	Low
37005002	*Notorynchus cepedianus*	Broadnose shark	0.016	0.1	Below	0.15	Below	0.2	Below	Low	NE	No RR required	Low
37007001	*Heterodontus portusjacksoni*	Port Jackson shark	0.015	0.07	Below	0.10	Below	0.14	Below	Low	NE	No RR required	Low
37012001	*Alopias vulpinus*	Common thresher	0.000	0.08	Below	0.12	Below	0.16	Below	Low	NE	No RR required	Low
37012002	*Alopias superciliosus*	Bigeye thresher shark	0.000	0.06	Below	0.09	Below	0.11	Below	Low	NE	No RR required	Low
37015013	*Cephaloscyllium albipinnum*	Whitefin swellshark	0.003	0.12	Below	0.18	Below	0.24	Below	Low	NE	No RR required	Low
37017003	*Furgaleus macki*	Whiskery shark	0.002	0.1	Below	0.15	Below	0.2	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEP-TIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37018001	*Carcharhinus brachyurus*	Bronze whaler	0.013	0.04	Below	0.06	Below	0.08	Below	Low	NE	No RR required	Low
37019004	*Sphyrna zygaena*	Smooth hammerhead shark	0.004	0.09	Below	0.13	Below	0.18	Below	Low	NE	No RR required	Low
37023002	*Pristiophorus cirratus*	Common sawshark^	0.013	0.09	Below	0.14	Below	0.19	Below	Low	NE	No RR required	Low
37024002	*Squatina tergocellata*	Ornate angelshark	0.000	0.07	Below	0.11	Below	0.15	Below	Low	NE	No RR required	Low
37039001	*Myliobatis tenuicaudatus*	New Zealand eagle ray; Southern eagle ray	0.016	0.07	Below	0.11	Below	0.14	Below	Low	NE	No RR required	Low
37043001	*Callorhinchus milii*	Elephantfish^	0.069	0.13	Below	0.19	Below	0.25	Below	Low	High discard rate	No RR required	Low
37337006	*Seriola lalandi*	Yellowtail kingfish	0.014	0.44	Below	0.66	Below	0.88	Below	Low	NE	No RR required	Low
37353001	*Chrysophrys auratus*	Snapper	0.044	0.28	Below	0.41	Below	0.55	Below	Low	NE	No RR required	Low
37367001	*Paristiopterus gallipavo*	Yellowspotted boarfish	0.001	0.28	Below	0.42	Below	0.56	Below	Low	NE	No RR required	Low
37367002	*Paristiopterus labiosus*	Giant boarfish	0.124	0.3	Below	0.45	Below	0.6	Below	Low	NE	No RR required	Low
37367003	*Pentaceropsis recurvirostris*	Longsnout boarfish	0.029	0.2	Below	0.3	Below	0.4	Below	Low	NE	No RR required	Low
37367004	*Pentaceros decacanthus*	Bigspine boarfish	0.001	0.27	Below	0.4	Below	0.53	Below	Low	NE	No RR required	Low
37367005	*Zanclistius elevatus*	Blackspot boarfish	0.006	0.27	Below	0.4	Below	0.53	Below	Low	NE	No RR required	Low
37367009	*Pseudopentaceros richardsoni*	Pelagic armourhead	0.003	0.27	Below	0.41	Below	0.54	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEP-TIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37367010	*Parazanclistius hutchinsi*	Short boarfish	0.012	0.32	Below	0.48	Below	0.64	Below	Low	NE	No RR required	Low
37377004	*Nemadactylus valenciennesi*	Blue morwong	0.004	0.23	Below	0.34	Below	0.46	Below	Low	NE	No RR required	Low
37378001	*Latris lineata*	Striped trumpeter	0.009	0.3	Below	0.45	Below	0.6	Below	Low	NE	No RR required	Low
37445005	*Seriolella brama*	Blue warehou	0.029	0.31	Below	0.47	Below	0.62	Below	Low	NE	No RR required	Low

Risk ranking guidelines:

1	Risk rating due to missing, incorrect or out of date information	4	Effort and catch management arrangements for target and byproduct species
2	At risk due to external factors (cumulative risks)	5	Management arrangements to mitigate against the level of bycatch
3	At risk in regard to level of interaction/capture with a zero or negligible level of susceptibility	6	Management arrangements relating to seasonal, spatial and depth closures

2.5.4 bSAFE - Bycatch species

There were 125 bycatch species considered in this SAFE (Figure 2.12a, b). Eight species were unassessable due to missing biological attributes employed in the bSAFE method (Table 2.30, classified as NA: unassessable). A PSA was conducted on these eight species (see Table 2.23). Of the 117 species, one was medium risk, and the remaining 116 species were low risk.

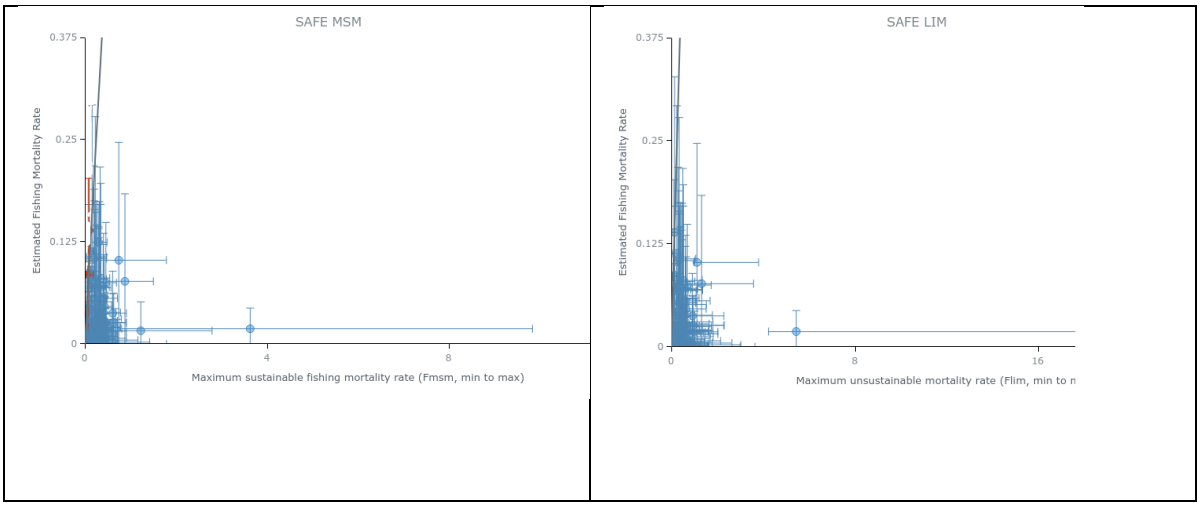

Figure 2.12. SAFE plot for bycatch species in the SESSF GHAT gillnet sub-fishery for (a) SAFE-MSM reference point [left] and (b) SAFE limit (LIM) reference point [right].

Table 2.30. bSAFE risk categories for bycatch species ecological component for F_MSM, F_Lim and F_Crash. A residual risk (RR) analysis conducted for high and medium risk species. Catch from Commonwealth logbook (Log) and observer (Obs) databases. Residual risk guidelines drawn from document "Revision of residual risk guidelines to reflect updated Ecological Risk Assessment Methodology – version Oct 12, 2016. See numbers at the foot of this table. R: retained. NE: not entered. NA: unassessable.

