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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): Manual Longline Sub-Fishery 2015-2019

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Report for the Australian Fisheries Management Authority

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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. 119 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) Manual Longline sub-fishery was undertaken using the ERAEF method version 9.2, with some additional modifications developed 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.

ERAEF proceeds through four stages of analysis: scoping; an expert judgement based on 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 2015-2019 assessment of the Southern and Eastern Scalefish and Shark (SESSF) Manual Longline sub-fishery includes the following:

- Scoping
- Level 1 results for all components

Fishery Description

Gear:	Demersal longline
Area:	Waters from south from Fraser Island in southern Queensland to 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.
Depth range:	10 - 183 m (over 90% of demersal longline effort occurred in waters shallower than 183 m)
Fleet size:	29 - 50 vessels
Effort:	1,105,085 - 2,894,732 hooks
Landings:	184.3 - 591.6 t
Discard rate:	Species specific
Key commercial species:	Gummy shark
Management:	Input controls: limited entry gear restrictions, spatial closures.
	Output controls: ITQ for 35 species/stocks and TACs, trigger, trip and catch limits.
Observer program:	Electronic monitoring required for demersal longline.

Ecological Units Assessed

Table ES1.1. Ecological units assessed in 2021 (data: 2015-2019).

ECOLOGICAL COMPONENT	UNITS ASSESSED IN 2021	UNITS ASSESSED IN 2006*
Key/secondary commercial species	1 (C1)	-
Byproduct and bycatch species	9 (BP), 154 (BC)	-
Protected species	49	-
Habitats	34 (29 demersal, 5 pelagic)	-
Communities	27 (22 demersal, 5 pelagic)	-

*this is a new sub-fishery

A total of 213 species across the three ecological components were assessed in this ERAEF (Table ES1.1).

Level 1 Results and Summary

All ecological components were eliminated at Level 1 (there were no risk scores of 3 – moderate – or above for each component) for any internal hazard (Table ES1.2).

Table ES1.2 Outcomes of assessments for ecological components conducted in 2021.

ECOLOGICAL COMPONENT	2021 (CURRENT)
Key/secondary commercial species	Level 1
Byproduct and bycatch	Level 1
Protected species	Level 1
Habitats	Level 1
Communities	Level 1

The key commercial species Gummy Shark (*Mustelus antarcticus*) is the only target species in this sub-fishery and has a current stock assessment. The catch from the manual (and one auto-longline vessel) sector combined comprise from ~ 20-25% of the TAC for this species. School Shark are also caught as a bycatch in this sub-fishery (and categorized as a byproduct species) comprising about ~25-50% of the TAC for this species. It is however subject to rebuilding strategy due to overfishing and is monitored regularly. On the other hand, it has been suggested that the Broadnose Sevengill Shark (*Notorynchus cepedianus*) is increasing particualry since fishing pressure has reduced and is therefore at low risk from fishing.

Historically, longline fisheries have presented serious threats to seabirds, particularly albatrosses (Baker et al. 2007). This fishery has a specific Bycatch and Discarding Workplan which incorporates a Threat Abatement Plan for Seabirds. Consequently, a variety of mitigation measures such as bycatch reduction devices (tori lines, brickle curtains, bycatch trigger limits, caps on hooks per boat are in place) and bycatch is continually monitored. A total of 15 interactions with seabirds were recorded over the five-year assessment period, which resulted in the deaths of three albatrosses including a Shy Albatross (*Thalassarche cauta*). This assessment also found fishing to occur off the coast of SA/Vic and around Albatross Island, the latter supporting one of the three main breeding colonies along western Bass Strait. While an analysis of albatrosses over the 1993-2013 period reported the population to be in decline (Phillips et al. 2016), recent population estimates of ~30 000 mature individuals of Shy Albatross (Alderman 2018), which includes ~5800 estimated breeding pairs at Albatross Island, suggests a low interaction with this sub-fishery, thereby representing a minor risk to the sub-population of Shy Albatross in western Bass Strait.

Habitats in this area were also not assessed at risk from fishing despite 80% of the effort being deployed there. Soft sediments are not likely to be particularly damaged by the lines and weights and no vulnerable assemblages were identified by Pitcher et al. (2018) in this area. However, a small amount of effort in habitats on the Tasmanian coasts that supported octocorals and bryozoan communities could put those communities at risk. However, there was little evidence of epifauna or habitat being snagged on hooks and given the very small footprint of this gear, these communities were considered minor risk only. The sharks being targeted by this fishing method could have put this functional group at risk but fishing closures, reduction in fishing pressure and TAC appears to have allowed some sharks to recover i.e., evidence for increasing population of Broadnose Sevengill Shark. However, populations of School Shark (*Galeorhinus galeus*) remain in a vulnerable state and Gummy Shark are not overfished.

Significant external hazards included other fisheries in the region which presented moderate risk to communities, major risk to key commercial species and severe risk to byproduct/bycatch species. Also, the coastal development external hazard presented a moderate risk to protected species and major risk to byproduct/bycatch species.

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.

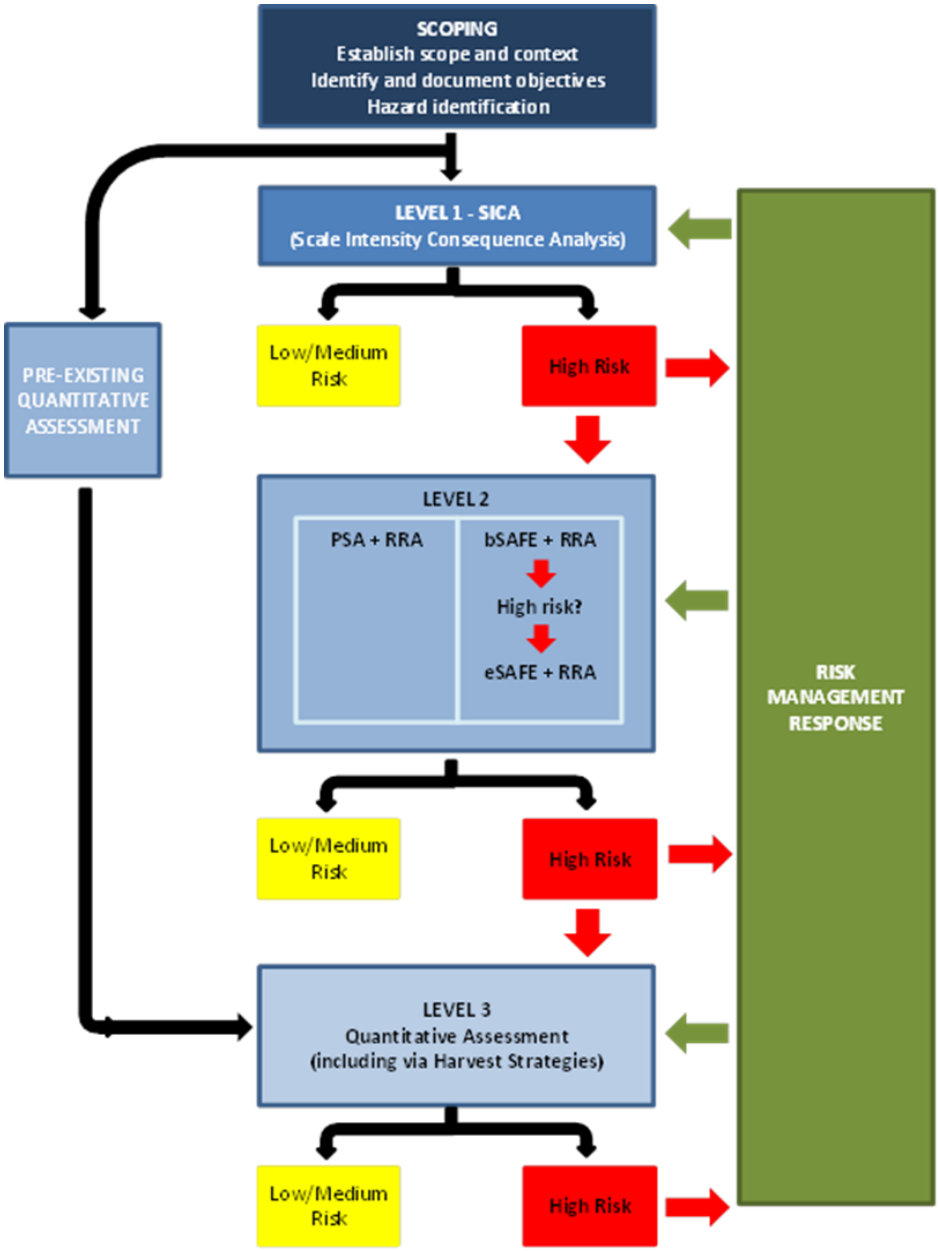


Figure 1.1. Structure of the 3 level hierarchical ERAEF methodology. SICA – Scale Intensity Consequence Analysis; PSA – Productivity Susceptibility Analysis; SAFE – Sustainability Assessment for Fishing Effects; RRA – Residual Risk Analysis. T1 – Tier 1. eSAFE may be used for species classified as high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

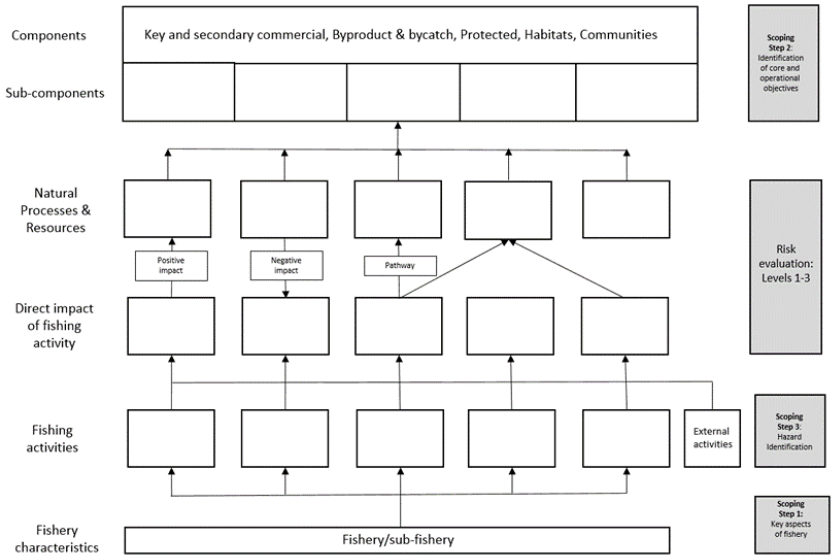


Figure 1.2. Generic conceptual model used in ERAEF.

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 takes into account 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. 2007a,b). 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

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

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 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 a number of 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 quantify uncertainty more precisely.

PSA (Productivity Susceptibility Analysis)

Details of the PSA method are described in the accompanying ERAEF Methods Document and also 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 taken into account 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 a number of 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 of 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 publicly 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; Zhou et al. 2011, 2012):

- is a more quantitative approach (analogous to stock assessment) that is able to 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.
- 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.

- **F_{LIM}** – instantaneous fishing mortality rate that corresponds to the limit biomass B_{LIM} where B_{LIM} is 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 is able to 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 suggest 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

[4] ERA Technical Working Group, September 2015

future overfished state). The limitations of SAFE with respect to measuring overfished risks are the same essentially as for PSA.

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 a number of factors including:

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

- 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.
- 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, so as 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.