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPTIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
The following 8 species have been analysed in the PSA (see Table 2.23):													
37466003	*Aracana aurita*	Shaw's cowfish	0.020	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37042001	*Chimaera ogilbyi*	Ogilby's ghostshark	0.008	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37296036	*Platycephalus grandispinis*	Longspine flathead	0.049	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37287006	*Neosebastes thetidis*	Thetis fish	0.003	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37287005	*Neosebastes scorpaenoides*	Common gurnard perch	0.039	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37287004	*Neosebastes bougainvillii*	Gulf gurnard perch	0.003	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37287003	*Neosebastes pandus*	Bighead gurnard perch	0.003	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
37022001	*Echinorhinus brucus*	Bramble shark	0.0005	-	NA	-	NA	-	NA	NA	-	-	See PSA Table 2.23
Other BC species:													
37377005	*Dactylophora nigricans*	Dusky morwong	0.105	0.2	Below	0.3	Below	0.4	Below	Low	NE	No RR required	Low
37031007	*Dentiraja lemprieri*	Thornback skate	0.085	0.07	Above	0.11	Below	0.15	Below	Medium	NE	No RR required	Medium
37020008	*Squalus acanthias*	Whitespotted dogfish	0.044	0.06	Below	0.09	Below	0.12	Below	Low	NE	No RR required	Low
37015024	*Asymbolus rubiginosus*	Orange spotted catshark	0.026	0.14	Below	0.21	Below	0.28	Below	Low	NE	No RR required	Low
37020048	*Squalus chloroculus*	Greeneye spurdog	0.001	0.06	Below	0.09	Below	0.12	Below	Low	NE	No RR required	Low
37013003	*Orectolobus maculatus*	Spotted wobbegong	0.006	0.07	Below	0.1	Below	0.14	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPTIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37015009	*Figaro boardmani*	Australian sawtail catshark; Sawtail catshark	0.001	0.12	Below	0.18	Below	0.25	Below	Low	NE	No RR required	Low
37017006	*Hypogaleus hyugaensis*	Pencil shark	0.024	0.11	Below	0.16	Below	0.22	Below	Low	NE	No RR required	Low
37018003	*Carcharhinus obscurus*	Dusky shark; Dusky whaler	0.002	0.04	Below	0.06	Below	0.08	Below	Low	NE	No RR required	Low
37018004	*Prionace glauca*	Blue shark	0.000	0.08	Below	0.11	Below	0.15	Below	Low	NE	No RR required	Low
37020001	*Centrophorus moluccensis*	Endeavour dogfish	0.001	0.05	Below	0.07	Below	0.09	Below	Low	NE	No RR required	Low
37020025	*Centroscymnus coelolepis*	Portuguese dogfish	0.001	0.04	Below	0.06	Below	0.08	Below	Low	NE	No RR required	Low
37027001	*Aptychotrema vincentiana*	Western shovelnose ray	0.015	0.11	Below	0.16	Below	0.21	Below	Low	NE	No RR required	Low
37027011	*Trygonorrhina dumerilii*	Southern fiddler ray	0.087	0.1	Below	0.15	Below	0.2	Below	Low	NE	No RR required	Low
37028001	*Hypnos monopterygius*	Coffin ray	0.003	0.12	Below	0.18	Below	0.25	Below	Low	NE	No RR required	Low
37028002	*Narcine tasmaniensis*	Tasmanian numbfish	0.018	0.68	Below	1.01	Below	1.35	Below	Low	NE	No RR required	Low
37031003	*Dentiraja cerva*	Whitespotted skate	0.005	0.1	Below	0.15	Below	0.21	Below	Low	NE	No RR required	Low
37031005	*Dentiraja confusa*	Longnose skate	0.043	0.09	Below	0.14	Below	0.19	Below	Low	NE	No RR required	Low
37031006	*Spiniraja whitleyi*	Melbourne skate	0.02	0.06	Below	0.09	Below	0.12	Below	Low	NE	No RR required	Low
37031028	*Dipturus canutus*	Grey skate	0.002	0.1	Below	0.14	Below	0.19	Below	Low	NE	No RR required	Low
37035001	*Bathytoshia brevicaudata* was: *Dasyatis brevicaudata*	Smooth stingray	0.012	0.11	Below	0.16	Below	0.21	Below	Low	NE	No RR required	Low
37038001	*Urolophus bucculentus*	Sandyback stingaree	0.019	0.15	Below	0.23	Below	0.31	Below	Low	NE	No RR required	Low
37038002	*Urolophus cruciatus*	Banded stingaree	0.042	0.16	Below	0.23	Below	0.31	Below	Low	NE	No RR required	Low
37038004	*Urolophus paucimaculatus*	Sparsely-spotted stingaree	0.022	0.2	Below	0.29	Below	0.39	Below	Low	NE	No RR required	Low
37038005	*Urolophus sufflavus*	Yellowback stingaree	0.019	0.15	Below	0.23	Below	0.31	Below	Low	NE	No RR required	Low
37038006	*Trygonoptera testacea*	Common stingaree	0.113	0.16	Below	0.24	Below	0.32	Below	Low	NE	No RR required	Low
37038007	*Urolophus viridis*	Greenback stingaree	0.011	0.15	Below	0.23	Below	0.31	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPTIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37038015	*Trygonoptera mucosa*	Western shovelnose stingaree	0.005	0.16	Below	0.24	Below	0.32	Below	Low	NE	No RR required	Low
37117001	*Latropiscis purpurissatus*	Sergeant baker	0.005	0.31	Below	0.46	Below	0.62	Below	Low	NE	No RR required	Low
37120001	*Paraulopus nigripinnis*	Blacktip cucumberfish	0.003	0.53	Below	0.79	Below	1.05	Below	Low	NE	No RR required	Low
37224003	*Pseudophycis barbata*	Bearded rock cod	0.02	0.39	Below	0.58	Below	0.78	Below	Low	NE	No RR required	Low
37224006	*Pseudophycis bachus*	Red cod	0.038	0.42	Below	0.62	Below	0.83	Below	Low	NE	No RR required	Low
37228002	*Genypterus blacodes*	Pink ling	0.001	0.19	Below	0.29	Below	0.38	Below	Low	NE	No RR required	Low
37228008	*Genypterus tigerinus*	Rock ling	0.02	0.20	Below	0.30	Below	0.41	Below	Low	NE	No RR required	Low
37255003	*Paratrachichthys macleayi*	Sandpaper fish	0.004	0.16	Below	0.24	Below	0.32	Below	Low	NE	No RR required	Low
37258001	*Beryx decadactylus*	Imperador	0.001	0.31	Below	0.47	Below	0.63	Below	Low	NE	No RR required	Low
37258002	*Beryx splendens*	Alfonsino	0.001	0.34	Below	0.52	Below	0.69	Below	Low	NE	No RR required	Low
37258003	*Centroberyx affinis*	Redfish	0.009	0.28	Below	0.42	Below	0.56	Below	Low	NE	No RR required	Low
37258004	*Centroberyx gerrardi*	Bight redfish	0.017	0.28	Below	0.42	Below	0.56	Below	Low	NE	No RR required	Low
37258005	*Centroberyx lineatus*	Swallowtail	0.018	0.29	Below	0.44	Below	0.58	Below	Low	NE	No RR required	Low
37258006	*Centroberyx australis*	Yelloweye redfish	0.000	0.35	Below	0.52	Below	0.70	Below	Low	NE	No RR required	Low
37264002	*Cyttus australis*	Silver dory	0.017	0.37	Below	0.55	Below	0.73	Below	Low	NE	No RR required	Low
37264003	*Zenopsis nebulosus*	Mirror dory	0.001	0.27	Below	0.40	Below	0.54	Below	Low	NE	No RR required	Low
37264004	*Zeus faber*	John dory	0.02	0.33	Below	0.50	Below	0.67	Below	Low	NE	No RR required	Low
37268001	*Lampris guttatus*	Spotted moonfish; opah	0.000	0.23	Below	0.35	Below	0.47	Below	Low	NE	No RR required	Low
37268002	*Lampris immaculatus*	Southern moonfish	0.001	0.24	Below	0.35	Below	0.47	Below	Low	NE	No RR required	Low
37287001	*Helicolenus percoides*	Reef Ocean perch	0.038	0.23	Below	0.35	Below	0.46	Below	Low	NE	No RR required	Low
37287008	*Scorpaena papillosa*	Southern red scorpionfish	0.052	0.40	Below	0.6	Below	0.81	Below	Low	NE	No RR required	Low
37287103	*Trachyscorpia carnomagula*	Deepsea scorpionfish	0.000	0.18	Below	0.28	Below	0.37	Below	Low	NE	No RR required	Low
37288001	*Chelidonichthys kumu*	Red gurnard	0.007	0.52	Below	0.78	Below	1.04	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPTIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37288003	*Lepidotrigla vanessa*	Butterfly gurnard	0.026	0.61	Below	0.91	Below	1.21	Below	Low	NE	No RR required	Low
37288006	*Pterygotrigla polyommata*	Latchet	0.016	0.44	Below	0.65	Below	0.87	Below	Low	NE	No RR required	Low
37288007	*Lepidotrigla modesta*	Cocky gurnard	0.038	0.61	Below	0.91	Below	1.21	Below	Low	NE	No RR required	Low
37296001	*Platycephalus richardsoni*	Tiger flathead	0.03	0.41	Below	0.61	Below	0.81	Below	Low	NE	No RR required	Low
37296002	*Platycephalus conatus*	Deepwater Flathead	0.001	0.29	Below	0.44	Below	0.59	Below	Low	NE	No RR required	Low
37296003	*Platycephalus bassensis*	Southern sand flathead	0.046	0.43	Below	0.64	Below	0.85	Below	Low	NE	No RR required	Low
37296006	*Platycephalus laevigatus*	Rock flathead	0.07	0.35	Below	0.52	Below	0.7	Below	Low	NE	No RR required	Low
37296035	*Platycephalus aurimaculatus*	Toothy Flathead	0.024	0.36	Below	0.54	Below	0.72	Below	Low	NE	No RR required	Low
37311005	*Othos dentex*	Harlequin fish	0.01	0.22	Below	0.33	Below	0.44	Below	Low	NE	No RR required	Low
37311006	*Polyprion oxygeneios*	Hapuku	0.001	0.13	Below	0.20	Below	0.26	Below	Low	NE	No RR required	Low
37311034	*Macquaria novemaculeata*	Australian Bass	0.069	0.34	Below	0.5	Below	0.67	Below	Low	NE	No RR required	Low
37311091	*Hypoplectrodes annulatus*	Blackbanded Seaperch	0.069	0.21	Below	0.32	Below	0.42	Below	Low	NE	No RR required	Low
37330014	*Sillago flindersi*	Eastern school whiting	0.026	0.63	Below	0.95	Below	1.27	Below	Low	NE	No RR required	Low
37334002	*Pomatomus saltatrix*	Tailor	0.028	0.38	Below	0.57	Below	0.76	Below	Low	NE	No RR required	Low
37337002	*Trachurus declivis*	Common jack mackerel	0.005	0.47	Below	0.71	Below	0.95	Below	Low	NE	No RR required	Low
37337007	*Seriola hippos*	Samsonfish	0.003	0.45	Below	0.67	Below	0.90	Below	Low	NE	No RR required	Low
37337025	*Seriola dumerili*	Amberjack	0.000	0.38	Below	0.56	Below	0.75	Below	Low	NE	No RR required	Low
37337062	*Pseudocaranx georgianus*	Silver trevally	0.028	0.27	Below	0.40	Below	0.53	Below	Low	NE	No RR required	Low
37344002	*Arripis trutta*	Eastern Australian salmon	0.075	0.46	Below	0.69	Below	0.93	Below	Low	NE	No RR required	Low
37344004	*Arripis truttaceus*	Western Australian salmon	0.013	0.51	Below	0.77	Below	1.02	Below	Low	NE	No RR required	Low
37345001	*Emmelichthys nitidus*	Redbait	0.024	0.43	Below	0.65	Below	0.87	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPTIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37345002	*Plagiogeneion macrolepis*	Bigscale rubyfish	0.001	0.36	Below	0.55	Below	0.73	Below	Low	NE	No RR required	Low
37345003	*Plagiogeneion rubiginosum*	Cosmopolitan rubyfish	0.004	0.36	Below	0.54	Below	0.72	Below	Low	NE	No RR required	Low
37354001	*Argyrosomus japonicus*	Mulloway	0.024	0.21	Below	0.32	Below	0.43	Below	Low	NE	No RR required	Low
37355001	*Upeneichthys lineatus*	Bluestriped goatfish	0.077	0.88	Below	1.32	Below	1.76	Below	Low	NE	No RR required	Low
37361001	*Kyphosus sydneyanus*	Silver Drummer	0.07	0.24	Below	0.36	Below	0.48	Below	Low	NE	No RR required	Low
37361003	*Tilodon sexfasciatus*	Moonlighter	0.054	0.31	Below	0.46	Below	0.61	Below	Low	NE	No RR required	Low
37361008	*Girella zebra*	Zebrafish	0.07	0.3	Below	0.45	Below	0.59	Below	Low	NE	No RR required	Low
37361004	*Scorpis aequipinnis*	Sea sweep	0.059	0.27	Below	0.4	Below	0.54	Below	Low	NE	No RR required	Low
37361007	*Girella tricuspidata*	Luderick	0.071	0.32	Below	0.48	Below	0.64	Below	Low	NE	No RR required	Low
37361009	*Scorpis lineolata*	Silver sweep	0.081	0.35	Below	0.52	Below	0.7	Below	Low	NE	No RR required	Low
37361015	*Scorpis georgiana*	Banded Sweep	0.003	0.26	Below	0.39	Below	0.52	Below	Low	NE	No RR required	Low
37369002	*Oplegnathus woodwardi*	Knifejaw	0.016	0.31	Below	0.47	Below	0.63	Below	Low	NE	No RR required	Low
37377001	*Cheilodactylus nigripes*	Magpie perch	0.058	0.27	Below	0.4	Below	0.53	Below	Low	NE	No RR required	Low
37377002	*Nemadactylus douglasii*	Grey morwong	0.068	0.24	Below	0.36	Below	0.48	Below	Low	NE	No RR required	Low
37377003	*Nemadactylus macropterus*	Jackass morwong	0.001	0.22	Below	0.32	Below	0.43	Below	Low	NE	No RR required	Low
37377006	*Cheilodactylus spectabilis*	Banded morwong	0.079	0.2	Below	0.31	Below	0.41	Below	Low	NE	No RR required	Low
37377009	*Cheilodactylus fuscus*	Red morwong	0.107	0.23	Below	0.34	Below	0.46	Below	Low	NE	No RR required	Low
37377014	*Nemadactylus sp. [see Smith et al, 1996]*	king morwong	0.053	0.22	Below	0.33	Below	0.44	Below	Low	NE	No RR required	Low
37378002	*Latridopsis forsteri*	Bastard trumpeter	0.074	0.21	Below	0.31	Below	0.41	Below	Low	NE	No RR required	Low
37384001	*Bodianus vulpinus*	Western pigfish	0.000	0.64	Below	0.96	Below	1.28	Below	Low	NE	No RR required	Low
37384002	*Achoerodus gouldii*	Western blue groper	0.009	0.29	Below	0.44	Below	0.59	Below	Low	NE	No RR required	Low
37384003	*Notolabrus tetricus*	Bluethroat wrasse	0.071	0.26	Below	0.39	Below	0.52	Below	Low	NE	No RR required	Low
37384020	*Pictilabrus laticlavius*	Senator Wrasse	0.059	0.31	Below	0.46	Below	0.61	Below	Low	NE	No RR required	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPTIBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016)	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37384043	*Achoerodus viridis*	Eastern blue groper	0.103	0.75	Below	1.12	Below	1.49	Below	Low	NE	No RR required	Low
37384057	*Bodianus frenchii*	Foxfish	0.005	0.22	Below	0.33	Below	0.44	Below	Low	NE	No RR required	Low
37400003	*Kathetostoma laeve*	Common stargazer	0.021	0.32	Below	0.48	Below	0.63	Below	Low	NE	No RR required	Low
37400018	*Kathetostoma canaster*	Speckled stargazer	0.017	0.36	Below	0.55	Below	0.73	Below	Low	NE	No RR required	Low
37439001	*Thyrsites atun*	Barracouta	0.003	0.36	Below	0.54	Below	0.71	Below	Low	NE	No RR required	Low
37439008	*Lepidocybium flavobrunneum*	Escolar	0.000	0.34	Below	0.51	Below	0.68	Below	Low	NE	No RR required	Low
37441001	*Scomber australasicus*	Blue mackerel	0.005	0.37	Below	0.55	Below	0.73	Below	Low	NE	No RR required	Low
37441002	*Thunnus albacares*	Yellowfin tuna	0.006	0.33	Below	0.5	Below	0.66	Below	Low	NE	No RR required	Low
37441003	*Katsuwonus pelamis*	Skipjack tuna	0.005	0.58	Below	0.87	Below	1.16	Below	Low	NE	No RR required	Low
37441004	*Thunnus maccoyii*	Southern bluefin tuna	0.000	0.17	Below	0.25	Below	0.33	Below	Low	NE	No RR required	Low
37441005	*Thunnus alalunga*	Albacore	0.000	0.19	Below	0.29	Below	0.39	Below	Low	NE	No RR required	Low
37441019	*Gasterochisma melampus*	Butterfly mackerel	0.000	0.54	Below	0.8	Below	1.07	Below	Low	NE	No RR required	Low
37441020	*Sarda australis*	Australian bonito	0.02	0.43	Below	0.65	Below	0.87	Below	Low	NE	No RR required	Low
37442001	*Xiphias gladius*	Broadbill swordfish; swordfish	0.000	0.19	Below	0.29	Below	0.39	Below	Low	NE	No RR required	Low
37445001	*Hyperoglyphe antarctica*	Blue-eye trevalla	0.007	0.21	Below	0.32	Below	0.42	Below	Low	NE	No RR required	Low
37445006	*Seriolella punctata*	Silver warehou	0.026	0.33	Below	0.5	Below	0.66	Below	Low	NE	No RR required	Low
37445011	*Seriolella caerulea*	White warehou	0.002	0.32	Below	0.48	Below	0.64	Below	Low	NE	No RR required	Low
37465003	*Eubalichthys mosaicus*	Mosaic leatherjacket	0.015	0.41	Below	0.61	Below	0.82	Below	Low	NE	No RR required	Low
37465005	*Meuschenia scaber*	Velvet leatherjacket	0.01	0.41	Below	0.61	Below	0.82	Below	Low	NE	No RR required	Low
37465006	*Nelusetta ayraud*	Ocean jacket	0.021	0.38	Below	0.56	Below	0.75	Below	Low	NE	No RR required	Low
37465007	*Scobinichthys granulatus*	Rough leatherjacket	0.056	0.41	Below	0.61	Below	0.82	Below	Low	NE	No RR required	Low
37469001	*Diodon nicthemerus*	Globefish	0.019	0.45	Below	0.68	Below	0.9	Below	Low	NE	No RR required	Low
37469002	*Allomycterus pilatus*	Australian burrfish	0.018	0.45	Below	0.68	Below	0.9	Below	Low	NE	No RR required	Low

Risk ranking guidelines:

1	Risk rating due to missing, incorrect or out of date information	4	Effort and catch management arrangements for target and byproduct species
2	At risk due to external factors (cumulative risks)	5	Management arrangements to mitigate against the level of bycatch
3	At risk in regard to level of interaction/capture with a zero or negligible level of susceptibility	6	Management arrangements relating to seasonal, spatial and depth closures

2.5.5 bSAFE - Protected species

There were five protected species considered in this SAFE (Figure 2.13a, b). All species were low risk (Table 2.31).

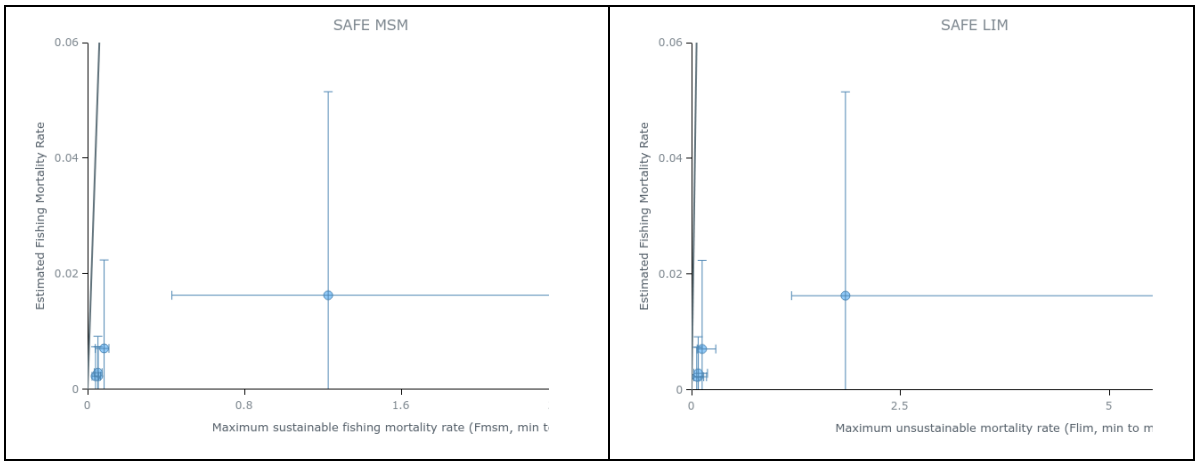

Figure 2.13. SAFE plot for protected species in the SESSF GHAT gillnet sub-fishery for a) SAFE-MSM reference point and (b) SAFE limit [left] (LIM) reference point [right].

Table 2.31. bSAFE risk categories for protected species ecological component for F_MSM, F_Lim and F_Crash. A residual risk (RR) analysis conducted for high and medium risk species. Catch from Commonwealth logbook (Log) and observer (Obs) databases. Residual risk guidelines drawn from document "Revision of residual risk guidelines to reflect updated Ecological Risk Assessment Methodology – version Oct 12, 2016. See numbers at the foot of this table. R: retained. NE: not entered. NA: not assessable.

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPT-IBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
37008001	*Carcharias taurus*	Grey nurse shark	0.007	0.08	Above	0.13	Below	0.17	Below	Low	1 dead animal (AFMA verified data)	No RR required	Medium
37010003	*Carcharodon carcharias*	White shark	0.002	0.04	Above	0.06	Above	0.08	Above	Low	40 alive, 8 dead (AFMA verified data)	No RR required Eastern Australia and New Zealand: estimated number of adults are small (280-650). Total population estimated to be 2500-6500 animals (Hillary et al. 2018). Survival probability >90 % (adults); ~73% juveniles (Hillary et al. 2018). East Australasian population, mean = 750 adults (uncertainty range: 470-1030). 5460 juveniles (uncertainty range: 2909 – 12,802). Reference: Bruce et. al. (2018). Mean estimate of adult abundance for the	Low

CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SUSCEPT-IBILITY	F MSM	F MSM RISK	F LIM	F LIM RISK	F CRASH	F CRASH RISK	F OVERALL RISK	CATCH (2012-2016) AND OTHER INFORMATION	RISK SCORE FOLLOWING RESIDUAL RISK	FINAL RISK SCORE
												southern-western population was 1,460 (uncertainty range 760 to 2,250). Reference: Bruce et. al. (2018).	
37010001	*Isurus oxyrinchus*	Shortfin mako	0.002	0.05	Below	0.08	Below	0.11	Below	Low	6 alive, 483 dead (AFMA verified data)	No RR required	Low
37010004	*Lamna nasus*	Porbeagle	0.003	0.05	Below	0.08	Below	0.11	Below	Low	1 dead (AFMA verified data)	No RR required	Low
37282029	*Solegnathus spinosissimus*	Spiny pipehorse	0.016	1.23	Below	1.84	Below	2.46	Below	Low	NE	No RR required	Low

Risk ranking guidelines:

1	Risk rating due to missing, incorrect or out of date information	4	Effort and catch management arrangements for target and byproduct species
2	At risk due to external factors (cumulative risks)	5	Management arrangements to mitigate against the level of bycatch
3	At risk in regard to level of interaction/capture with a zero or negligible level of susceptibility	6	Management arrangements relating to seasonal, spatial and depth closures

2.6 Habitat Component

The Habitat component was eliminated at Level 1.

2.7 Community Component

The Community component was eliminated at Level 1.

2.8 Decision rules to move from Level 2 to Level 3 (Step 7)

For the PSA overall risk values, units that fall in the upper third (risk value > 3.18) and middle third (2.64 < risk value < 3.18) of the PSA plots are deemed to be at high and medium risk, respectively. For the SAFE method, species that fall above the SAFE-MSM or limit reference point (SAFE-LIM) are considered to be at risk of overfishing (Table 2.28). Species identified from either method need to be the focus of further work, either through implementing a management response to address the risk to the vulnerable species or by further examination for risk within the ecological component at Level 3. PSA-units at low risk, (i.e. in the lower third), or at SAFE where units were below the overfishing limit point (i.e. SAFE-LIM) will be deemed not at risk from the sub-fishery and the assessment is concluded for these units.

The output from the Level 2 analysis will result in four options:

- The risk of a unit of analysis within a component (e.g. single species or habitat type) is not high, the rationale is documented, and the impact of the fishing activity on this unit need not be assessed at a higher level unless management or the fishery changes.
- The risk of a unit is high, but management strategies are introduced rapidly that will reduce this risk, this unit need not be assessed further unless the management or the fishery changes.
- The risk of a unit is high but there is additional information that can be used to determine if Level 3, or even a new management action is required. This information should be sought before action is taken.
- The risk of a unit is high and there are no planned management interventions that would remove this risk; therefore the reasons are documented and the assessment moves to Level 3.

At the conclusion of the Level 2 analysis, a fishery can decide to further investigate the risk of fishing to the species via a Level 3 assessment or implement a management response to mitigate the risk. To ensure all fisheries follow a consistent process in responding to the results of the risk assessment, AFMA has developed an ecological risk management framework. The framework (Figure 2.14) makes use of the existing AFMA management structures to enable the ERAs to become a part of normal fisheries management, including the involvement of fisheries consultative committees. A separate document, the ERM report, will be developed that outlines the reasons why species are at high risk and what actions the fishery will implement to respond to the risks.

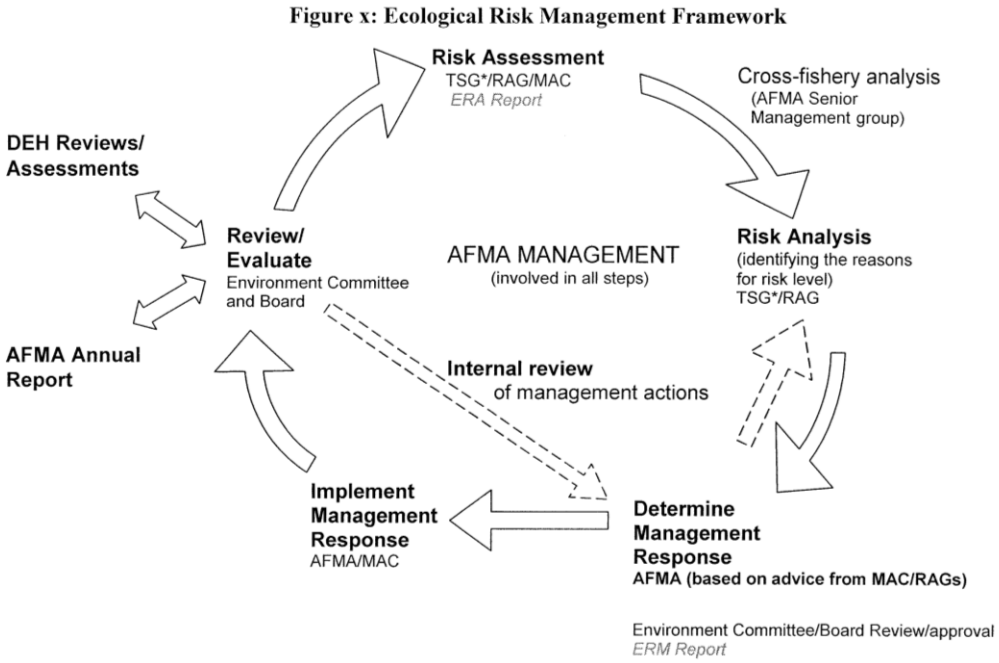

Figure 2.14. Schematic of the Ecological risk management cycle. TSG – Technical Support Group.

2.9 Extreme and high-risk categorisation (Step 8): update with Residual Risk information

PSA

Bycatch species

A residual risk analysis was performed on the two high risk teleosts species (from the eight ranked as unassessable in bSAFE), resulting in both species reduced to low risk due to the small number of interactions/capture within the assessment period. Six of 16 invertebrate BC species were high risk, but all were reduced to low risk following a residual risk analysis.

Protected species

A total of 27 species were at high risk (22 marine birds and five marine mammals). Following a residual risk analysis, five marine bird species remained high risk while seven species were reduced to medium risk and 10 species reduced to low risk. The five high risk species were Campbell's albatross *Thalassarche impavida*, shy albatross *Thalassarche cauta*, wandering albatross *Diomedea exulans*, blue petrel *Halobaena caerulea* and soft-plumaged petrel *Pterodroma mollis*.

Of the five high risk marine mammal species, two remained at high risk, two were reduced to medium risk and one was reduced to low risk. The remaining two high risk marine mammal

species were the Indian Ocean bottlenose dolphin *Tursiops aduncus* and common bottlenose dolphin *Tursiops truncatus*.

bSAFE

Byproduct species

There were no species assessed at high or extreme risk.

Bycatch species

There were no bycatch species assessed at extreme or high risk.

Protected species

There were no protected species assessed at extreme or high risk.

3 General discussion and research implications

3.1 Level 1

In this case, 16 out of 32 possible internal activities were identified as occurring in this sub-fishery. All six external scenarios were also identified. Thus, a total of 21 activity-component scenarios were considered at Level 1. This resulted in 105 (excluding the key commercial x direct impact by capture activity) scenarios (of 160 possible) to be developed and evaluated using the unit lists (Key commercial/secondary, byproduct/bycatch, protected species, habitats, communities).

3.2 Level 2

3.2.1 Species at risk

A Level 2 analysis was triggered for two ecological components: byproduct/bycatch species, protected species, as risk (consequence) scores were $\geq$3 in the Level 1 SICA analysis.

Residual risk

As discussed elsewhere in this report (Section 1), the ERAEF methods are both hierarchically structured and precautionary. The Level 1 (SICA) analyses are used to identify potential hazards associated with fishing and which broad components of the ecological system they apply to. The Level 2 (PSA) analyses consider the direct impacts of fishing on individual species and habitats (rather than whole components), but the large numbers of species that need to be assessed and the nature of the information available for most species in the PSA analyses limits these analyses in several important respects. These include that some existing management measures are not directly accounted for, and that no direct account is taken of the level of mortality associated with fishing. Both these factors are considered in the ERAEF framework at Level 3, but the analyses reported here stop at Level 2. This means that the risk levels for species must be regarded as identifying potential rather than actual risk, and due to the precautionary assumptions made in the PSA analyses, there will be a tendency to overestimate absolute levels of risk from fishing.