[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 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.
- 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 on the basis of 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 Manual Longline sub-fishery of the Southern and Eastern Scalefish and Shark Fishery (SESSF). 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 Manual Longline 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 and data	Phone calls and emails	May 2021	Max Bayly (AFMA), Sally Weekes (AFMA)	-
Data updates	Phone calls and emails	May 2021, June 2021	Max Bayly (AFMA), Sally Weekes (AFMA)	-
Level 1 (SICA)	Phone calls and emails	May 2021, June 2021	Max Bayly (AFMA), Sally Weekes (AFMA)	-
Draft report	Submitted to AFMA	June 2021	AFMA, SharkRAG members	Draft report submitted to AFMA
Draft report	Submitted to AFMA	5 November 2021	AFMA, SharkRAG members	Draft report submitted for presentation at SharkRAg meeting
Draft report	Submitted to AFMA	15 November 2021	AFMA, SharkRAG members	Presented results at SharkRAG meeting
Final report	Submitted to AFMA	22 December 2021	AFMA	Final report submitted to AFMA

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 – Manual Longline

Assessment date: May 2021

Assessor: Authors of this report (CSIRO) and AFMA

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 • Shark Hook – automatic longline Great Australian Bight Trawl Sector East Coast Deepwater Trawl Sector
Sub-fisheries assessed	This sub-fishery covers the demersal longline (Scalefish Hook and Shark Hook), and Shark Hook – auto-longline sub-fisheries of the Commonwealth Gillnet Hook and Trap Sector of the SESSF. The Shark Hook – auto-longline sector comprises of one vessel which uses automatic baiting gear to target shark. This method is currently restricted to waters adjacent to South Australia.
Start date/ history	Hook and line methods have been used since the early 1900s to catch fish over shelf waters. Prior to 1985 there were few restrictions on the method of fishing. The number of vessels was unregulated and there were 2000 licensees in the fishery. In 1985 the Commonwealth began to limit entry by placing a freeze on new permits. In 1992, ITQ's were introduced to the Commonwealth Trawl Sector for 16 species groups providing effective management for these species. However, operators were able to target some of these species without quota, using non-trawl methods which had the potential to undermine the management aims for the 16 quota species groups. Also, in 1992, a single Commonwealth permit was issued to allow the first automatic longline vessel to begin operating in the fishery, mainly targeting ling around the west coast of Tasmania. The hook and line part of the fishery was not formally managed until 1994. From 1995 onwards, restrictions were introduced to regulate the scalefish catch by hook and line methods. In 1995, interim gear restrictions were placed on these methods south of 40° S because of concerns regarding catches of Blue-eye trevalla in the area. In 1998, ITQs were introduced in the Southern and eastern non-trawl fishery (SENTF) for three key species: Pink ling, Blue-eye and Blue warehou. On 1 January 2001, ITQ management arrangements were applied to the remaining 13 species groups. Initially all quota, except for Blue-eye trevalla could be freely traded between the trawl and non- sector sectors. Trade in Blue-eye quota was limited to 10% of the total Blue-eye trevalla quota. Most restrictions on auto-longlining were removed but automatic longliners were not permitted to fish on the Cascade Plateau and a limit of 15,000 hooks was imposed to minimize seabird interactions. Commercial shark fishing began in the mid-1920s using demersal longlines to target School Shark, but gillnets replaced hooks as the main fishing method between mid-1960s to early 1970s. Since the early 1970s Gummy Shark has progressively replaced School Shark as the principal target species. In 2015 temporary gillnet to hook permits were allocated to shark fishermen affected by gillnet closures in the Australian Sea lion zones in South Australia. These permits allow gillnet concession holders in South Australian waters to use hook methods to target shark species in the SESSF. Holders of gillnet to hook permits are authorised to use manual and automatic baiting methods.
Geographic extent of fishery	The SESSF is a multi-sector, multi-species fishery that covers almost half of the Australian Fishing Zone (AFZ). The area of the fishery stretches south from Fraser Island in southern Queensland, around Tasmania, to Cape Leeuwin in southern Western Australia (Figure 1). The fishery operates in both Commonwealth and some State waters under different Offshore Constitutional Settlement (OCS) arrangements with State governments. Lord Howe Island and Balls Pyramid are not part of the SESSF.

Area of the Scalefish Hook sector. Source: AFMA

The Scalefish Hook sector includes all waters off South Australia, Victoria and Tasmania from 3 nm to the extent of the Australian Fishing Zone. It also includes waters off southern Queensland (south of Sandy Cape) and New South Wales from approximately the 4000m depth contour (60-80 nm from the coast) to the extent of the AFZ. Waters inside this line off the New South Wales and Queensland coasts, and inside 3 nm around South Australia, Victoria and Tasmania, are managed by the state governments.

Area of the Shark Hook sector. Source: AFMA

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	This fishery comprises management zones for scalefish as well as shark regions.
Fishing season	The fishing season for all sectors of the Southern and Eastern Scalefish and Shark Fishery runs from 1 May to 30 April each year. Fishing occurs throughout the year.
Key/secondary commercial species and stock status	A list of key commercial species and their stock status is included in Section 2.2.2. 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 demersal longline sector have been defined as the species (or species groups) which contribute a significant proportion of the total landed catch. These are Gummy Shark. A majority of fishing effort in this subsector occurs in waters shallower than 183 meters depth, which is typically the depth range for fishers targeting shark species. Fishers targeting scalefish species will typically fish in waters around 600 m – 800 m. Stock assessments are in place for each of the commercial species under quota in the SESSF. The status of species relevant to the SESSF demersal hook sector, an overview of stock status and fishing mortality is available in the ABARES Fishery Status Report 2020 (Patterson et al. 2020). Fishers operating under a Scalefish Hook Boat SFR typically target Blue-eye trevalla and Pink ling, however with significantly less effort than vessels operating under a Shark Hook Boat SFR.
Bait collection and usage	Tommy rough (*Arripis georgiana*), eel, Salmon (*Arripis trutta*), Squid, Pilchards (*Sardinops sagax*).
Current entitlements	The table below outlines the types of concessions that authorise the use of demersal longline in the SESSF. Coastal waters (linked) permits must be used in conjunction with a Shark hook or a Scalefish Hook Boat SFR.

SESSF concessions authorising the use of demersal longline fishing gear.

Permit Type	No. Permits
SA Coastal Waters Gillnet and Hook Fishing Permit	7
SA Coastal Waters Gillnet Fishing Permit	2
SA Coastal Waters Gillnet Permit (Linked)	1
SA Coastal Waters Gillnet/Hook Permit (Linked)	7
SA Coastal Waters Hook Fishing Permit	6
SA Coastal Waters Permit, Method Unknown (Linked)	1
Scalefish Hook Boat SFR	37
SES temporary Gillnet to Hook permit (for coastal water permit) Linked	4
SES Temporary Gillnet to Hook Permit (for SFR) Linked	17
Shark Hook Boat SFR	13
TAS Coastal Waters Gillnet and Hook Fishing Permit	1
TAS Coastal Waters Gillnet/Hook Permit (Linked)	3
TAS Coastal Waters Hook Fishing Permit	3
TAS Coastal Waters Hook Permit (Linked)	9
TAS Rock Lobster Waters Gillnet and Hook Permit	1
Tasmanian Rock Lobster Fishing Permit	8

Number of boats to use demersal longline fishing gear in the SESSF 2015-2019.

Year	No. Active Boats (Demersal longline)	No. Active Boats (Automatic longline)
2015	31	
2016	29	
2017	36	
2018	42	1
2019	49	1

NB: the above table refers to the number of active vessels each year for the period 2014 – 2019 inclusive. Also, the same vessel can operate each year (i.e., these vessels aren't unique). Source: AFMA

Current and recent TACs, quota trends by method

There are quotas for the main species and Total Allowable Catches (TACs) apply to all fishing methods in the SESSF.

Total Allowable Catch (TAC (t)) for quota species in the SESSF fishing seasons (1 May – 30 April) 2010-11 to 2019-20. TACs apply to all fishing methods in the SESSF. Research quota included in these TACs. Undercatch and Overcatch not included. Key commercial species for demersal longline sector are in bold.

	Agreed TAC (t)									
Quota Species	10/11	11/12	12/13	13/14	14/15	25/16	16/17	27/18	18/19	19/20
Alfonsino	500	750	750	1125	1017	1016	1017	1017	1017	1017
Bight Redfish	1653	1556	2334	2358	2358	2358	800	800	800	600
Blue Eye Trevalla	428	326	387	388	335	335	410	458	462	458
Blue Grenadier	4700	4700	4998	5208	6800	8796	8810	8765	8810	12183
Blue Warehou	183	133	118	118	118	118	118	118	118	118
Deepwater Flathead	1100	1650	1560	1150	1150	1150	1150	1128	1128	1128
Deepwater shark (eastern)	85	85	80	85	47	47	47	46	23	24
Deepwater shark (western)	95	143	215	215	215	215	215	215	264	235
Elephant Fish	65	89	89	109	109	163	92	114	114	114
Flathead	2750	2750	2741	2750	2878	2860	2882	2712	2507	2468
Gemfish (Eastern)	100	100	100	100	100	100	100	100	100	100
Gemfish (Western)	109	94	141	199	199	183	247	199	200	200
Gummy Shark	**1717**	**1717**	**1714**	**1836**	**1836**	**1836**	**1836**	**1774**	**1763**	**1785**
Jackass Morwong	450	450	565	568	568	598	474	513	505	469
John Dory	221	221	220	221	221	169	167	175	263	395
Mirror Dory	718	718	1077	1616	808	437	325	235	253	188
Ocean Perch	300	300	230	195	195	166	190	190	241	241
Orange Roughy (Albany and Esperance)	50	50	50	50	50	50	50	50	50	50
Orange Roughy (Cascade Plateau)	500	500	500	500	500	500	500	500	500	500
Orange Roughy (Eastern)	25	25	25	25	25	465	465	465	698	900
Orange Roughy (Southern)	35	35	35	35	35	66	66	66	84	94

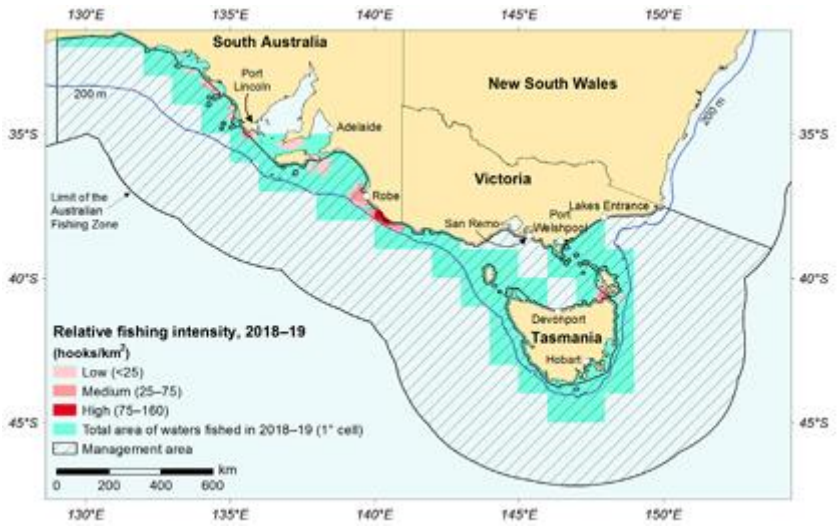
Orange Roughy (Western)	60	60	60	60	60	60	60	60	60	60
Oreodory	188	113	111	132	132	128	128	128	185	185
Pink Ling	1200	1200	996	834	996	980	1144	1154	1117	1288
Redfish	551	276	275	276	138	100	100	100	100	50
Ribaldo	131	168	167	168	252	355	355	355	430	422
Royal Red Prawn	400	303	302.5	303	344	386	387	384	381	409
Saw Shark	255	226	226	339	459	482	433	442	430	430
School Shark	**216**	**176**	**150**	**215**	**215**	**215**	**215**	**215**	**215**	**189**
School Whiting	844	641	640	809	809	747	868	986	820	788
Silver Trevally	360	540	677	781	615	602	588	613	307	292
Silver Warehou	2566	2566	2541	2329	2329	2417	1209	605	600	450
Smooth oreodory (Cascade Plateau)	150	150	150	150	150	150	150	150	150	150
Smooth oreodory (other)	45	45	23	23	23	23	90	90	90	90

Species Oreo include Spikey, Warty, Black and Rough Oreo. Source: AFMA

Current and recent fishery effort trends by method

Annual (calendar year) hook effort (total hooks set and number of shots) in the demersal longline sector for 2015-2019 inclusive. Source: AFMA

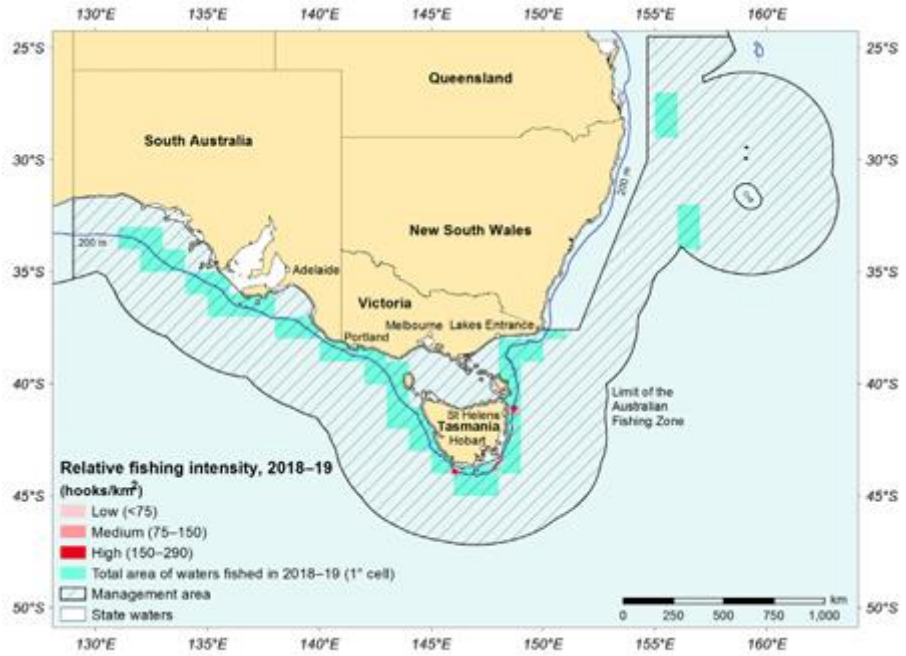
Year	No. of hooks	No. of shots
2015	1,994,839	2,796
2016	1,105,085	1,719
2017	1,851,994	2,202
2018	1,883,526	2,526
2019	2,091,632	3,197



Relative fishing intensity in the Commonwealth Manual Hook sector of the SESSF for the 2018-19 fishing season. Source: Emery et al. 2019.