In moving from ERA to ERM, AFMA will focus scarce resources on the highest priority species and habitats (those likely to be most at risk from fishing). To that end, and because Level 3 analyses are not yet available for most species, AFMA (with input from CSIRO and other stakeholders) has developed guidelines to assess “residual risk” for those species identified as being at high potential risk based on the PSA analyses. The residual risk guidelines will be applied on a species-by-species basis and include consideration of existing management

measures not currently accounted for in the PSA analyses, as well as additional information about the levels of direct mortality. These guidelines will also provide a transparent process for including more precise or missing information into the PSA analysis as it becomes available.

CSIRO and AFMA will continue to work together to include the broad set of management arrangements in Level 2 analyses, and these methods will be incorporated in future developments of the ERAEF framework. CSIRO has also undertaken some preliminary Level 3 analyses for bycatch species for several fisheries, and these or similar methods will also form part of the overall ERAEF framework into the future.

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Zhou, S.J., Fuller, M., Daley, R. (2012). Sustainability assessment of fish species potentially impacted in the Southern and Eastern Scalefish and Shark Fishery: 2007-2010. Report to the Australia Fisheries Management Authority, Canberra, Australia. March 2012. 47 p.

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Appendix A. Commercial species and stock status

Commercial species stock status, assessment and tier status, and ERA classification for this sub-fishery (Gillnet). NSTOF: Not subject to overfishing; NOF: Not overfished; OF: Overfished; UNC: uncertain. Note: Stock status is not assessed for non-quota species. NT: no Tier assessment within 2012-2016 (where known). Primary: C1; Secondary: C2; Byproduct: BP; Bycatch: BC. ^: based on ABARES classification. ^^ based on stock assessment.

COMMON NAME	SPECIES NAME	ERA CLASSIFICATION#	FISHING MORTALITY^	BIOMASS^	STOCK STATUS^^	YEAR LAST ASSESSED	REFERENCE	TIER LEVEL ASSESS-MENT	COMMENTS
Gummy shark	*Mustelus antarcticus*	C1	NSTOF	NOF	Above limit reference	2016	Punt et al. 2016	1	
School shark	*Galeorhinus galeus*	C2	UNC	OF	Uncertain if total mortality will allow recovery in required time frame.	2009	Thomson and Punt 2009	1	
Elephantfish	*Callorhinchus milii*	BP	NSTOF	NOF	Above limit reference	2015	Sporcic and Haddon 2018	4	
Sawshark	*Pristiophorus cirratus and Pristiophorus nudipinnis*	BP	NSTOF	NOF	Above limit reference	2015	Sporcic and Haddon 2018~	4	
Blue warehou	*Seriolella brama*	BP	UNC	OF	No evidence to suggest rebuilding above the limit reference	2013	Haddon 2013	4	
Bight redfish	*Centroberyx gerrardi*	BC	NSTOF	OF	Above limit reference	2015	Haddon 2015b	1	
Jackass morwong	*Nemadactylus macropterus*	BC	NSTOF	NOF	Above limit reference	2015	Tuck et al. 2015	1	
Tiger flathead	*Platycephalus richardsoni*	BC	NSTOF	NOF	Above limit reference	2016	Day 2016	1	
Deepwater shark (east)	*Dogfish (Squalidae), brier shark (Deania calcea), platypus shark (D.*	BC	NSTOF	UNC	Multispecies nature of stock makes CPUE	2013	Haddon and Sporcic 2017a	4	

COMMON NAME	SPECIES NAME	ERA CLASSIFICATION#	FISHING MORTALITY^	BIOMASS^	STOCK STATUS^^	YEAR LAST ASSESSED	REFERENCE	TIER LEVEL ASSESS-MENT	COMMENTS
	quadrispinosa), Plunket's shark (Centroscymnus plunketi), roughskin shark (species of Centroscymnus and Deania), 'pearl shark' (D. calcea and D. quadrispinosa), black shark (Centroscymnus species), lantern shark (Etmopterus species) and other sharks (Klaer et al. 2014).				potentially unreliable as the index of abundance				
Deepwater shark (west)			NSTOF	UNC	Multispecies nature of stock makes CPUE potentially unreliable as the index of abundance.	2013	Haddon and Sporcic 2017a	4	
Latchet	*Pterygotrigla polyommata*	BC	-	-	-	-	-	NT	
Redfish	*Centroberyx affinis*	BC	UNC	OF	Below limit reference	2014	Tuck et. al. 2017	1	
Pink ling	*Genypterus blacodes*	BC	NSTOF	NOF	Above limit reference	2015	Cordue 2015	1	
Silver trevally	*Pseudocaranx georgianus*	BC	NSTOF	NOF	Above limit reference	2013	Haddon and Sporcic 2017a	4	
Red gurnard	*Chelidonichthys kumu*	BC	-	-	-	-	-	NT	
John dory	*Zeus faber*	BC	NSTOF	NOF	Above limit reference	2014	Castillo-Jordán 2017	3	
Leatherjackets	*Balistidae, Monacanthidae* - undifferentiated	BC	-	-	-	-	-	NT	
Reef ocean Perch	*Helicolenus percoides*	BC	NA	NA	NA	2013	Haddon and Sporcic 2017a	4	
Alfonsino	*Beryx splendens*	BC	NSTOF	NOF	Above limit reference	2013	Klaer 2013	3	
Flatheads	*Platycephalidae* - undifferentiated	BC	NSTOF	NOF	Above limit reference **	-	-		
Silver warehou	*Seriolella punctata*	BC	NSTOF	NOF	Above limit reference	2015	Thompson et al. 2015	1	
Mirror dory	*Zenopsis nebulosus*	BC	NSTOF	NOF	Above limit reference	2016	Haddon and Sporcic 2017a	4	

COMMON NAME	SPECIES NAME	ERA CLASSIFICATION#	FISHING MORTALITY^	BIOMASS^	STOCK STATUS^^	YEAR LAST ASSESSED	REFERENCE	TIER LEVEL ASSESS-MENT	COMMENTS
Blue-eye trevalla	*Hyperoglyphe antarctica*	BC	NSTOF	NOF	Above limit reference	2016	Haddon and Sporcic 2017a	4	
Gould's squid	*Nototodarus gouldi*	BC	NSTOF	NOF	Above limit reference	2015	Barnes et. al. 2015	NT	Based on assessment of southern squid jig fishery
Ocean jacket	*Nelusetta ayraudi*	BC	NSTOF	NOF	Above limit reference	NA	Haddon and Sporcic 2017c^	NT	
Ribaldo	*Mora moro*	BC	NSTOF	NOF	Above limit reference	2013	Haddon and Sporcic 2017a	4	
Blue grenadier	*Macruronus novaezelandiae*	BC	NSTOF	NOF	Above limit reference	2013	Tuck 2013	1	
King dory	*Cyttus traversi*	BC	-	-	-	-	-	NT	
Deepwater flathead	*Platycephalus conatus*	BC	NSTOF	NOF	Above limit reference	2016	Haddon 2016	1	
Oreo basket	*Warty—Allocyttus verrucosus, spikey—Neocyttus rhomboidalis, rough—N. psilorhynchus, black—A. niger, other—Neocyttus spp.*	BC	NSTOF	NOF	Above limit reference	2017	Haddon and Sporcic 2017a	4	
Oreo (smooth Cascade)	*Pseudocyttus maculatus*	BC	NSTOF	NOF	Above limit reference	2015	Haddon et al. 2015a	4	
Oreo (smooth other)			NSTOF	NOF	Above limit reference	2015	Haddon et al. 2015a	4	
Eastern School Whiting	*Sillago flindersi*	BC	NSTOF	NOF	Above limit reference	2017	Day 2017	1	
Gemfish (Eastern)	*Rexea solandri*	BC	UNC	OF	Below limit reference	2011	Little and Rowling 2011		
Gemfish (Western)			NSTOF	NOF	Above limit reference	2016	Helidonioti s and Moore 2016	1/4	
Orange roughy (Albany and Esperance)	*Hoplostethus atlanticus*	N/A*	NSTOF	UNC	No commercial catch, no formal	-	-	1	

COMMON NAME	SPECIES NAME	ERA CLASSIFICATION#	FISHING MORTALITY^	BIOMASS^	STOCK STATUS^^	YEAR LAST ASSESSED	REFERENCE	TIER LEVEL ASSESS-MENT	COMMENTS
					assessment				
Orange roughy (Cascade Plateau)			NSTOF	NOF	Above limit reference	2009	Deep RAG (2009)	1	
Orange roughy (Eastern)			NSTOF	NOF	Above limit reference	2016	Haddon 2017	1	
Orange roughy (Southern)			NSTOF	OF	Negligible catches, no updated stock assessment	2000		1	
Orange roughy (Western)			NSTOF	OF	Negligible catches, no updated stock assessment	2002		1	
Frostfish	*Lepidopus caudatus*	N/A*						NT	
Royal Red Prawn	*Haliporoides sibogae*	N/A*	NSTOF	NOF	Above limit reference	2017	Haddon and Sporcic 2017a	4	

Stock status is not assessed for non-quota species.
N/A* - these species did not appear in the gillnet ERA species list.
^: Based on relative standardized CPUE; * Tiger flathead has a separate Tier 1 assessment. The group "flatheads (*Platycephalidae* – undifferentiated)" do not have an assessment. **: No formal assessment, but assumed to be mostly comprised of Tiger flathead, which has an assessment. ~data up to 2016.

Record of stock assessments during the ERA assessment period and their respective Tier levels (shaded). Tier 1 (blue); Tier 3 (orange); Tier 4 (green).

COMMON NAME	2012	2013	2014	2015	2016
Alfonsino	3	3			
Bight Redfish				1	
Blue Eye Trevalla		4		4	4
Blue Grenadier		1			
Blue Warehou	4	4			
Deepwater Flathead	1	1			1
Deepwater shark east		4			
Deepwater shark west		4			
Elephant Fish	4	4	4	4	
Flathead	1				1
Gemfish - East					
Gemfish - west		1/4			1/4
Gummy Shark		1			1
Jackass Morwong	1	1		1	
John Dory	3	3	3		
Mirror Dory	3	4	4	4	4
Reef Ocean Perch	4	4			
Orange Roughy - south					
Orange Roughy - east			1		
Orange Roughy - west					
Orange Roughy - Cascade Plateau					
Orange Roughy - Albany and Esperance					
Oreo Smooth - Cascade					
Oreo Smooth - other					
Oreo Basket	4	4			
Pink Ling	1	1		1	
Redfish	3/4	3/4	1		
Ribaldo	4	4			
Royal Red Prawn	4	4			
Saw Shark	4	4	4	4	
School Shark					
School Whiting					
Silver Trevally	4	4			
Silver Warehou	1			1	
Tiger Flathead		1			1

Appendix B. Current gillnet entitlements

QUOTA YEAR	NO. GILLNET BOAT SFRS	NO. GILLNET BOAT SFR HOLDERS	NO. OF SA COASTAL WATERS PERMITS (LINKED)*	NO. SOUTH AUSTRALIA COASTAL WATERS PERMIT (LINKED)* HOLDERS	NO. SOUTH AUSTRALIA COASTAL WATERS PERMITS (UNLINKED)	NO. SOUTH AUSTRALIA COASTAL WATERS PERMIT (UNLINKED) HOLDERS)	NO. TASMANIAN COASTAL WATERS PERMITS (LINKED)*	NO. TASMANIAN COASTAL WATERS PERMIT (LINKED)* HOLDERS	NO. TASMANIAN COASTAL WATERS PERMITS (UNLINKED)	NO. TASMANIAN COASTAL WATERS PERMIT (UNLINKED) HOLDERS	TASMANIAN ROCK LOBSTER NOT LINKED 200 HOOKS GILLNET 1800M - PERMITS	TASMANIAN ROCK LOBSTER NOT LINKED 200 HOOKS GILLNET 1800M – PERMIT HOLDERS	NO. ACTIVE BOATS	NO. INACTIVE CONCESSIONS/BOATS**
2008-09	62	64	11	11	21	26	31	29	14	13	1	2	62	36
2009-10	62	65	11	11	21	23	31	29	14	13	1	2	63	35
2010-11	62	68	11	12	19	21	31	32	14	14	1	1	59	37
2011-12	62	65	11	10	19	23	31	30	14	15	1	1	45	51
2012-13	61	64	11	11	15	16	31	29	12	14	1	1	46	43
2013-14	61	57	10	16	15	21	32	31	12	11	1	1	43	46
2014-15	61	56	10	11	15	16	33	26	12	10	1	1	40	49
2015-16	61	52	10	9	15	16	33	29	12	12	1	1	37	52
2016-17	61	53	9	8	15	18	33	28	12	12	1	1	36	53

*Linked permits can only be used if linked to a Gillnet Boat SFR. Unlinked permits can be used without a Gillnet Boat SFR.