Annual (calendar year) hook effort (total hooks set and number of shots) in the shark auto-longline sector for 2018-2019 inclusive. Source: AFMA.

Year	No. of hooks	No. of shots
2018	209,600	86
2019	803,100	277



Relative fishing intensity in the Commonwealth Automatic Hook sector for the 2018-19 fishing season. Source: Helidoniotis et al. 2019.

Current and recent fishery catch trends by method

Annual (calendar year) total catch (retained weight; kg) of the key commercial species caught by demersal longline in data the SESSF 2015-2019 inclusive. Source: AFMA Logbook data.

Year	Gummy Shark	School Shark	Total
2015	236,351	45,914	282,265
2016	155,301	29,019	184,320
2017	296,155	89,434	385,589
2018	367,218	42,562	409,780
2019	408,409	78,307	486,716

Annual (calendar year) total catch (retained weight; kg) of the key commercial species caught by automatic longline in the shark auto-longline sector in the SESSF 2018-2019. Source: AFMA Logbook data.

Year	Gummy Shark	School Shark	Total
2018	50,759	4,729	55,488
2019	82,715	22,187	104,902

Current and recent value of fishery ($)

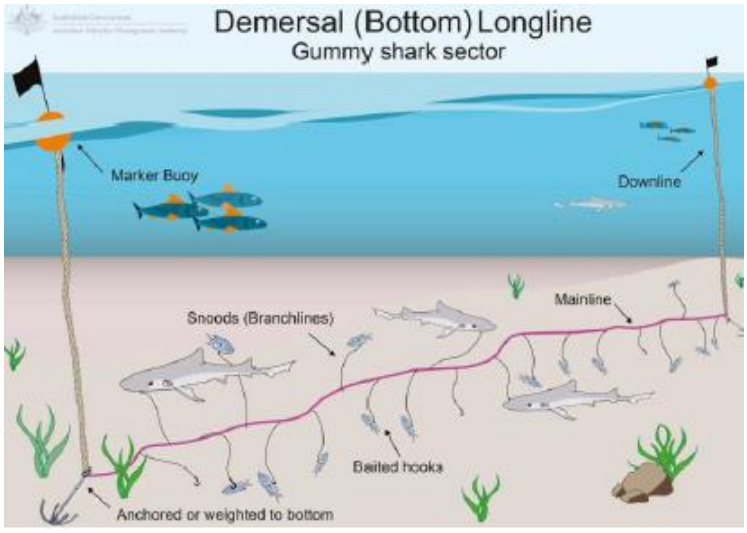
The current and recent value for this sub-fishery is confidential and withheld in this report. See ABARES for estimates and/or ABARES Fishery Status Report 2017 (Patterson et al. 2017).

Relationship with other fisheries

There are other Commonwealth, State and recreational fisheries that overlap this sub-fishery. Recreational catches are known to occur for Gummy Shark, School Shark, Elephant Fish, Pink Ling and Blue-eye Trevalla.

Many permit holders who operate in GHAT sub-fisheries also have permits to operate in a variety of other fisheries. Tasmania and South Australia both have scalefish fisheries within 3 nm of their coastlines that use both gillnets and hooks. These fisheries take SESSF species as byproduct.

	1. **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 Fisher • Bass Strait Central Zone Scallop Fishery • Small Pelagic Fishery • East Coast tuna and Billfish Fishery 2. **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 3. **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 4. **The following fisheries operate under South Australian jurisdiction in waters overlapping or adjacent to this fishery:** • Marine Scalefish Fishery • Rock Lobster Fishery • Abalone Fishery 5. **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 6. **The following fisheries operate under New South Wales jurisdiction in waters overlapping or adjacent to the fishery:** • Abalone fishery • Fish Trawl fishery • Lobster fishery • Ocean Haul fishery • Ocean Trap and Line fishery
Gear	
Fishing methods and gear	**<u>Demersal Longline</u>** Demersal longlining is a method of fishing where gear is set horizontally along the ocean floor and held in place using anchors. The primary difference between bottom longline fishing and auto longline fishing is that hooks are baited by hand rather than a machine.



Demersal (bottom) longline. Source: AFMA

Demersal longline gear consists of a rope mainline with baited hooks spaced every 2 to 5 m on monofilament or braided cord snoods. The mainline is attached at both ends to downlines which have a large buoy on the surface for locating gear, and anchors at the bottom to hold the gear in place. Hauling is done using hydraulic winches which are fixed to the deck of the boat. The gear can be hauled from either end by retrieving the downline.

Demersal longline fishing causes very little damage to the sea floor and has only a very limited level of bycatch. Gear can become snagged on the bottom and get broken off, although this is not a common occurrence.

Fish that have been hooked are brought to the surface slowly, and are often alive when they reach the boat, which greatly increases the likelihood of survivability for non-target species returned to the water.

Auto-longline

Automatic longline gear typically consists of a rope mainline with hooks spaced every 1.3 m on 40 cm monofilament or braided cord lines ('snoods'). The mainline is attached at both ends to downlines which have a large buoy on the surface for locating gear, and anchors at the bottom to hold the gear in place. The main line is lowered the stern of the vessel where tori lines are used to deter birds from diving on the baits. In this fishery only the Mustad autoline system has been approved for use. The Mustad system is an efficient baiting system in which 95% of the hooks are baited and very few loose baits fall to the water. Each line is normally left to 'soak' for around 6 to 8 hours before being hauled. Hauling is done using hydraulic winches which are fixed to the deck of the boat. The gear can be hauled from either end by retrieving the downline. During hauling a deck hand gaffs and removes captured fish from successful hooks, while the system cleans any remaining bait from unsuccessful hooks and stacks the hooks on a storage magazine. To use autolonglining in this sub-fishery, operators must comply with requirements under the Australian Antarctic Division's *Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations* (2018) (the TAP) and AFMA's Upper-Slope Dogfish Management Strategy (see 'technical measures' for further details).

Currently, automatic longlines in the shark fishery are only permitted in waters adjacent to South Australia.

Fishing gear restrictions	For vessels fishing under a Shark Hook SFR, gear is restricted to waters shallower than 183 m. Vessels are exempt from this rule if they are equipped with an AFMA approved electronic monitoring system or carry an observer. For vessels using automatic baiting equipment associated with the shark hook licence, there is a 5000 hook-limit per shot.

	For vessels fishing under a Scalefish Hook Boat SFR, there is no restriction on depth that fishing gear can be set and no limit on the number of hooks that can be set. Source: AFMA; SESSF Management Arrangements Booklet 2017
Selectivity of fishing methods	The GHAT fishery is a relatively low volume, high quality fishery. The fishing gear is selective and only removes some parts of the demersal community. The baited hooks are attractive to sharks and rays which have a powerful sense of smell.
Spatial gear zone set	There are spatial closures that apply through the fishery to protect habitat or species such as upper-slope dogfish. These can be found in the Sothern and Eastern Scalefish and Shark Fishery and Small pelagic Fishery Closure Direction 2021 https://www.legislation.gov.au/Details/F2021L00445.
Depth range gear set	When targeting sharks, the gear is typically set in shelf waters up to approximately 100 m deep and when targeting Blue-eye trevalla or Pink ling, between 300 to 400 m deep. Between 2015 - 2019, over 90% of demersal longline effort occurred in waters shallower than 183 m.
How gear set	Bottom longline gear consists of a rope mainline with baited hooks spaced every two to five metres on monofilament or braided cord snood. Hooks are baited manually rather than by a machine. The mainline is attached at both ends to downlines which have a large buoy on the surface for locating gear, and anchors at the bottom to hold the gear in place. The weights hold the line on the sea floor so that the hooks are set close to the bottom to catch shark species that live on or near the sea floor. When targeting sharks, the gear is typically set in shelf waters up to approximately 100 m deep and when targeting Blue-eye trevalla or Pink ling, between 300 to 400 m deep. Hauling is done using hydraulic winches which are fixed to the deck of the boat. The gear can be hauled from either end by retrieving the downline. Source: AFMA; http://www.afma.gov.au/portfolio-item/trawling/ accessed 9 Mar 2018.
Area of gear impact per set or shot	All fishing gear used in the GHAT Fishery is passive gear that has minimal effect on habitat (Auster et al., 2011). Demersal longlines area of impact would be approximately 1200 m^2 based on a snood length of 30 cm and a 4000 m total mainline length (i.e., the mode of the frequency distribution of total mainline length for the period 2010 – 2015).
Capacity of gear	There is no limit on the number of hooks for manually baited shark or scalefish demersal longlines. However, typically, between 200 and 400 hooks are manually baited per set. For vessels using automatic baiting equipment associated with shark hook, there is a 5000 hook-limit per shot. Source: AFMA
Effort per annum all boats	See “Current and recent fishery effort trends by method”
Lost gear and ghost fishing	Bottom set longline fishing causes little damage to the seafloor and has only limited level of bycatch. Gear can become snagged at the bottom and get broken off, or bitten off from larger sharks, although this is not a common occurrence. After most break offs, the line is hauled from the other end in a cautious manner. If gear is broken off at both ends it may be possible to retrieve the gear by grappling. Fish which have been caught are brought to the surface slowly, which greatly increases their likelihood of survival when returned to the water. The impact of ghost fishing is likely to be minimal after several days as the gear will not capture fish once bait has been removed from the hooks.
Issues	
Key/second-ary commercial species issues and Interactions	There remains uncertainty about the stock structure of Blue-eye Trevalla in southeastern Australia. Williams et al. (2017) provided evidence for stock structure within the broad southern Australian distribution of Blue-eye Trevalla. A workshop is scheduled for early 2018 to consider these findings and the implications to the stock assessment and management of Blue-eye Trevalla. Stock assessments are in place for each of the commercial species under quota in the SESSF. The status of species relevant to the Commonwealth Trawl Sector, an overview of stock status and fishing mortality is available in the ABARES Fishery Status Report 2017 (Patterson et al. 2017).

	The South East Resource Assessment Group identified the need to update the understanding of key species biology (growth, age at maturity etc.). This is currently a research priority on the SESSF Research Statement. All commercial quota species in the SESSF have stock assessments. The status of for species relevant to the manual shark hook and manual scalefish hook sub-fishery, an overview of stock status and fishing mortality is available in the ABARES Fishery Status Report 2020 (Patterson et al. 2020). Gummy Shark are the key target species for shark hook. Gummy Shark are thought to be one genetic stock within this fishery, however, for assessment purposes three areas of stock are assumed: South Australia, Bass Strait and Tasmania south of 41°S. The most recent accepted stock assessment in 2016 found all three areas of stock were above the target reference point. There is currently no reliable estimate of the recreational catch of Gummy Shark.
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. The main byproduct species are School Shark, Broadnose Shark, Bronze Whaler, Whiskery Shark, Southern Eagle Ray, Pink Snapper, Pink Ling, Striped Trumpeter and Blue-eye Trevalla. For the purpose of this ERA, School Shark is classified as a byproduct species. School Shark are a longer-lived and less productive species than Gummy Shark. While historically targeted, targeting is not currently permitted, but the species are caught incidentally while fishing for Gummy Shark. They are currently assessed as overfished and are under a rebuilding strategy. The rebuilding strategy outlines a range of management measure implemented to assist rebuilding of the species. These management arrangements have changed fisher behaviour when targeting Gummy Shark as they now try to avoid School Shark. The rebuilding strategy is currently undergoing a five-year review. There is currently no reliable estimate of the recreational catch of School Shark. Both species are managed under quota, are low value, highly discarded and are sometimes landed as byproduct. Discards of Elephant Fish have been high historically (up to 75%) which have contributed to uncertainties with the Elephant Fish stock assessment. The Shark Resource Assessment Group (RAG) recommended that Elephant Fish be considered for removal from the quota management system as the costs associated with buying or leasing quota have been reported to contribute to the high discard rate of this species. Bycatch species are defined as species which are caught as part of fishing activities but are rarely landed. The ERA is the primary assessment tool to assess the impact on these species. 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 (*C. zeehaani*). The management actions provide some protection for other dogfish species including Endeavour Dogfish (*C. moluccensis*) and Greeneye Spurdog (*Squalus chloroculus*).
Protected species issues and interactions	Operators are required to report all interactions with protected species in their logbooks and AFMA reports quarterly to the Department of Environment and Energy. **Recorded wildlife interactions from the AFMA Logbook database for the period 2015-2019 inclusive from manual longlining. alive (A); dead (D); unknown (U); Tot (Total). ^ family Otariidae; *: in 2015.**

Scientific or taxa name	Common name	2015		2016		2017		2018		2019		Tot A	Tot D	Tot U	TOTAL
		A	D	A	D	A	D	A	D	A	D				
Diomedeidae - undifferentiated	Albatrosses (unclassified)	1			1		1	2		2		5	2		7
Thalassarche cauta	Shy albatross								1				1		1
Diomedea epomophora	Southern Royal albatross										1		1		1

Procellariidae - undifferentiated	Petrels, Prions and Shearwaters								1			1		1
Avians	Birds										2	2		2
Dermochelys coriacea	Leatherback turtle							1				1		1
Arctocephalus forsteri	New Zealand fur seal				1							1		1
Otariidae and Phocidae	Seals (unclassified)	1						1^				2	1*	3
Lamna nasus	Porbeagle								2			2		2
Carcharodon carcharias	White shark	2		2		4		2		3		13		13
Isurus oxyrinchus	Shortfin mako		8		3		3		9		9	32		32
	Grand Total	4	8	2	5	4	4	6	13	5	12	**21**	**42**	**1**	**64**

Recorded wildlife interactions from the AFMA Logbook database for the period 2015-2019 inclusive from automatic longlining. alive (A); dead (D); unknown (U). Tot (Total).