**No. inactive concessions (SFRs and permits) or boats = (no. gillnet boat SFRs + no. unlinked permits) – no. active vessels

Appendix C. TAC and percent caught

		PRIMARY COMMERCIAL SPECIES	SECONDARY COMMERCIAL SPECIES
SESSF SEASON	TAC AND CATCH	GUMMY SHARK	SCHOOL SHARK
2008-09	Agreed TAC	1,717,200	240,000
	TAC after over/undercatch	1,855,781	262624
	% TAC caught (SESSF)	96	86
	Logbook catch gillnet*	1,475,154	203,960
2009-10	Agreed TAC	1,717,200	240,000
	TAC after over/undercatch	1,771,427	254,686
	% TAC caught (SESSF)	91	81
	Logbook catch gillnet*	1,274,308	165,539
2010-11	Agreed TAC	1,717,000	216,000
	TAC after over/undercatch	1,826,502	233,544
	% TAC caught (SESSF)	85	100
	Logbook catch gillnet*	1,229,736	175,601
2011-12	Agreed TAC	1,717,000	176,000
	TAC after over/undercatch	1,846,555	175,778
	% TAC caught (SESSF)	79	92
	Logbook catch gillnet*	1,026,475	114,332
2012-13	Agreed TAC	1,714,000	150,000
	TAC after over/undercatch	1,862,154	150,000
	% TAC caught (SESSF)	79	85
	Logbook catch gillnet*	1,027,304	85,509
2013-14	Agreed TAC	1,836,000	215,000
	TAC after over/undercatch	1,963,679	214,402
	% TAC caught (SESSF)	77	90
	Logbook catch gillnet*	935,401	89,690
2014-15	Agreed TAC	1,836,000	215,000
	TAC after over/undercatch	1,986,415	214,736
	% TAC caught (SESSF)	77	94
	Logbook catch gillnet*	1,019,910	104,467
2015-16	Agreed TAC	1,836,000	215,000
	TAC after over/undercatch	1,977,759	214,731
	% TAC caught (SESSF)	91	84
	Logbook catch gillnet*	1,319,032	103,286
2016-17	Agreed TAC	1,836,000	215,000
	TAC after over/undercatch	1,924,570	214,999
	% TAC caught (SESSF)	87%	81%
	Logbook catch gillnet*	1,211,236	84,595

Appendix D. Gillnet Closures

Closures legislated under the *Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016.*

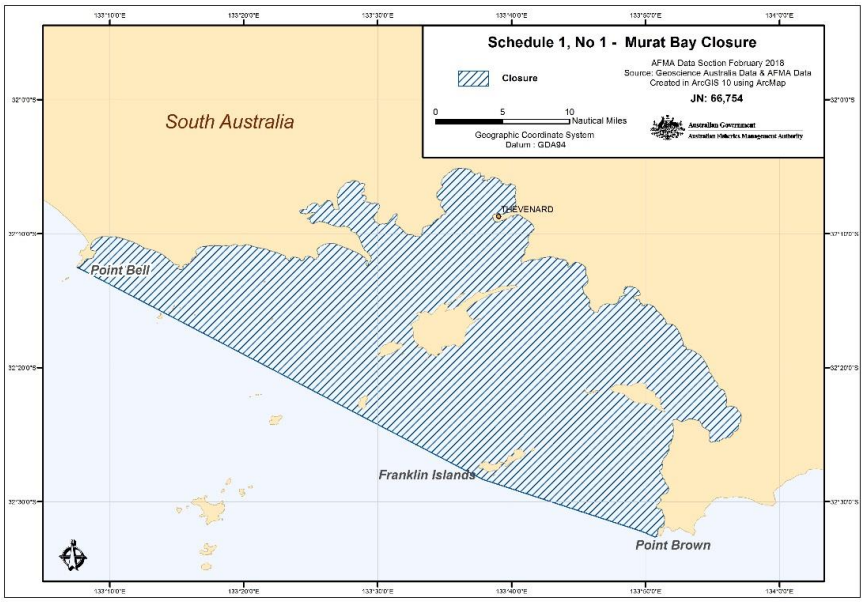
For exact coordinates of area closures refer to the relevant sections of the SESSF Closure Directions, as referenced by the map title.

Schedule 1 - Murat Bay

Location: Coastal Waters off South Australia

Reason: Protect stocks of Australian sea lions, bronze whalers, pink snapper and mulloway

Prohibited: Gillnet methods

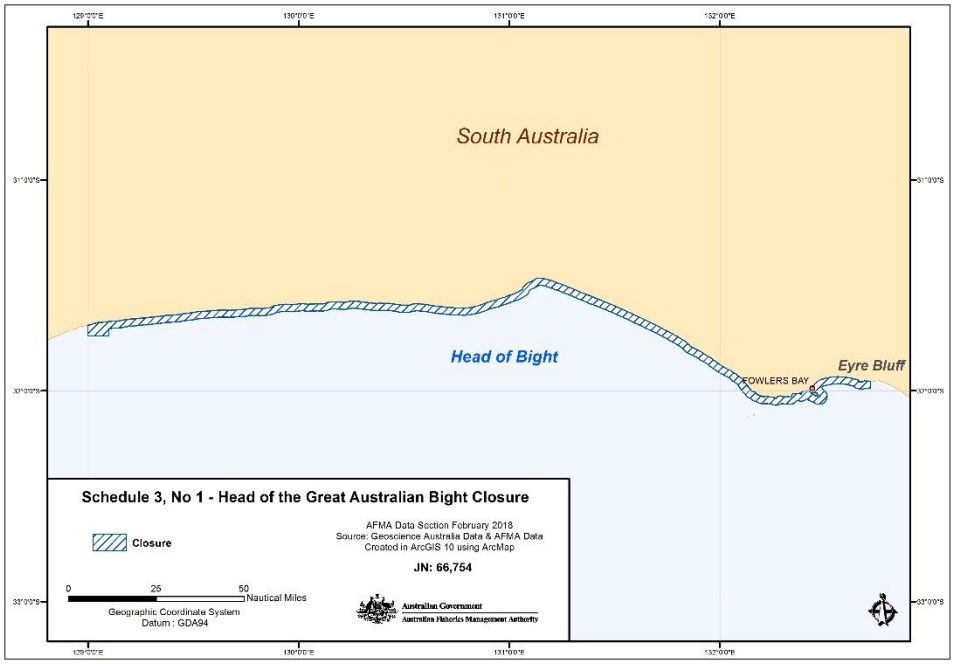


Schedule 3 - Head of the Great Australian Bight

Location: Great Australian Bight, South Australia

Reason: Protect breeding school shark and Australian sea lion populations

Prohibited: All fishing methods

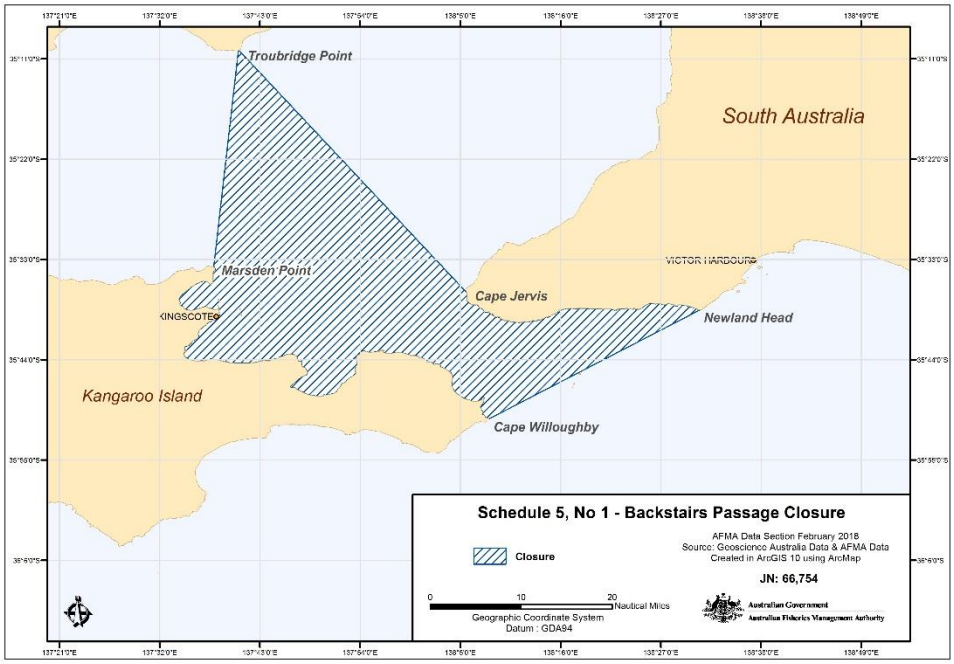


Schedule 5 – South Australian Gillnet Closure – Backstairs Passage

Location: Great Australian Bight, South Australia

Reason: Protect breeding school shark and Australian sea lion populations

Prohibited: Gillnet methods

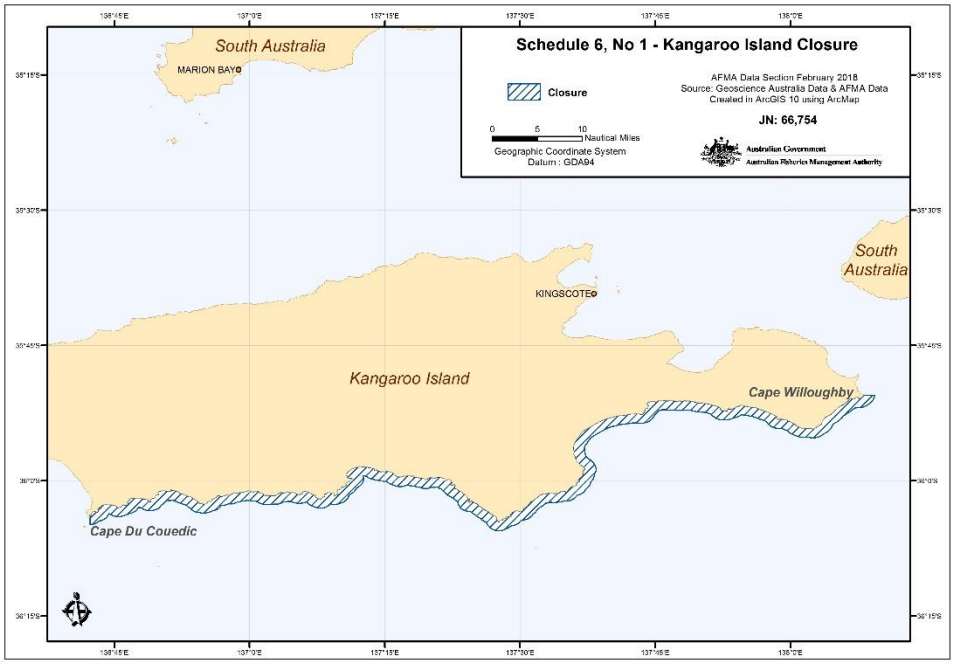


Schedule 6 - South Australian Shark Closure – Kangaroo Island

Location: Kangaroo Island, South Australia

Reason: Protect breeding school shark and Australian sea lion populations

Prohibited: All fishing methods

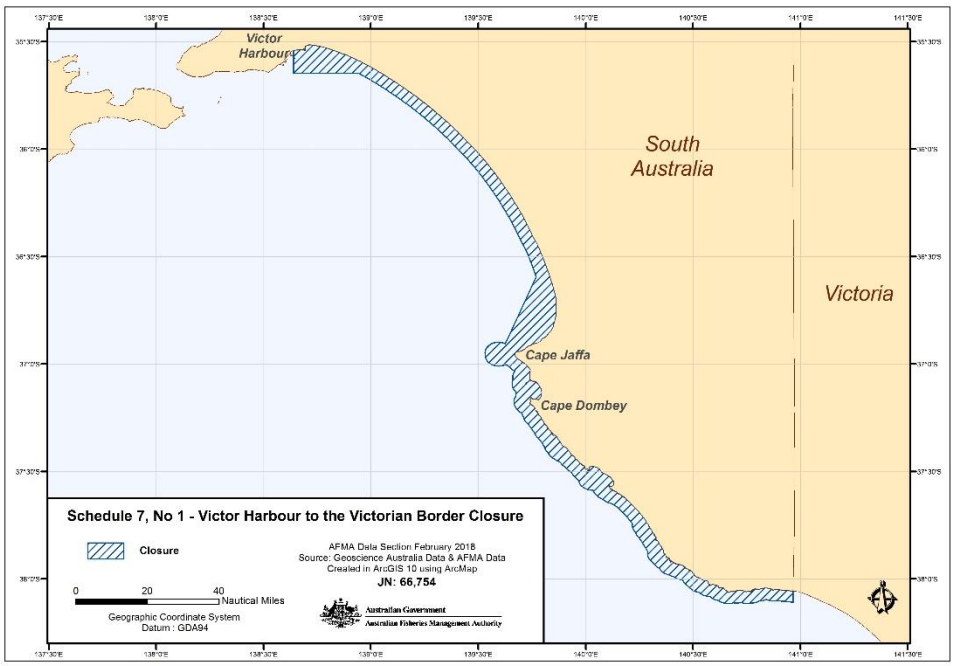


Schedule 7 - South Australian Shark Closure –Victor Harbor to the Victorian Border

Location: Inshore Victoria

Reason: Protect breeding school shark and Australian sea lion populations

Prohibited: All fishing methods

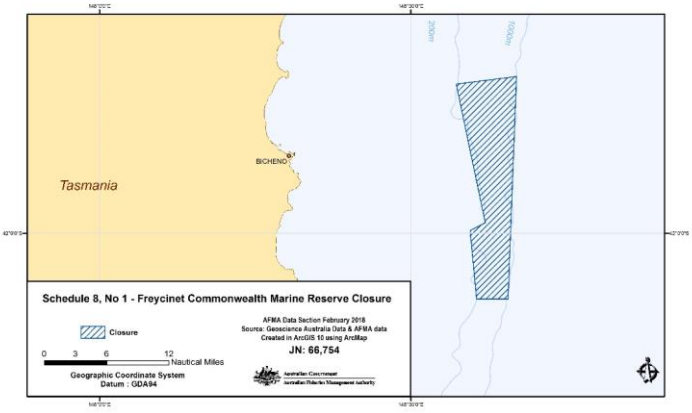


Schedule 8 - Freycinet Commonwealth Marine Reserve Closure

Location: Area off eastern Tasmania

Reason: Protect Upper-Slope dogfish

Prohibited: If the Harrisson's and southern dogfish triggers are met (refer to 6 (i) in the Direction) then all fishing methods (excluding hydraulic hand reel drop-lining) are prohibited for the concession holder for 12 months within this area. 100% observer coverage required. Please note that Demersal (bottom) Trawl, Danish Seine and Scallop Dredge are prohibited under the Commonwealth Marine Reserve Closure. Refer to http://www.environment.gov.au/topics/marine/marine-reserves for updated information on prohibited fishing methods.