Scientific or taxa name	Common name	2018		2019		Tot A	Tot D	Tot U	TOTAL
		A	D	A	D				
Puffinus spp. - undifferentiated	Shearwaters	1	1			1	1		2
Puffinus spp.	Shearwaters (mixed)				1		1		1
Carcharodon carcharias	White shark	2	1	1		3	1		4
Isurus oxyrinchus	Shortfin mako							3 (2018)	3
	Grand Total	3	2	1	1	4	3	**3**	**10**

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

Overall, there were 74 protected species interactions within this assessment period (25 alive; 45 dead; 4 unknown), across four taxa: comprising mostly chondrichthyans (54 interactions; 73%), followed by seabirds (15), marine mammals (4) and marine reptiles (1). Chondrichthyans were the Shortfin mako (35), White Shark (17) and Porbeagle (2). Most of the Shortfin Mako interactions were dead (32), with the remaining three unknown life status. By contrast, most of the White Shark interactions were alive (16 alive, 1 dead). Both reported Porbeagle interactions were dead over the assessment period. Fifteen of the remaining 20 interactions were mostly dead seabirds (albatrosses (9; 5 alive, 4 dead), petrels, prions and shearwaters (4; 1 alive, 3 dead), avians (2; both dead)), followed by seals (4; 1 dead, 2 alive, 1 unknown) and the Leatherback Turtle (1; alive).

Habitat issues and interactions

Due to the nature of demersal longlining and the species targeted, there are interactions with the seabed as part of fishing. Removal, modification or disturbance of seabed flora and fauna by this method does occur.

The gear has an intermediate footprint and is thought to have a lower impact on the bottom (Pham et al., 2014). 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.

There are substantial closures in place which afford protection to large areas of vulnerable midslope and deep-water habitats such those supporting fragile deepwater corals.

Community issues and interactions

The GHAT fishery is a relatively low volume, high quality fishery. The fishing gear is selective and only removes some parts of the demersal community. It is unclear 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.

Removing one species or size range of the population, in addition, to changes to the community structure from which it is removed, will also change food web dynamics and energy transfer in the system.

	Over the past decade, it has become evident that climate change is affecting the water temperatures and probably salinities and other water properties. This effect on species could cause changes in distribution and there is increasingly species are being more regularly sighted beyond previous known distributions. Some species might not be able to disperse or extend their range so readily and populations may decline because of their inability to adapt to new environmental conditions. While ecosystem models do account to some extent for cumulative pressures, the way in which they interact might not be linear and is currently the focus of research. Irrespective, whole of ecosystem-based advice is being sought and accepted by fishery management.
Discarding	Since the introduction of electronic monitoring, logbook recorded discards in the demersal longline sector have become more reliable, however there is still work to be done to achieve a more accurate estimate of discards.
Management: planned and those implemented	
Manage-ment objectives	The objectives of the Southern and Eastern Scalefish and Shark Fishery Management Plan 2003 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 manage-ment plan	The SESSF, which includes the demersal longline 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; GAB 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.
Input controls	A vessel must have a boat Statutory Fishing Right (SFR) or a Commonwealth Coastal Waters Permit allowing a vessel to use a demersal longline. The above concession conditions (SFR) entitle a vessel to use demersal longline gear in a specific area of water. Gear requirements are detailed earlier in this report. For the period being assessed, fisheries closures were legislated under the *Southern and Eastern Scalefish and Shark Fishery and Small Pelagic Fishery (Closures) Direction 2016* and under

	concession conditions. Further information on these closures is detailed in AFMA's *2021 Southern and Eastern Scalefish and Shark Fishery Management Arrangements Booklet* (see 'Management Plans' for details on how to access this document). In addition to fisheries closures, there are also a range of Commonwealth Marine Reserves that overlap with this sub-fishery as follows: 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 Agriculture, Water and the Environment 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 eight marine parks are available from the Department of Agriculture Water and the Environment and Energy website: www.environment.gov.au/topics/marine/marine-reserves/temperate-east
Output controls	All the major key commercial and byproduct species in the shark hook 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 State managed byproduct species (see Appendix). Operators also must not carry or possess any shark (Class Chondrichthyes) dorsal, pectoral, caudal, pelvic or anal fins on board their vessels that are not attached to the sharks' carcass.
Technical measures	Retained and/or landed Gummy Shark and School Shark must exceed 450 millimetres 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. This catch ratio rule means an 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 unfished levels. Under Shark hook SFR concession conditions, SFR holders must not take more than 200 kg of Pink Ling (*Genypterus blacodes*) east of longitude 147° East per trip unless AFMA has been notified by the South East Trawl Fishing Industry Association (SETFIA) that the concession holder has entered into an agreement with SETFIA to take a specified amount of Pink Ling east of Longitude 147° East during a fishing year. To support South Australia's rebuilding efforts for Snapper, AFMA introduced additional Snapper management measures to mirror those implemented by the State. Under these arrangements, Commonwealth fishers in the south-east region are permitted to retain 50 kilograms of Snapper per trip between 1 February and 31 October each year. Fishers in the West Coast, Spencer Gulf and Gulf St Vincent regions are currently prohibited from retaining any Snapper. To ensure interactions with seabirds are minimised operators in this sub-fishery must not discard processing waste, including offal, from the nominated boat while setting or hauling using demersal longline fishing methods unless an exemption has been provided by AFMA.
Regulations	The Fisheries Management Regulations 2019 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 statutory fishing rights (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.

<table>
<tr><td></td><td>Under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999, interactions with a protected species must be reported within seven days of the incident occurring to the Department of Agriculture, Water and the Environment. A Memorandum of Understanding between AFMA and the Department for the Reporting of Fisheries Interactions with Protected Species (Reporting MOU) streamlines those reporting requirements (DoE 2015). 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).</td></tr>
<tr><td>Initiatives, strategies and incentives</td><td>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.</td></tr>
<tr><td>Enabling processes</td><td>AFMA is responsible for data collection and monitoring in this sub-fishery. Commonwealth scientific logbooks have been compulsory in the sub-fishery since the 1990's. Prior to 1997, shark and non-trawl operators completed State logbooks. This data has been collated and is used in assessments. Landings are also recorded through the quota monitoring system by catch disposal records (CDRs).

In 2015, electronic monitoring systems were introduced in this sub-fishery to provide accurate verification of fishers' logbook data and reduce reliance on the ISMP (see 'other data').

The collection of age-length data for scalefish was conducted by State agencies and often sporadic or duplicated prior to 1991. The Central Aging Facility (CAF) was established in 1991 to conduct age estimation for these fisheries. Fish Ageing Services now provides ageing services for the main quota species in the SESSF. Samples for ageing were collected by on-board observers up until 2015 and are now collected through an industry-managed sample collection program in accordance with scientific expert advice.

Fishery independent shark surveys were conducted up until ~ 2008, providing information on abundance primarily for School Shark and Gummy Shark as well as information on bycatch species.

Fishery independent trawl surveys (FIS) have been conducted in the SESSF since 2006. These surveys provide an independent index of abundance, 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 umbrella 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 all shark and ray species taken by all sectors of the SESSF. The Great Australian Bight Assessment Group 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.
<table>
<tr><th>TIER LEVEL</th><th>REFERENCE POINT</th><th>REFERENCE POINT FUNCTION</th><th>INFORMATION REQUIREMENTS</th><th>CONTROL RULE</th></tr>
<tr><td>Tier 1</td><td>B_{20}</td><td>Limit</td><td>Catch, effort, discards, age, length, relative abundance, biomass information from:</td><td>$<B_{20}$: No targeted fishing, rebuild strategy required</td></tr>
</table>
</td></tr>
</table>

			- Logbooks - ISMP - FIS	
	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 & 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 shark hook 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 national and international initiatives in place which impact management of the fishery. These include:

- Australia's 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
- Fisheries Management Act 1991
- Fisheries Administration Act 1991
- Environment Protection and Biodiversity Conservation Act 1999
- Declaration of the Harvest Operations of the Southern and Eastern Scalefish and Shark Fishery as an approved wildlife trade operation, 2019
- the Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations (2018)
- Seabird Bycatch Operational Guidelines for Commonwealth Fisheries, 2018
- Commonwealth Fisheries Policy Statement, 2017
- Commonwealth Fisheries Bycatch Policy: Framework for managing the risk of fishing-related impacts on bycatch species in Commonwealth fisheries, 2018
- Guidelines for the Implementation of the Commonwealth Fisheries Bycatch Policy, 2018
- Upper-Slope Dogfish Management Strategy, 2012. (AFMA 2012)
- Fishery Management Paper Number 15: AFMA Bycatch Strategy. Mitigating protected species interactions and general bycatch: 2017-2022
- Fisheries Management Paper 14: AFMA's Ecological Risk Management, 2017
- Commonwealth Fisheries Harvest Strategy Policy: Framework for applying an evidence-based approach to setting harvest levels in Commonwealth fisheries, 2018

	• Guidelines for the Implementation of the Commonwealth Fisheries Harvest Strategy Policy, 2018
	• Stock rebuilding strategies for conservation dependent species:
	  ○ School shark rebuilding strategy
	  ○ Upper-Slope Dogfish Management Strategy
	• Bycatch and discarding work plans for each sector of the SESSF

Data	
Logbook data	Catch and effort data and all interactions with protected species are recorded shot-by-shot 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 demersal longline vessels that have fished more than 100 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 Australian Fishing Zone" (AFMA http://www.afma.gov.au/fisheries-services/observer-services/: accessed 29 June 2016). 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 and • 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 ceased in this sector since the implementation of electronic monitoring and an Industry biological data collection program was introduced in 2018 (see 'Other data'). Up until 2015, on-board observers were used in the sub-fishery. Since then, electronic monitoring has been used to verify fishers' logbook reporting of catch, effort and interactions with protected species. Biological data, including age and lengths is collected via an industry-managed data collection program following the same sampling design as used in the previous observer program.
Other data	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 shark hook 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 electronic monitoring (EM) in the demersal longline sector of the SESSF. Demersal longline vessels that fish for more than 100 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.

	In 2018, an industry data collection program, supported by EM, was implemented through co-management with AFMA to better meet the biological data collection needs in the fishery. The program relies on commercial fishers tagging retained fish at sea so they can be sampled in port. 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 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 2019** 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 **Fisheries Administrations Act 1991** https://www.legislation.gov.au/Details/C2017C00373 **Fisheries Management Act 1991** https://www.legislation.gov.au/Details/C2017C00363 **Commonwealth Harvest Strategy Policy 2018** https://www.awe.gov.au/sites/default/files/sitecollectiondocuments/fisheries/domestic/hsp.pdf **Memorandum of Understanding between the Australian Fisheries Management Authority and the Department of the Environment and Heritage for the reporting of fisheries interactions with protected species under the Environment Protection and Biodiversity Conservation Act 1999** https://www.afma.gov.au/sites/g/files/net5531/f/uploads/2010/06/mou.pdf **Threat Abatement Plan for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations (2018)** http://www.antarctica.gov.au/environment/plants-and-animals/threat-abatement-plan-seabirds **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 http://www.agriculture.gov.au/fisheries/environment/sharks/sharkplan-2 **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
Manage-ment Plans	**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 **AFMA 2020 Southern and Eastern Scalefish and Shark Fishery Management Arrangements Booklet:** https://www.afma.gov.au/sites/default/files/2020_southern_and_eastern_scalefish_and_shark_fishery_management_arrangements_booklet.pdf **Automatic longline Sector Bycatch and Discard Workplan**: https://www.afma.gov.au/sustainability-environment/bycatch-discarding/bycatch-discard-workplans **Guide to AFMA's Ecological Risk Management:** https://www.afma.gov.au/sustainability-environment/ecological-risk-management-strategies **Southern and Eastern Scalefish and Shark Fishery Management Plan 2003:** 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/
References	Auster, P. J.et al. (2011). Definition and detection of vulnerable marine ecosystems on the high seas: problems with the ''move-on'' rule. *ICES J. Mar. Sci*. 68, 254–264, doi:10.1093/icesjms/fsq074 Emery, T., Woodhams, J., Curtotti, R. (2019). Chapter 9. Commonwealth Trawl and Scalefish Hook sectors. In Patterson, H, Williams, A, Woodhams, J and Curtotti, R (2019). Fishery status reports 2019, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/5d80431de3fae. Helidoniotis, F., Emery, T., Woodhams, J., Curtotti, R. (2019). Chapter 9. Commonwealth Trawl and Scalefish Hook sectors. In Patterson, H, Williams, A, Woodhams, J and Curtotti, R (2019). Fishery status reports 2019, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/5d80431de3fae. Hobday, A.J., Bulman, C., Williams, A., Fuller, M. (2011). Ecological risk assessment for effects of fishing on habitats and communities. FRDC Project 2009/029, Canberra. Hobday, A.J., Smith, A., Webb, H., Daley, R., Wayte, S., Bulman, C., Dowdney, J., Williams, A., Sporcic, M., Dambacher, J., Fuller, M., Walker, T. (2007). Ecological risk assessment for the effects of fishing: Methodology. AFMA Project R04/1072, Canberra. Morison, A.K., Knuckey, I.A., Simpfendorfer, C.A, Buckworth, R.C. (2013). South East Scalefish and Shark Fishery: draft 2012 stock assessment summaries for species assessed by GABRAG, ShelfRAG and Slope/DeepRAG, report to AFMA, Canberra Patterson, H., Larcombe, J., Woodhams, J., Curtotti, R. (2020). Fishery status reports 2020, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra. CC BY 4.0. https://doi.org/10.25814/5f447487e6749. Pham, C., Diogo, H., Menezes, G. et al. (2014). Deep-water longline fishing has reduced impact on Vulnerable Marine Ecosystems. *Sci Rep* 4**,** 4837 https://doi.org/10.1038/srep04837 Williams, A., Hamer, P., Haddon. M., Robertson, S., Althaus, F., Green, M., Kool, J. (2017). Determining Blue-eye Trevalla stock structure and improving methods for stock assessment. DRAFT Final Report FRDC Project No 2013/015.

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)
Byproduct and bycatch species:	9 (BP) 154 (BC)
Protected species:	49
Habitats:	25 (20 demersal, 5 pelagic)
Communities:	33 (28 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 Manual longline sub-fishery.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
C1	Chondrichthyan	Triakidae	37017001	*Mustelus antarcticus*	Gummy 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 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 Manual Longline sub-fishery.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BP	Chondrichthyan	Hexanchidae	37005002	*Notorynchus cepedianus*	Broadnose sevengill shark	AFMA
BP	Chondrichthyan	Triakidae	37017003	*Furgaleus macki*	Whiskery shark	AFMA
BP	Chondrichthyan	Triakidae	37017008	*Galeorhinus galeus*	School shark	AFMA
BP	Chondrichthyan	Carcharhinidae	37018001	*Carcharhinus brachyurus*	Bronze whaler	AFMA
BP	Chondrichthyan	Myliobatidae	37039001	*Myliobatis tenuicaudatus*	Southern eagle ray	AFMA
BP	Teleost	Ophidiidae	37228002	*Genypterus blacodes*	Pink ling	AFMA
BP	Teleost	Sparidae	37353001	*Chrysophrys auratus*	Pink Snapper	AFMA
BP	Teleost	Latridae	37378001	*Latris lineata*	Striped trumpeter	AFMA
BP	Teleost	Centrolophidae	37445001	*Hyperoglyphe antarctica*	Blue-eye trevalla	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 Manual Longline sub-fishery.

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Chondrichthyan	Hexanchidae	37005001	*Heptranchias perlo*	Sharpnose sevengill shark	AFMA
BC	Chondrichthyan	Hexanchidae	37005004	*Hexanchus nakamurai*	Bigeye sixgill shark	Added from Hexanchidae - undifferentiated
BC	Chondrichthyan	Hexanchidae	37005005	*Hexanchus griseus*	Bluntnose Sixgill shark	AFMA
BC	Chondrichthyan	Heterodontidae	37007001	*Heterodontus portusjacksoni*	Port jackson shark	AFMA
BC	Chondrichthyan	Odontaspididae	37008003	*Odontaspis ferox*	Sandtiger shark	AFMA
BC	Chondrichthyan	Alopiidae	37012001	*Alopias vulpinus*	Thresher shark	AFMA
BC	Chondrichthyan	Orectolobidae	37013003	*Orectolobus maculatus*	Spotted wobbegong	AFMA
BC	Chondrichthyan	Parascylliidae	37013005	*Parascyllium ferrugineum*	Rusty carpetshark	AFMA
BC	Chondrichthyan	Scyliorhinidae	37015001	*Cephaloscyllium laticeps*	Draughtboard shark	AFMA
BC	Chondrichthyan	Scyliorhinidae	37015009	*Figaro boardmani*	Australian sawtail catshark	AFMA
BC	Chondrichthyan	Scyliorhinidae	37015013	*Cephaloscyllium albipinnum*	Whitefin swellshark	AFMA. Note: This species is classified as a BC over this (2015-19) assessment period. More recently, it has been nominated for listing under the EPBC Act (1999). Therefore, this classification is likely to change in future ERAs.
BC	Chondrichthyan	Scyliorhinidae	37015031	*Cephaloscyllium variegatum*	Northern draughtboard shark	Added from *Cephaloscyllium* spp.
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	Carcharhinidae	37018021	*Carcharhinus leucas*	Bull shark	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Chondrichthyan	Carcharhinidae	37018022	*Galeocerdo cuvier*	Tiger shark	AFMA
BC	Chondrichthyan	Sphyrnidae	37019001	*Sphyrna lewini*	Scalloped hammerhead	AFMA. This species is classified as a BC over this (2015-19) assessment period. More recently, it has been nominated for listing under the EPBC Act (1999). Therefore, this classification is likely to change in future ERAs.
BC	Chondrichthyan	Sphyrnidae	37019004	*Sphyrna zygaena*	Smooth hammerhead	AFMA
BC	Chondrichthyan	Centrophoridae	37020001	*Centrophorus moluccensis*	Endeavour dogfish	AFMA
BC	Chondrichthyan	Centrophoridae	37020004	*Deania quadrispinosa*	Longsnout dogfish	AFMA
BC	Chondrichthyan	Squalidae	37020006	*Squalus megalops*	Piked spurdog	AFMA
BC	Chondrichthyan	Squalidae	37020008	*Squalus acanthias*	Whitespotted spurdog	AFMA
BC	Chondrichthyan	Dalatiidae	37020014	*Isistius brasiliensis*	Smalltooth cookiecutter shark	AFMA
BC	Chondrichthyan	Centrophoridae	37020023	*Centrophorus granulosus*	Gulper shark	AFMA
BC	Chondrichthyan	Etmopteridae	37020027	*Etmopterus bigelowi*	Smooth lanternshark	AFMA
BC	Chondrichthyan	Squalidae	37020038	*Squalus albifrons*	Eastern highfin spurdog	Added from Squalidae - undifferentiated
BC	Chondrichthyan	Squalidae	37020041	*Squalus grahami*	Eastern longnose spurdog	Added from Squalidae - undifferentiated
BC	Chondrichthyan	Squalidae	37020048	*Squalus chloroculus*	Greeneye spurdog	Species reclassified as *S. chloroculus*
BC	Chondrichthyan	Squalidae	37020049	*Cirrhigaleus australis*	Mandarin shark	Added from Squalidae - undifferentiated
BC	Chondrichthyan	Pristiophoridae	37023001	*Pristiophorus nudipinnis*	Southern sawshark	AFMA
BC	Chondrichthyan	Pristiophoridae	37023002	*Pristiophorus cirratus*	Common sawshark	AFMA
BC	Chondrichthyan	Squatinidae	37024001	*Squatina australis*	Australian angelshark	AFMA
BC	Chondrichthyan	Trygonorrhinidae	37027006	*Trygonorrhina fasciata*	Eastern fiddler ray	AFMA
BC	Chondrichthyan	Rajidae	37031002	*Dentiraja australis*	Sydney skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031003	*Dentiraja cerva*	White-spotted skate	AFMA
BC	Chondrichthyan	Rajidae	37031005	*Dentiraja confusus*	Longnose skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031006	*Spiniraja whitleyi*	Melbourne skate	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Chondrichthyan	Rajidae	37031007	*Dentiraja lemprieri*	Thornback skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Arhynchobatidae	37031009	*Pavoraja nitida*	Peacock skate	AFMA
BC	Chondrichthyan	Rajidae	37031010	*Dipturus gudgeri*	Bight skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031011	*Dentiraja healdi*	Leyland's skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031028	*Dipturus canutus*	Grey skate	AFMA
BC	Chondrichthyan	Rajidae	37031029	*Dipturus grahami*	Graham's skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031032	*Dipturus apricus*	Pale tropical skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031035	*Dipturus acrobelus*	Deepwater skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Rajidae	37031041	*Amblyraja hyperborea*	Boreal skate	Added from Rajidae - undifferentiated
BC	Chondrichthyan	Dasyatidae	37035001	*Bathytoshia brevicaudata*	Short-tail stingray	AFMA
BC	Chondrichthyan	Dasyatidae	37035002	*Bathytoshia lata*	Thorntail stingray	AFMA
BC	Chondrichthyan	Dasyatidae	37035004	*Neotrygon australiae*	Bluespotted maskray	Added from Dasyatidae - undifferentiated
BC	Chondrichthyan	Dasyatidae	37035010	*Pteroplatytrygon violacea*	Pelagic stingray	Added from Dasyatidae - undifferentiated
BC	Chondrichthyan	Chimaeridae	37042003	*Chimaera ogilbyi*	Ogilby's ghostshark (legacy name)	AFMA
BC	Chondrichthyan	Callorhinchidae	37043001	*Callorhinchus milii*	Elephantfish	AFMA
BC	Invertebrate	Ommastrephidae	23636004	*Nototodarus gouldi*	Gould's squid	Reported in logbooks prior to 2015. May be part of the recorded Teuthoidea - undifferentiated (23615000).
BC	Invertebrate	Asteriidae	25154011	*Coscinasterias muricata*	Eleven-arm seastar	Reported in logbooks prior to 2015. May be part of the recorded Asteroidea - undifferentiated (25102000)
BC	Invertebrate	Holothuriidae	25416002	*Actinopyga mauritiana*	Surf redfish (sea cucumber)	AFMA
BC	Invertebrate	Menippidae	28915002	*Pseudocarcinus gigas*	Giant crab	AFMA
BC	Teleost	Muraenesocidae	37063003	*Muraenesox bagio*	Common pike eel	AFMA
BC	Teleost	Aulopidae	37117001	*Latropiscis purpurissatus*	Sergeant baker	AFMA
BC	Teleost	Paraulopidae	37120001	*Paraulopus nigripinnis*	Blacktip cucumberfish	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Moridae	37224002	*Mora moro*	Ribaldo	AFMA
BC	Teleost	Moridae	37224003	*Pseudophycis barbata*	Bearded rock cod	AFMA
BC	Teleost	Moridae	37224004	*Tripterophycis gilchristi*	Chiseltooth grenadier cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224005	*Lotella rhacina*	Largetooth beardie	AFMA
BC	Teleost	Moridae	37224006	*Pseudophycis bachus*	Red cod	AFMA
BC	Teleost	Moridae	37224007	*Notophycis marginata*	Forkbeard cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224008	*Antimora rostrata*	Violet cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224009	*Halargyreus johnsonii*	Slender cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224010	*Lepidion microcephalus*	Smallhead cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224011	*Pseudophycis breviuscula*	Bastard red cod	Added from *Lotella* & *Pseudophycis* spp
BC	Teleost	Moridae	37224013	*Guttigadus globiceps*	Fathead cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224017	*Lepidion schmidti*	Schmidt's cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224019	*Eeyorius hutchinsi*	Finetooth beardie	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224021	*Physiculus therosideros*	Scalyfin cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224023	*Lotella phycis*	Slender beardie	Added from *Lotella* & *Pseudophycis* spp
BC	Teleost	Moridae	37224028	*Gadella macrura*	Longtail cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224029	*Tripterophycis svetovidovi*	Brown grenadier cod	Added from Moridae - undifferentiated
BC	Teleost	Moridae	37224041	*Guttigadus kongi*	Austral cod	Added from Moridae - undifferentiated
BC	Teleost	Macruronidae	37227001	*Macruronus novaezelandiae*	Blue grenadier	AFMA
BC	Teleost	Ophidiidae	37228001	*Dannevigia tusca*	Tusk	AFMA
BC	Teleost	Ophidiidae	37228008	*Genypterus tigerinus*	Rock ling	AFMA
BC	Teleost	Carapidae	37229003	*Echiodon rendahli*	Messmate 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