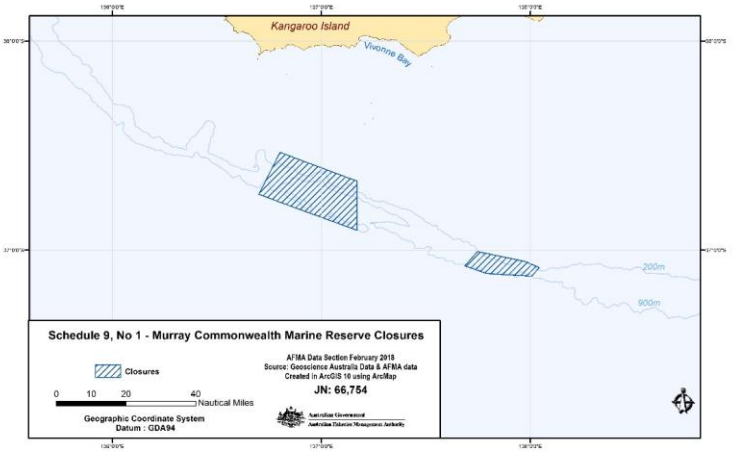


Schedule 9 - Murray Commonwealth Marine Reserves Closures

Location: Area off Kangaroo Island

Reason: Protect Upper-Slope dogfish

Prohibited: If the Harrisson's and southern dogfish triggers are met (refer to 6 (k) in the Direction) then all fishing methods (excluding hydraulic hand reel drop-lining) are prohibited for the concession holder for 12 months within this area. 100% observer coverage is required. Please note that Demersal (bottom) Trawl, Danish Seine and Scallop Dredge are prohibited under the Commonwealth Marine Reserve Closure. Refer to http://www.environment.gov.au/topics/marine/marine-reserves for updated information on prohibited fishing methods.

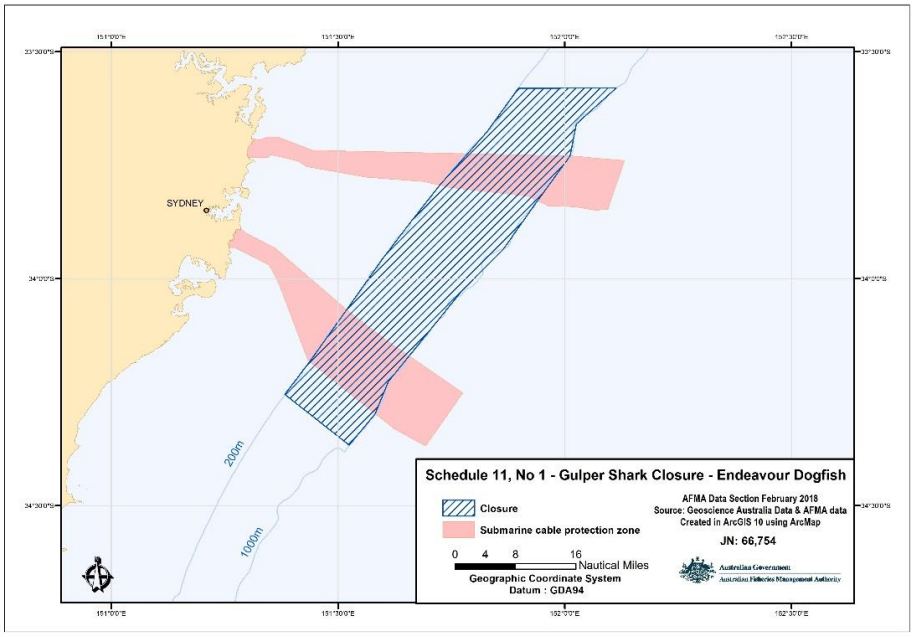


Schedule 11 - Gulper Shark Closure – Endeavour Dogfish

Location: Waters off Sydney in the area of the submarine cable protection zones

Reason: Protect Upper-Slope dogfish

Prohibited: All fishing methods

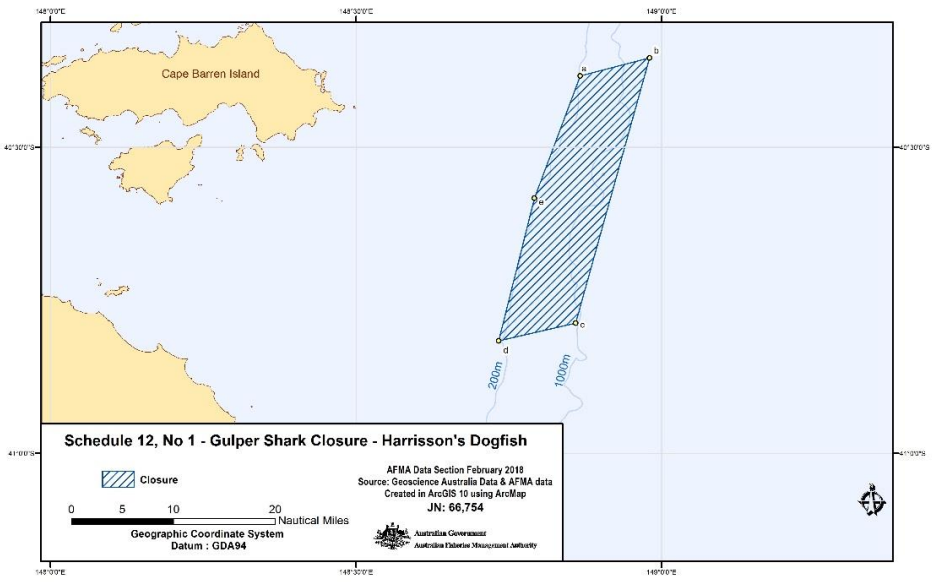


Schedule 12 - Gulper Shark Closure – Harrisson's Dogfish

Location: East Bass Strait

Reason: Protect Upper-Slope dogfish

Prohibited: All fishing methods

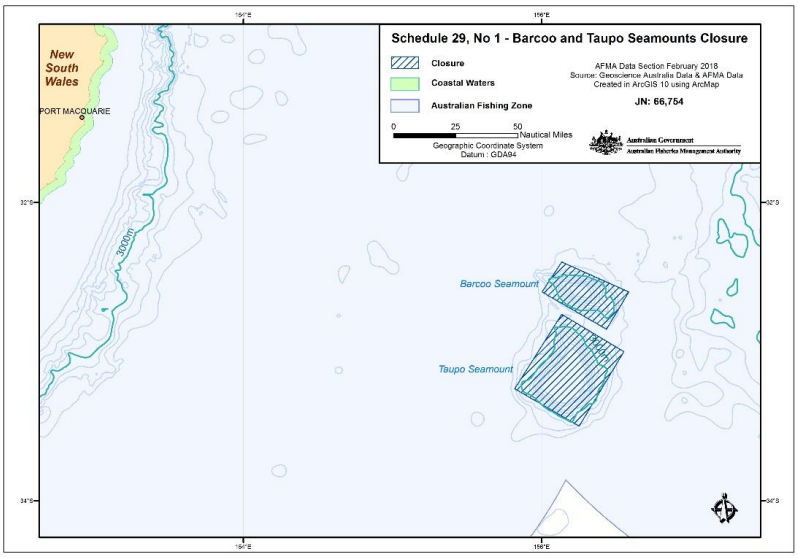


Schedule 29 - Barcoo and Taupo Seamounts Closure

Location: East coast of southern New South Wales

Reason: Protect Upper-Slope dogfish

Prohibited: Trawl methods and if the Harrisson's and southern dogfish triggers are met (refer to 6 (q) in the Direction) then all fishing methods (excluding hydraulic hand reel drop-lining) are prohibited for the concession holder for 12 months within this area. 100% observer coverage is required.

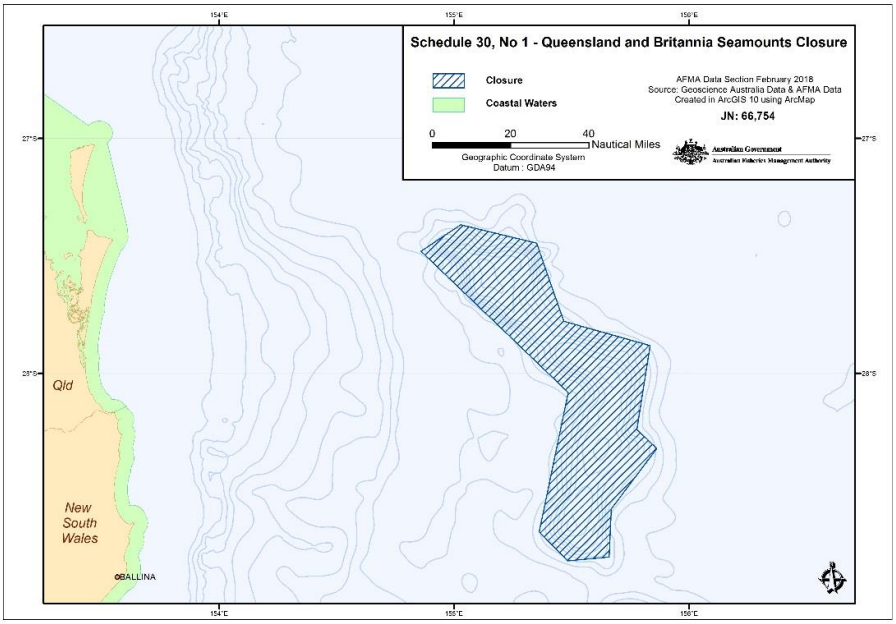


Schedule 30 - Queensland and Britannia Seamounts Closure

Location: Area off southern Queensland

Reason: Protect Upper-Slope dogfish

Prohibited: All fishing methods except hydraulic hand reel drop-lining.