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Berycidae	37258004	*Centroberyx gerrardi*	Bight redfish	AFMA
BC	Teleost	Berycidae	37258005	*Centroberyx lineatus*	Swallowtail	AFMA
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	Added from 37264000 - Zeidae, Cyttidae - undifferentiated
BC	Teleost	Zeidae	37264004	*Zeus faber*	John dory	AFMA
BC	Teleost	Oreosomatidae	37266001	*Neocyttus rhomboidalis*	Spikey oreodory	AFMA
BC	Teleost	Oreosomatidae	37266002	*Oreosoma atlanticum*	Oxeye oreodory	AFMA
BC	Teleost	Oreosomatidae	37266005	*Allocyttus niger*	Black oreodory	AFMA
BC	Teleost	Sebastidae	37287001	*Helicolenus percoides*	Reef ocean 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	Scorpaenidae	37287086	*Scorpaenopsis venosa*	Raggy scorpionfish	AFMA
BC	Teleost	Sebastidae	37287093	*Helicolenus barathri*	Bigeye ocean perch	AFMA
BC	Teleost	Sebastidae	37287103	*Trachyscorpia carnomagula*	Deepsea scorpionfish	AFMA
BC	Teleost	Triglidae	37288001	*Chelidonichthys kumu*	Red 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	37296007	*Platycephalus caeruleopunctatus*	Bluespotted flathead	AFMA

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Platycephalidae	37296035	*Platycephalus aurimaculatus*	Toothy flathead	AFMA
BC	Teleost	Platycephalidae	37296036	*Platycephalus grandispinis*	Longspine flathead	AFMA
BC	Teleost	Platycephalidae	37296038	*Platycephalus marmoratus*	Marbled flathead	Added from Platycephalidae - undifferentiated
BC	Teleost	Serranidae	37311001	*Lepidoperca pulchella*	Eastern orange perch	AFMA
BC	Teleost	Serranidae	37311005	*Othos dentex*	Harlequin fish	AFMA
BC	Teleost	Polyprionidae	37311006	*Polyprion oxygeneios*	Hapuku	AFMA
BC	Teleost	Serranidae	37311026	*Variola albimarginata*	White-edge coronation trout	AFMA
BC	Teleost	Sillaginidae	37330014	*Sillago flindersi*	Eastern school whiting	AFMA
BC	Teleost	Carangidae	37337002	*Trachurus declivis*	Common jack mackerel	AFMA
BC	Teleost	Carangidae	37337006	*Seriola lalandi*	Yellowtail kingfish	AFMA
BC	Teleost	Carangidae	37337007	*Seriola hippos*	Samson fish	AFMA
BC	Teleost	Carangidae	37337062	*Pseudocaranx georgianus*	Silver trevally	AFMA
BC	Teleost	Bramidae	37342001	*Brama brama*	Ray's bream	AFMA
BC	Teleost	Lutjanidae	37346007	*Lutjanus malabaricus*	Saddletail snapper	AFMA
BC	Teleost	Lutjanidae	37346014	*Etelis carbunculus*	Ruby snapper	AFMA
BC	Teleost	Lutjanidae	37346038	*Etelis coruscans*	Flame snapper	AFMA
BC	Teleost	Lutjanidae	37346060	*Paracaesio kusakarii*	Saddleback snapper	AFMA
BC	Teleost	Sciaenidae	37354001	*Argyrosomus japonicus*	Mulloway	AFMA
BC	Teleost	Mullidae	37355001	*Upeneichthys lineatus*	Bluestriped goatfish	AFMA
BC	Teleost	Scorpididae	37361003	*Tilodon sexfasciatus*	Moonlighter	AFMA
BC	Teleost	Kyphosidae	37361007	*Girella tricuspidata*	Luderick	AFMA
BC	Teleost	Scorpididae	37361009	*Scorpis lineolata*	Silver 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

ROLE IN FISHERY	TAXA NAME	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE
BC	Teleost	Cheilodactylidae	37377003	*Nemadactylus macropterus*	Jackass morwong	AFMA
BC	Teleost	Cheilodactylidae	37377004	*Nemadactylus valenciennesi*	Blue morwong	AFMA
BC	Teleost	Cheilodactylidae	37377009	*Cheilodactylus fuscus*	Red morwong	AFMA
BC	Teleost	Latridae	37378002	*Latridopsis forsteri*	Bastard trumpeter	AFMA
BC	Teleost	Latridae	37378003	Latridopsis ciliaris	Black moki	Added this species from *Latridopsis* spp. (37378900)
BC	Teleost	Labridae	37384002	*Achoerodus gouldii*	Western blue groper	AFMA
BC	Teleost	Labridae	37384003	*Notolabrus tetricus*	Bluethroat wrasse	AFMA
BC	Teleost	Labridae	37384043	*Achoerodus viridis*	Eastern blue groper	AFMA
BC	Teleost	Gempylidae	37439001	*Thyrsites atun*	Barracouta	AFMA
BC	Teleost	Gempylidae	37439002	*Rexea solandri*	Gemfish	AFMA
BC	Teleost	Trichiuridae	37440002	*Lepidopus caudatus*	Frostfish	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	Xiphiidae	37442001	*Xiphias gladius*	Swordfish	AFMA
BC	Teleost	Centrolophidae	37445005	*Seriolella brama*	Blue warehou	AFMA
BC	Teleost	Centrolophidae	37445011	*Seriolella caerulea*	White warehou	AFMA
BC	Teleost	Monacanthidae	37465006	*Nelusetta ayraud*	Ocean jacket	AFMA
BC	Teleost	Diodontidae	37469001	*Diodon nicthemerus*	Globefish	AFMA

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 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 workbook 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); birds: Menkhorst et al. (2017), Reid et al. (2002), Marchant and Higgins (1990); marine mammals: Woinarski et al. (2014), Jefferson et al. (2015); teleosts: Atlas of Living Australia Fishmap http://fish.ala.org.au/ , CAAB http://www.caab.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 & 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 Manual Longline sub-fishery.

ROLE IN FISHERY	TAXA	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE(S)
PS	Chondrichthyan	Lamnidae	37010003	*Carcharodon carcharias*	White shark	AFMA
PS	Chondrichthyan	Mobulidae	37041004	*Mobula birostris*	Giant manta ray	This species was recorded in logbooks prior to 2015. It may be part of the recorded skates and rays - unspecified (37990018).
PS	Marine mammal	Otariidae	41131001	*Arctocephalus forsteri*	New Zealand fur seal	AFMA
PS	Marine mammal	Otariidae	41131003	*Arctocephalus pusillus doriferus*	Australian fur Seal	Added from Otariidae and Phocidae
PS	Marine mammal	Otariidae	41131004	*Arctocephalus tropicalis*	Subantarctic fur seal	Added from Otariidae and Phocidae

[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 mammal	Otariidae	41131005	*Neophoca cinerea*	Australian sea lion	Added from Sealions
PS	Marine mammal	Phocidae	41136001	*Hydrurga leptonyx*	Leopard seal	Added from Otariidae and Phocidae
PS	Marine mammal	Phocidae	41136004	*Mirounga leonina*	Southern elephant seal	Added from Otariidae and Phocidae
PS	Reptile	Dermochelyidae	39021001	*Dermochelys coriacea*	Leatherback turtle	AFMA
PS	Seabird	Diomedeidae	40040001	*Thalassarche bulleri*	Buller's albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040002	*Thalassarche cauta*	Shy albatross	AFMA
PS	Seabird	Diomedeidae	40040004	*Thalassarche chrysostoma*	Grey-headed albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040005	*Diomedea epomophora*	Southern royal albatross	AFMA
PS	Seabird	Diomedeidae	40040006	*Diomedea exulans*	Wandering albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040007	*Thalassarche melanophrys*	Black-browed albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040008	*Phoebetria fusca*	Sooty albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040009	*Phoebetria palpebrata*	Light-mantled albatross; Light-mantled sooty albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040010	*Diomedea gibsoni*	Gibson's albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040011	*Diomedea antipodensis*	Antipodean albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040012	*Diomedea sanfordi*	Northern royal albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040013	*Thalassarche impavida*	Campbell albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Diomedeidae	40040014	*Thalassarche carteri*	Indian yellow-nosed albatross	Added from Diomedeidae - undifferentiated
PS	Seabird	Procellariidae	40041003	*Daption capense*	Cape petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041004	*Fulmarus glacialoides*	Southern fulmar	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041005	*Halobaena caerulea*	Blue petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041007	*Macronectes giganteus*	Southern giant petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041008	*Macronectes halli*	Northern giant petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041009	*Pachyptila belcheri*	Slender-billed prion	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041011	*Pachyptila desolata*	Antarctic prion	Added from Procellariidae - undifferentiated

ROLE IN FISHERY	TAXA	FAMILY NAME	CAAB CODE	SCIENTIFIC NAME	COMMON NAME	SOURCE(S)
PS	Seabird	Procellariidae	40041012	*Pachyptila salvini*	Salvin's prion	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041013	*Pachyptila turtur*	Fairy prion	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041017	*Pelecanoides urinatrix*	Common diving-petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041018	*Procellaria aequinoctialis*	White-chinned petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041019	*Procellaria cinerea*	Grey petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041028	*Pterodroma inexpectata*	Mottled petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041029	*Pterodroma lessonii*	White-headed petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041030	*Pterodroma leucoptera*	Gould's petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041031	*Pterodroma macroptera*	Great-winged petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041032	*Pterodroma mollis*	Soft-plumaged petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041035	*Pterodroma solandri*	Providence petrel	Added from Procellariidae - undifferentiated
PS	Seabird	Procellariidae	40041036	*Puffinus assimilis*	Little shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Procellariidae	40041038	*Ardenna carneipes*	Flesh-footed shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Procellariidae	40041040	*Puffinus gavia*	Fluttering shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Procellariidae	40041042	*Ardenna grisea*	Sooty shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Procellariidae	40041043	*Puffinus huttoni*	Hutton's shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Procellariidae	40041045	*Ardenna pacifica*	Wedge-tailed shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Procellariidae	40041047	*Puffinus tenuirostris*	Short-tailed shearwater	Added from *Puffinus* spp. - undifferentiated
PS	Seabird	Sulidae	40047004	*Sula dactylatra*	Masked booby	Added from Avians
PS	Seabird	Laridae	40128014	*Larus pacificus*	Pacific gull	Added from Avians

Scoping Document S2B1. Benthic Habitats

Since the previous assessment nearly two 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, 2016,2018; Williams et al. 2009, 2010a, b, 2011). This has culminated in a redefinition of much of the Australian seafloor based on meso-scale surrogates collated from data from biological surveys, environmental data, protected area/fishery closure data by Pitcher et al. (2018). They used fishery effort data from 1985- 2012 which is immediately prior to this current assessment period and their habitat assessment was relevant and more comprehensive than the previous ones. Therefore, we chose to use the new categorisation by Pitcher et al. 2018 to scope vulnerable habitats in preference to the original scoping of habitats. Consequently, the new habitat data and methodology we use here are not directly mappable to the original ERAEF habitat definition nor directly comparable to the original analyses.

The habitat assessment of Pitcher et al. (2018) was conducted primarily for trawl fisheries but the identification of the vulnerable habitats within assemblages is relevant to any of the other fishing methods in the region (Figure 2.1). By overlaying the footprint of the fishery to be assessed over the assemblage distribution maps of Pitcher et al. (2018), we could identify those containing vulnerable habitats that might be at particular risk (see Table 2.7).