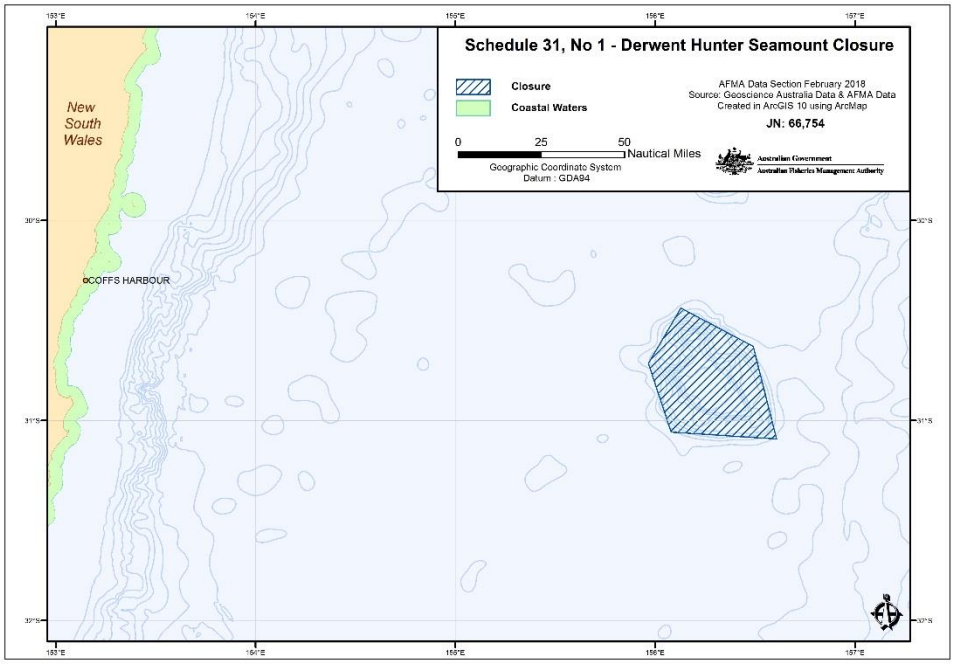


Schedule 31 - Derwent Hunter Seamount Closure

Location: Area off mid New South Wales

Reason: Protect Upper-Slope dogfish

Prohibited: All fishing methods

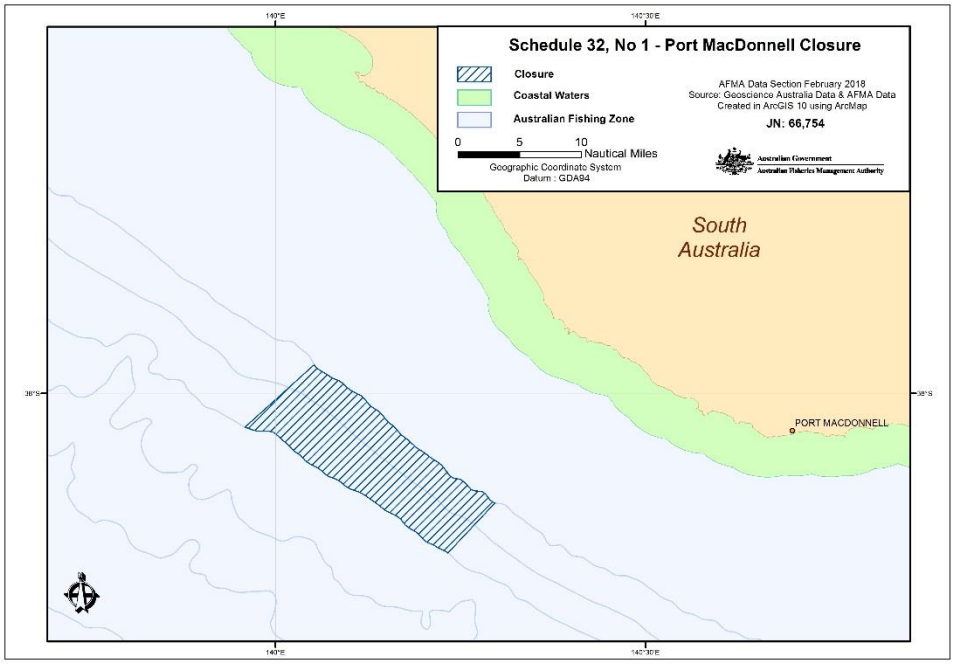


Schedule 32 - Port MacDonnell Closure

Location: Area off southeastern Australia

Reason: Protect Upper-Slope dogfish

Prohibited: All fishing methods

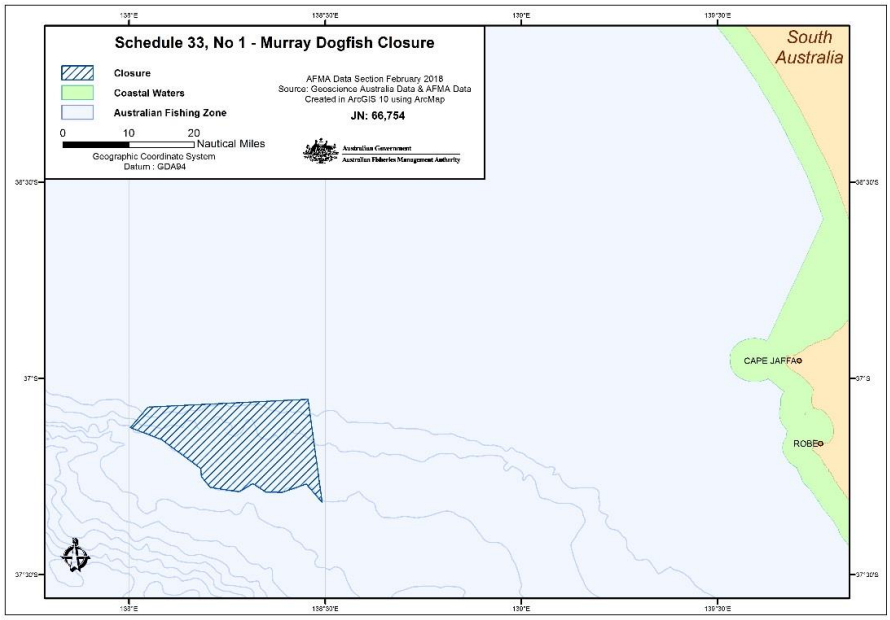


Schedule 33 - Murray Dogfish Closure

Location: Area off southeastern Australia

Reason: Protect Upper-Slope dogfish

Prohibited: Trawl methods and if the Harrisson's and southern dogfish triggers are met (refer to 6 (u) in the Direction) then all fishing methods (excluding hydraulic hand reel drop-lining) are prohibited for the concession holder for 12 months within this area. 100% observer coverage is required.

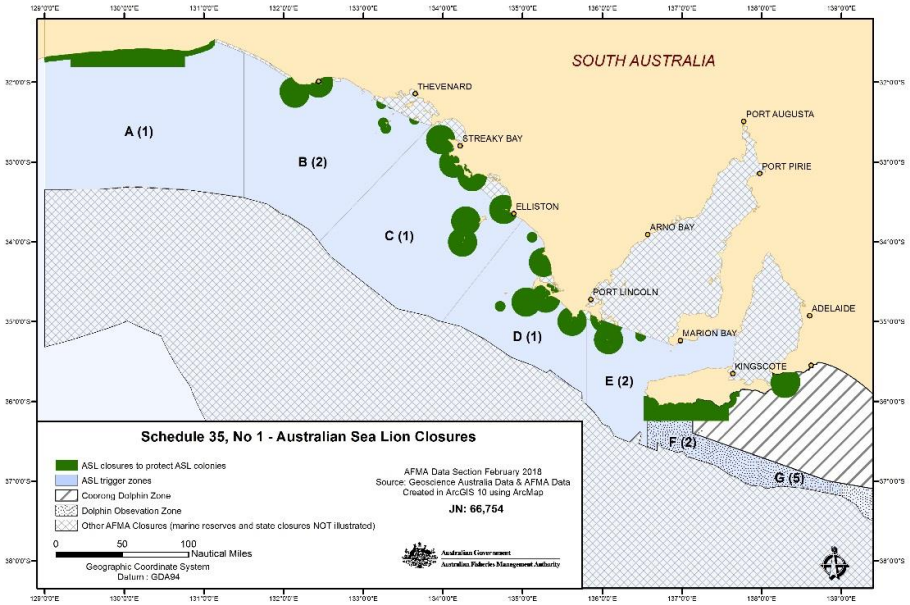


Schedule 35 – Australian sea lion Closures

Location: South Australia

Reason: Protect Australian sea lions.

Prohibited Gillnet methods

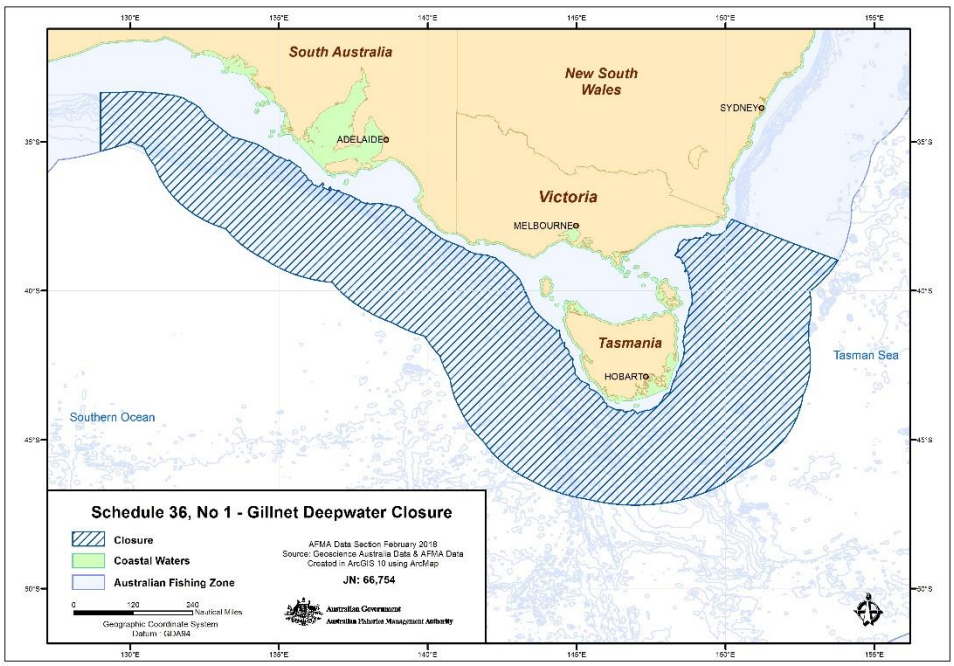


Schedule 36 – Gillnet Deepwater Closure

Location: Australian Fishing Zone in deep waters within the SESSF

Reason: Protect breeding school shark populations.

Prohibited Gillnet methods



Closures legislated under the *Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 11 2013.*

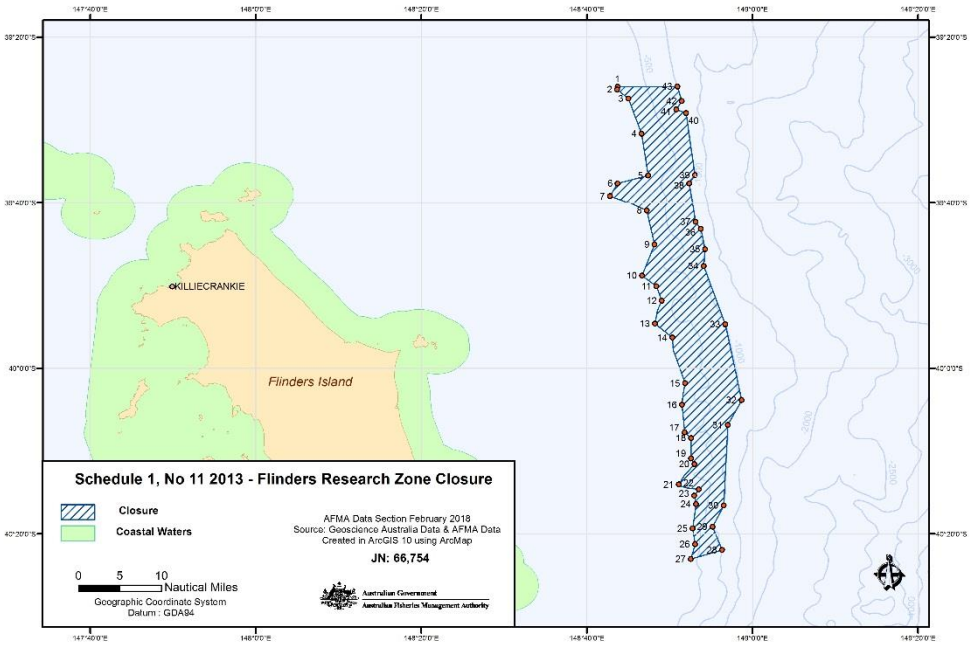
For exact coordinates of area closures refer to the relevant sections of the SESSF Closure Directions, as referenced by the map title.

Schedule 1 - Flinders Research Zone Closure

Location: Eastern Bass Strait

Reason: Protect Upper-Slope dogfish

Prohibited: All fishing methods



Closures legislated under the *Southern and Eastern Scalefish and Shark Fishery (Closures) Direction No. 2 2015.*

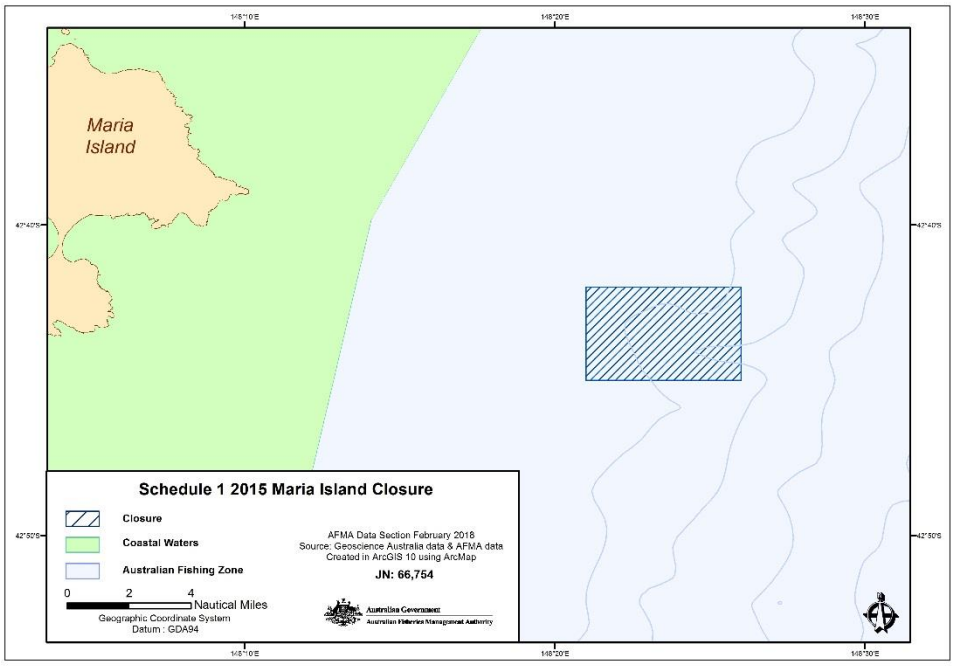
For exact coordinates of area closures refer to the relevant sections of the SESSF Closure Directions, as referenced by the map title.