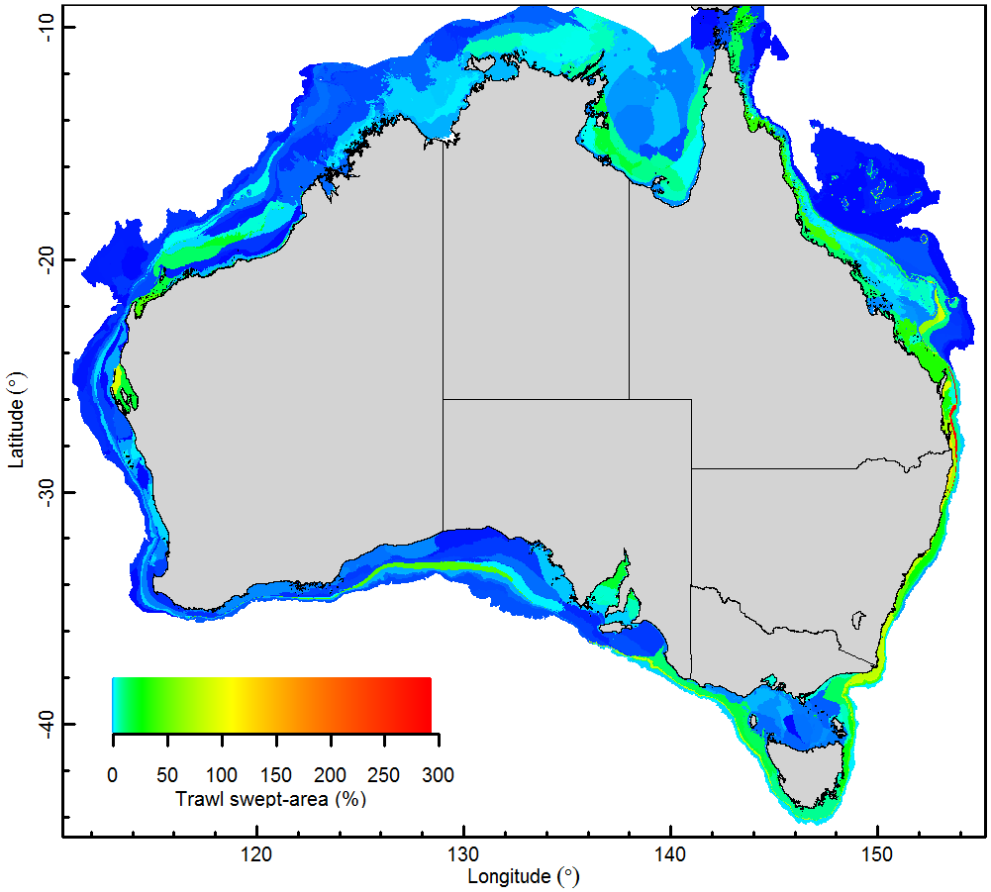


Figure 2.1. Map of assemblages from 0-1500 m indicating average annual swept-area by trawling (%) within each assemblage. This is an indicator of relative intensity of trawling. (Taken from Pitcher et al. 2018).

The effort data for the Manual longline sub-fishery indicated that the greatest concentration of fishing was spread throughout the jurisdiction from eastern Bass Strait around Tasmania, and to the west of the Gulfs in the GAB. For this assessment of the Manual longline sub-fishery, we assessed habitats within regions 7 (Great Australian Bight shelf and slope, GAB) (Figure 2.2) and 8 (Southeast Australian shelf and slope colloquially known as the SE trawl area, SET) (Figure 2.3) as characterised by Pitcher et al. (2018). The actual footprint of the manual longline sub-fishery is largely confined to the inner and outer shelves off South Australia and Tasmania. Assemblages already highly exposed to trawling (and therefore potentially other forms of fishing) were assemblage 21 in the GAB (45% swept area), and in the SET, assemblages 16, 17 and 22 (82-85% swept area) and to a lesser extent assemblage 21 (45% swept area), some of which are potentially exposed to manual longlining.

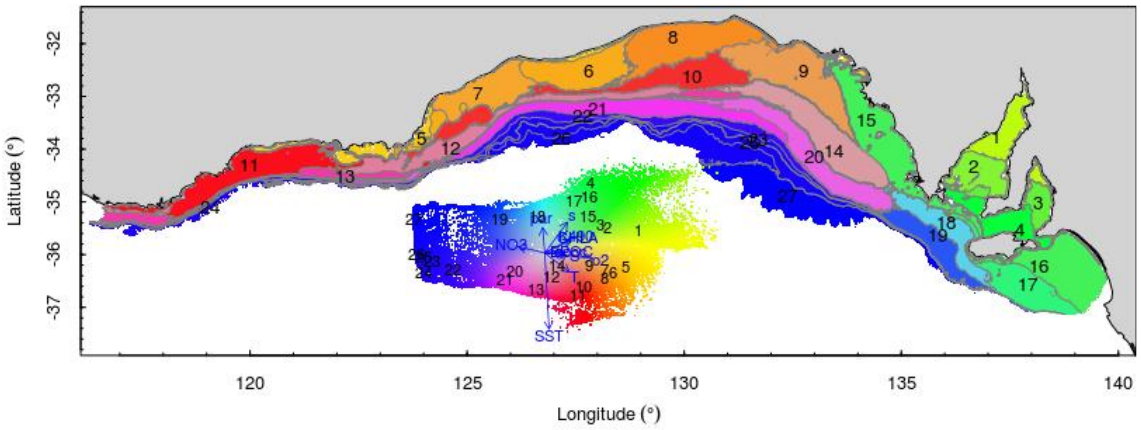


Figure 2.2. Map of the Southern Australian shelf and slope trawl region in the Great Australian Bight #7 showing the 27 derived by Pitcher et al. 2018. Each of the assemblages are now used as proxies for habitat in the assessment. (Taken from Pitcher et al. 2018).

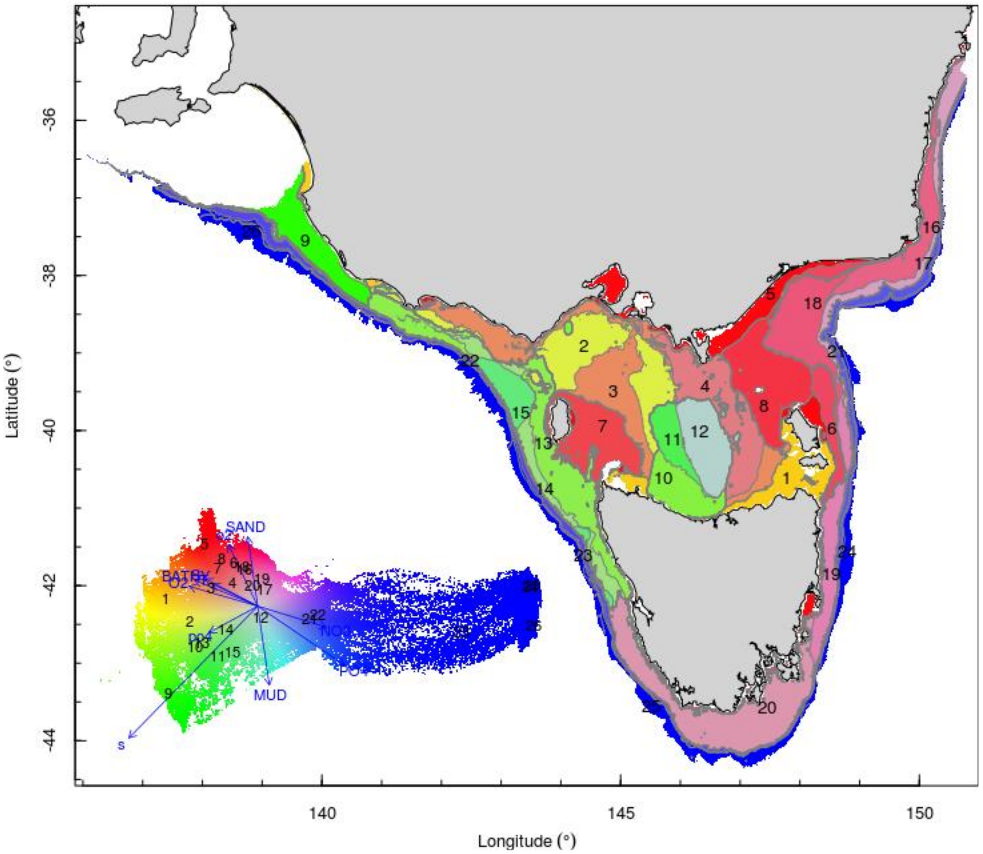


Figure 2.3. Map of the Southeast Australian shelf and slope region #8 showing the 26 assemblages derived by Pitcher et al. 2018. Each of the assemblages are now used as proxies for habitat in the assessment. (Taken from Pitcher et al. 2018).

Vulnerable habitat types or “sensitive habitat-forming biological components” in these two regions are described as:

- habitat–forming benthos in the GAB (assemblage 21)
- bryozoans and sponges from the eastern part of the SET area (assemblage 21)
- sub-cropping friable sandstone supporting large habitat-forming gorgonians and sponges within exposed mid-shelf assemblages (SET assemblage 17)
- aggregations of relict stalked crinoid *Metacrinus cyaneus* restricted within a few exposed shelf-break assemblages (in SET assemblage 21)
- ribbons of delicate bryozoan communities restricted to a narrow depth range within many shelf-edge assemblages, some of which are exposed (in SET assemblages 20, 22,23,25,26)
- tree-forming octocorals and black corals restricted to high flow, steep banks in some exposed upper-slope assemblages (in SET assemblage 21, 24).

These habitats are listed in Table 2.7. 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).

These vulnerable types are potentially accessible to trawling (and other fishing methods) and may be at risk (Williams et al. 2011) but an assessment of the exposure of the sensitive biological components (to trawling) has not been completed (Pitcher et al. 2018). The risk from other forms of fishing method is also unknown. The lack of evidence to prove direct impact from manual longlining impedes further analysis. Ideally, ERAEF habitat protocols and assessment need to be updated to integrate the assessments by Pitcher et al. (2018) to enable thorough analysis. Consequently, this SICA is preliminary and further assessment at Level 2 is not possible now.

Table 2.7. Benthic habitats that occur within the jurisdictional boundary of the Manual longline sub-fishery and in which the fishery effort occurs are highlighted in blue.

REGION	ASSEMBLAGE	HABITAT TYPE
7 GAB	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	Sensitive habitat forming biological components e.g., sponges and bryozoans
	9	
	10	
	11	
	12	
	13	
	14	
	15	
	16	
	17	
	18	
	19	
	20	
	21	Sensitive habitat forming biological components e.g., sponges and bryozoans
	22	
	23	
	24	
	25	
	26	
	27	
8 SET	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	

REGION	ASSEMBLAGE	HABITAT TYPE
	13	
	14	
	15	
	16	
	17	Sub-cropping friable sandstone supporting large habitat-forming gorgonians and sponges within exposed mid-shelf assemblages
	18	Sub-cropping friable sandstone supporting sponge gardens
	19	
	20	Bryozoans on shelf edge
	21	Relict stalked crinoid on shelf breaks, tree-forming octocorals and black corals in steep upper-slope banks
	22	Bryozoans on shelf edge
	23	Bryozoans on shelf edge
	24	Tree-forming octocorals and black corals in steep upper-slope banks
	25	Bryozoans on shelf edge
	26	Bryozoans on shelf edge

Scoping Document S2B2. Pelagic Habitats

Table 2.8. Pelagic habitats for the SESSF Manual Longline 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
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

ERAEF Pelagic Habitat No.	Pelagic Habitat type	Depth (m)	Comments	Source
P13	Heard/McDonald Islands Pelagic Provinces - Plateau	0 -1000	this is a the same as community Heard Plateau 0-1000 m	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 North Eastern 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 bioregionalisation for the slope (IMCRA 1998; Last et al. 2005). The spatial boundaries for the pelagic communities are based on pelagic bioregionalisation 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 in which fishing effort occurs in the SESSF Manual Longline sub-fishery. Shaded cells indicate all communities within the province. Bold crosses refer to communities where fishing occurred in the SESSF Manual Longline 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**									
Outer Shelf 110 – 250m [1,2,]								**x**	**x**	**x**									
Upper Slope 250 – 565m [3]						**x**		**x**	**x**										
Mid–Upper Slope 565 – 820m[3]						**x**		**x**	**x**	**x**									
Mid Slope 820 – 1100m[3]								**x**	**x**										
Lower slope/ Abyssal > 1100m[6]					**x**			**x**	**x**	**x**									
Reef 0 -110m[7, 8]																			
Reef 110-250m[8]																			
Seamount 0 – 110m																			
Seamount 110- 250m																			
Seamount 250 – 565m																			
Seamount 565 – 820m																			
Seamount 820 – 1100m																			
Seamount 1100 – 3000m					**x**														

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
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.