Schedule 1 – Maria Island

Location: Area off eastern Tasmania

Reason: Protect pink ling stocks

Prohibited: All methods unless the holder is already subject to a condition to retain no more than 25 per cent of their total pink ling (Genypterus blacodes) quota (caught or uncaught) in waters east of Longitude 147° East at any time.

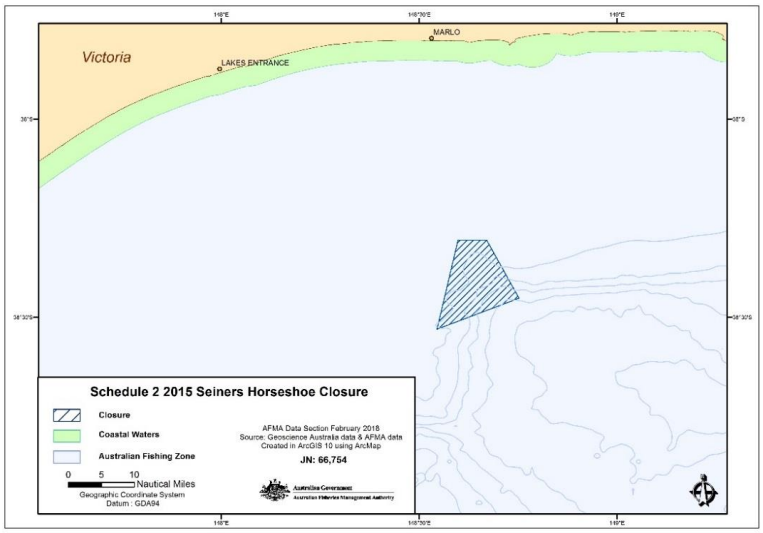


Schedule 2 – Seiner's Horseshoe

Location: Area off southeastern Australia

Reason: Protect pink ling stocks

Prohibited: All methods unless the holder is already subject to a condition to retain no more than 25 per cent of their total pink ling (Genypterus blacodes) quota (caught or uncaught) in waters east of Longitude 147° East at any time.

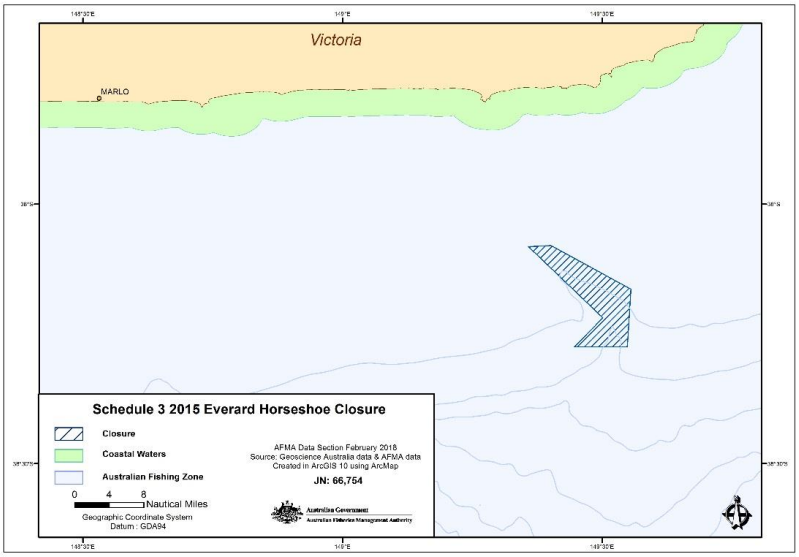


Schedule 3 – Everard Horseshoe

Location: Area off southeastern Australia

Reason: Protect pink ling stocks

Prohibited: All methods unless the holder is already subject to a condition to retain no more than 25 per cent of their total pink ling (Genypterus blacodes) quota (caught or uncaught) in waters east of Longitude 147° East at any time.



Area closures outside AFMA's jurisdiction

Commonwealth Marine Reserves Network

Some fishing methods are prohibited in Commonwealth marine reserves. This information can be found on the Department of the Environment and Energy's website at http://www.environment.gov.au/topics/marine/marine-reserves.

Tasmanian Coastal Shark Closures

The Tasmanian Government has declared specific coastal areas as Shark Refuge areas and Tasmanian state law prohibits fishing in these areas.

For further information on Tasmanian Shark Refuge areas please visit the Tasmanian Department of Primary Industries, Parks, Water and Environment website at http://dpipwe.tas.gov.au/.

State Marine Parks

Fishing is prohibited in many state based marine parks and reserves. For more information on these areas please contact the relevant state authority.

Appendix E. State trip limits

Trip limits relevant to Victoria

FINFISH (VICTORIA, NON-TRAWL METHODS)		
Australian anchovy	No take	
Australian salmon		
Blue sprat		
King George whiting		
Pilchard		
Sprat		
Wrasse		
Black cod		
Barracouta	200 kg	Combined 200 kg trip limit
Leatherjackets		
Striped trumpeter	20 kg	
Snapper	50 kg	
Yellowtail kingfish	10 individuals	
CRUSTACEANS (Victoria)		
Deepwater prawn	Trip limits do not apply	
Red prawn		
Prawn (Genus Aristeus)		
Royal red prawn		
Scarlet prawn		
Carid prawns (family Pandalidae)		
Eastern king prawn	No take	
School prawns		
Rock lobster		
Giant (king) crab (Psuedocarincus	5 individuals	Combined 50 kg trip limit
Bay bugs (family Scyllaridae)	10 kg	
Other crustaceans	50 kg trip limit	
MOLLUSCS (Victoria)		
Arrow squid	Trip limits do not apply	
Red ocean squid		
Southern ocean arrow squid		
Yellowback squid		
Scallops		
Abalone	No take	
Other molluscs	50 kg trip limit	

Trip limits relevant to South Australia

FINFISH (South Australia)		
Australian anchovy	No Take	
Australian salmon/Tommy ruff		
Banded morwong		
Black bream		
Black cod		
Blue sprat		
Dusky morwong		
Garfish		
Grassy (rock) flathead		
King gar		
King George whiting		
Luderick		
Magpie morwong		
Pilchard		
Red mullet		
Sea sweep		
Snook		
Sprat		
Wrasse		
Yelloweye mullet		
Yellow-finned whiting		
Bastard trumpeter	20 kg	Combined 200 kg trip limit
Blue Groper	50 kg	
Leatherjackets* (black reef, chinaman and rough)	200 kg	
Mulloway	100 kg	
Parrotfish* (knifejaw)	200 kg	
Striped trumpeter	20 kg	
Snapper	50 kg	
Yellowtail kingfish	10 individuals	
CRUSTACEANS (South Australia)		
Deepwater prawn	Trip limits do not apply	
Red prawn		
Prawn (Genus Aristeus)		
Royal red prawn		
Scarlet prawn		
Carid prawns (family Pandalidae)		
All other prawns	No take	
Rock lobster		

FINFISH (South Australia)		
Bay bugs (family Scyllaridae)	200 kg	
Giant (king) crab (*Psuedocarincus gigas*)	5 individuals	Combined 50 kg trip limit
Other crustaceans	50 kg trip limit	
MOLLUSCS (South Australia)		
Arrow squid	Trip limits do not apply	
Red ocean squid		
Southern ocean arrow squid		
Yellowback squid		
Scallops	No take	
Abalone		
Shells and Shellfish (Class *Gastropoda*)	50 kg trip limit	Combined 500 kg limit
Other molluscs	500 kg trip limit	

Trip limits relevant to Tasmania

FINFISH (Tasmania)	
Australian anchovy	No Take
Australian salmon/Tommy ruff	
Banded morwong	
Black bream	
Black cod	
Blue sprat	
Dusky morwong	
Garfish	
Grassy (rock) flathead	
Handfish (Family Brachionichthyidae)	
King gar	
King George whiting	
Luderick	
Mulloway	
Magpie morwong	
Pilchard	
Red mullet	
Sea sweep	
Seahorses and Pipefish (Family Syngnathidae)	
Snook	
Sprat	
Three finned blennies (Family Tripterygiidae)	

FINFISH (Tasmania)		
Wrasse		
Yelloweye mullet		
Yellow-finned whiting		
Bastard trumpeter	20 kg	
Blue groper	50 kg	
Striped trumpeter	Combined 250 kg of which no more than 150 kg can be striped trumpeter	
Snapper		
Yellowtail kingfish		
CRUSTACEANS (Tasmania)		
Deepwater prawn	Trip limits do not apply	
Red prawn		
Prawn (Genus Aristeus)		
Royal red prawn		
Scarlet prawn		
Other prawns	No take	
Rock lobster		
Giant (king) crab (*Psuedocarincus gigas)*	5 individuals	Combined 50 kg trip limit
Other crustaceans	50 kg trip limit	
MOLLUSCS (Tasmania)		
Arrow squid	Trip limits do not apply	
Red ocean squid		
Southern ocean arrow squid		
Yellowback squid		
Scallops		
Abalone	No take	
Limpets or keyhole limpets		
Shells and Shellfish (Class *Gastropoda*)	50 kg trip limit	Combined 500 kg trip limit
Other molluscs	500 kg trip limit	

Glossary of Terms

Assemblage	A subset of the species in the community that can be easily recognized and studied. For example, the set of sharks and rays in a community is the Chondricythian assemblage.
Attribute	A general term for a set of properties relating to the productivity or susceptibility of a particular unit of analysis.
Bycatch species	A non-target species captured in a fishery, usually of low value and often discarded (see also Byproduct).
Byproduct species	A non-target species captured in a fishery, but it may have value to the fisher and be retained for sale.
Community	A complete set of interacting species.
Component	A major area of relevance to fisheries with regard to ecological risk assessment (e.g. target species, bycatch and byproduct species, threatened and endangered species, habitats, and communities).
Component model	A conceptual description of the impacts of fishing activities (hazards) on components and sub-components, linked through the processes and resources that determine the level of a component.
Consequence	The effect of an activity on achieving the operational objective for a sub-component.
Core objective	The overall aim of management for a component.
End point	A term used in risk assessment to denote the object of the assessment; equivalent to component or sub-component in ERAEF
Ecosystem	The spatially explicit association of abiotic and biotic elements within which there is a flow of resources, such as nutrients, biomass or energy (Crooks, 2002).
External factor	Factors other than fishing that affect achievement of operational objectives for components and sub-components.
Fishery method	A technique or set of equipment used to harvest fish in a fishery (e.g. long-lining, purse-seining, trawling).
Fishery	A related set of fish harvesting activities regulated by an authority (e.g. Southern and Eastern Scalefish and Shark Fishery).
F_MSM	Maximum sustainable fishing mortality
F_Lim	Limit fishing mortality which is half of the maximum sustainable fishing mortality
F_Crash	Minimum unsustainable fishing mortality rate that may lead to population extinction in the longer term
Habitat	The place where fauna or flora complete all or a portion of their life cycle.
Hazard identification	The identification of activities (hazards) that may impact the components of interest.

Indicator	Used to monitor the effect of an activity on a sub-component. An indicator is something that can be measured, such as biomass or abundance.
Likelihood	The chance that a sub-component will be affected by an activity.
Operational objective	A measurable objective for a component or sub-component (typically expressed as “the level of X does not fall outside acceptable bounds”)
Precautionary approach	The approach whereby, if there is uncertainty about the outcome of an action, the benefit of the doubt should be given to the biological entity (such as species, habitat or community).
PSA	Productivity-Susceptibility Analysis. Used at Level 2 in the ERAEF methodology.
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.
SICA	Scale, Impact, Consequence Analysis. Used at Level 1 in the ERAEF methodology.
Sub-component	A more detailed aspect of a component. For example, within the target species component, the sub-components include the population size, geographic range, and the age/size/sex structure.
Sub-fishery	A subdivision of the fishery on the basis of the gear or areal extent of the fishery. Ecological risk is assessed separately for each sub-fishery within a fishery.
Sustainability	Ability to be maintained indefinitely
Target species	A species or group of species whose capture is the goal of a fishery, sub-fishery, or fishing operation.
Trophic position	Location of an individual organism or species within a foodweb.
Unit of analysis	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”, while for Habitats, they are “biotypes”, and for Communities the units are “assemblages”.

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