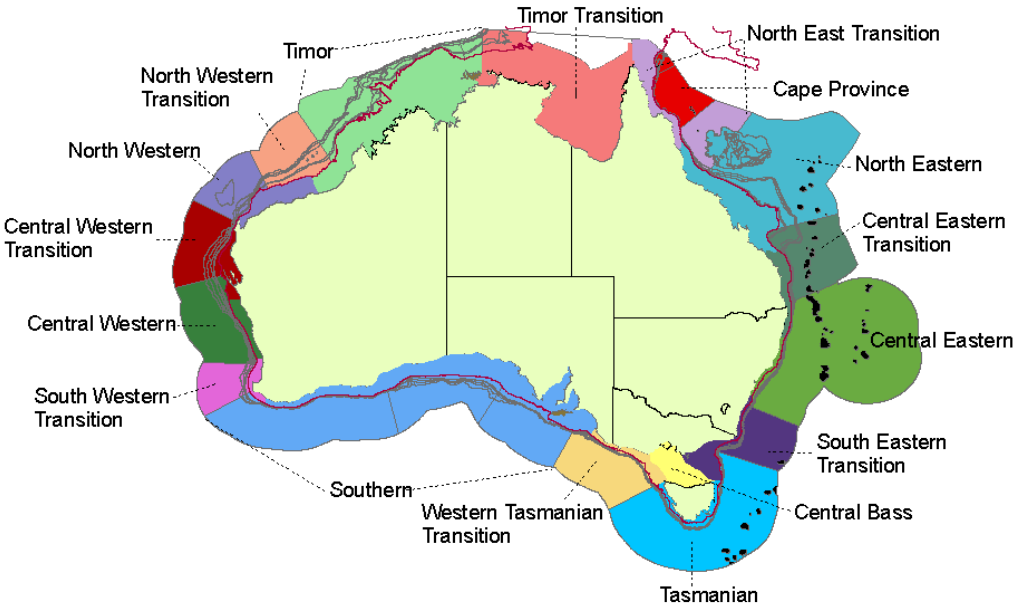
Scoping Document S2C2. Pelagic Communities

Table 2.10. Pelagic communities overlying demersal communities in which fishing activity occurs in the SESSF Manual Longline 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		x						
Oceanic (2) >600m		x						
Seamount oceanic (1) 0 – 600m								
Seamount oceanic (2) 600–3000m								
Oceanic (1) 0 – 200m								
Oceanic (2) 200-600m								
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)

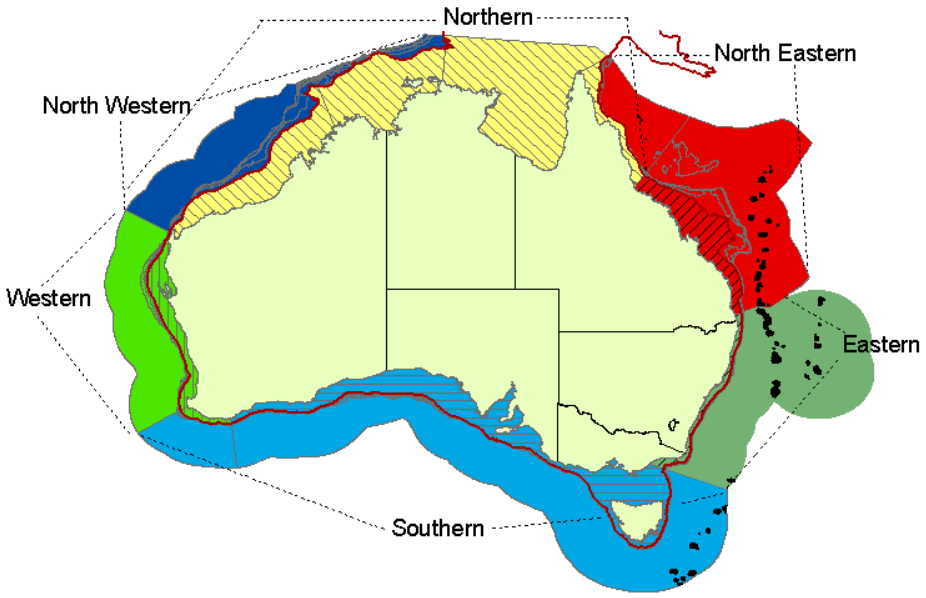


Figure 2.4 (a) Demersal communities around mainland Australia based on bioregionalisation schema. Some inshore (0-110 m) communities comprise more than one community e.g., Timor Transition comprises 4 distinct communities. b) Australian pelagic provinces. Hatched areas indicate coastal epipelagic zones 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 impairment 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 commercial 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): ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development). 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
		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 species suggests that the fishery is not targeting recruitment or spawning grounds.

Component	Core Objective	Sub-component	Example Operational Objectives	Example Indicators	Rationale
		5. Reproductive Capacity	5.1 Fecundity of the population does not change outside acceptable bounds (e.g., more than X% of reference population fecundity) 2 Recruitment to the population does not change outside acceptable bounds	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.
		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)	6.1. Changes to behaviour that are deleterious to the species and populations are to be avoided.
Byproduct and Bycatch	Avoid recruitment impairment 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 byproduct and bycatch 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. 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	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.

Component	Core Objective	Sub-component	Example Operational Objectives	Example Indicators	Rationale
			acceptable bounds		
		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.
		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
		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 Fishing 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 impairment of protected species Avoid negative consequences for protected	1. Population size	1.1 Species do not further approach extinction or become extinct 1.2 No trend in biomass	Biomass, numbers, density, CPUE, yield	1.1 EMO – This is a general objective for all AFMA fisheries as per Fisheries Management Act 1991 objective (1b): ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development); and objective (2):

Component	Core Objective	Sub-component	Example Operational Objectives	Example Indicators	Rationale
	species or population sub-components Avoid negative impacts on the population from fishing		1.3 Maintain biomass above a specified level 1.4 Maintain catch at specified level		ensuring, through proper conservation and management measures, that the living resources of the AFZ are not endangered by over-exploitation; Therefore 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.
		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)	Egg production of population Abundance of recruits	5.1 The reproductive capacity of protected species is of concern because potential fishery induced changes in reproductive ability may have immediate impact on the population size of protected species.

Component	Core Objective	Sub-component	Example Operational Objectives	Example Indicators	Rationale
			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 Longlining 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 Avoid reduction in the amount and quality of habitat	1. Water quality	1.1 Water quality does not change outside acceptable bounds	Water chemistry, noise levels, debris levels, turbidity levels, pollutant concentrations, light pollution from artificial light	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.
		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, longlining 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 – General objective for all AFMA fisheries as per Fisheries Management Act 1991 (objective 1b): ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development. The fishery is conducted, in a manner that minimises the impact of fishing operations on benthic habitat.
		4. Habitat types	4.1 Relative abundance of habitat types does not vary outside	Extent and area of habitat types, % cover, spatial pattern, landscape scale	4.1 Longlining activities may result in changes to the local habitat types on fishing grounds.

Component	Core Objective	Sub-component	Example Operational Objectives	Example Indicators	Rationale
			acceptable bounds		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 Longlining activities may result in localized disruption to 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 – General objective for all AFMA fisheries as per Fisheries Management Act 1991 (objective 1b): ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the principles of ecologically sustainable development) 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. 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 of the community	3.1 Community range does not vary outside acceptable bounds	Geographic range of the community, continuity of range, patchiness	3.1 Longlining operations have unknown impacts on the benthos in the 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 Longlining 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 Longlining 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: Manual longline
Date completed: May, June 2021

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

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	SCORE (0/1)	DOCUMENTATION OF RATIONALE
Capture	Bait collection	0	Not required for this fishery method.
	Fishing	1	Actual fishing i.e., capture of species resulting from deployment and retrieval of demersal longline including key commercial, bycatch, byproduct and protected species are caught.
	Incidental behaviour	0	Activities such as recreational fishing are not permitted or occur rarely.
Direct impact without capture	Bait collection	0	Not required.
	Fishing	1	Demersal longlining is most likely to impact benthic habitats and animals as the gear contacts seafloor. Unknown mortality on fish arising from escapement. Birds, seals and dolphins may also interact with gear at times resulting in injury or mortality when gear is retrieved.
	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. Fishery management plan requires operators to take all reasonable steps to minimise loss of gear.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	SCORE (0/1)	DOCUMENTATION OF RATIONALE
	Anchoring/ mooring	1	Vessels may anchor inshore occasionally when not fishing. Potential for anchoring to impact inshore habitats.
	Navigation/steaming	1	Steaming/navigation to find aggregations of fish may result in collisions (e.g., seabirds or whales vessel interactions), seabird collisions with night-time lights/navigation lights.
Addition/ movement of biological material	Translocation of species	1	Bait used every fishing opreation. Translocation could occur through imported bait (10% NZ squid 90% mackerel). Also, 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 specifically 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 (not while hauling or setting gear).
	Discarding catch	1	Discarding is common.
	Stock enhancement	0	None occurs
	Provisioning	1	Provisioning occurs through bait lost during manual and/or automatic baiting.
	Organic waste disposal	1	If uncontaminated, food wastes may be discharged into the sea while the fishing vessel is in transit, if the waste is discharged subject to location-specific conditions. MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits food waste if contaminated by any other garbage types.
Addition of non-biological material	Debris	1	May occur. MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Rubbish must be collected onboard and disposed of ashore.
	Chemical pollution	1	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. 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	FMP requires operators to take all reasonable steps to minimise loss of gear. If a line breaks off it is generally retrieved by hauling from other end, without substantial loss of gear. Double breakoffs are rare for experienced skippers. Major gear losses of entire longlines are rare and usually retrieved. No information on minor components loss.
	Navigation/ steaming	1	Longline operations involve vessel navigating to and from fishing grounds, introducing noise and visual stimuli. 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 collection not required by fishery.
	Fishing	1	Fishing may disturb seabed sediments and structure by lines and weights coming into contact with benthos.
	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.

DIRECT IMPACT OF FISHING	FISHING ACTIVITY	SCORE (0/1)	DOCUMENTATION OF RATIONALE
	Navigation/ steaming	1	Longline operations involve navigating and steaming to and from fishing grounds which may affect benthos and pelagos through turbulence created by propellers or wake formation have potential to disturb marine species. It may disturb the local pelagic habitat through the addition of emissions. Noise is also associated with travel. Depth sounders/ acoustic net positioning systems have potential to disturb marine species.
External Hazards	Other capture fishery methods	1	Other fisheries operating in the CTS: - Danish seine, otter trawl, GAB Trawl. Also operating in the same area are fisheries in the GHAT sector: Scalefish Hook – auto-longline, dropline; trap; Shark gillnet; tuna fisheries- the SBT, ETBF; squid jig; Bass Strait scallop; recreational, and state fisheries operate in adjacent waters.
	Aquaculture	1	Salmon and mollusc aquaculture occurs in inshore (state waters) in Tasmania and more broadly along the eastern seaboard respectively. 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	Petroleum/gas exploration and associated activities e.g., seismic and drilling occurs in Bass Strait/GAB.
	Other non-extractive activities	1	Defence and major coastal shipping activity, submarine cables 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, ballasting)	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 or food scraps, 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 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	Defence, 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:

- SESSF Management Plan
- SESSF Management Arrangements Booklet 2017
- Harvest Strategy Framework. http://www.afma.gov.au/wp-content/uploads/2017/03/SESSF-Harvest-Strategy-Framework-2017-final.pdf

Other publications that may have provided information include

- Rebuilding Strategies
- ABARES Fishery Status Reports
- Previous risk assessments and residual risk assessments;
    - http://www.afma.gov.au/wp-content/uploads/2014/11/GABT-Otter-Board-Trawl-Residual-Risk-2012.pdf;
    - http://www.afma.gov.au/wp-content/uploads/2014/11/Otter-Trawl-Residual-Risk-Assessment-2014.pdf;
    - http://www.afma.gov.au/wp-content/uploads/2014/11/SESSF-ERM-Strategy-2015.pdf

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, 19 out of 26 possible internal activities were identified as occurring in this sub-fishery. Six out of six external scenarios were also identified. Thus, a total of 25 activity-component scenarios will be considered at Level 1. This results in 124 total scenarios (of 160 possible, excluding the key commercial x direct impact by capture activity) 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 with regard to 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.

Table 2.19. SICA for key commercial/secondary commercial species. Note: The direct impact of fishing hazard (i.e., Capture: Fishing) for key/secondary commercial species that have stock assessments is no longer assessed at L1.

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		1.2, 1.3, 1.4	3			There are no key 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 (*Mustelus antarcticus*)	1.2, 1.3, 1.4	3	1	1	Fishing could cause a school to aggregate around baits or to disperse but fish that are not caught are likely to return to their normal behaviour quickly. Intensity: moderate. Consequence: negligible as unlikely to occur. Confidence: low, the amount of escaping of this species is not well known but is not expected to die because of hook ingestion, and therefore minimal impact on population size.
	Incidental behaviour	0									
	Gear loss	1	1	3	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	2	1	2	Lost gear may drift for a while before balling up or entangling benthic relief. Baits soon fall off, longline gear unlikely to ghost fish. Intensity: minor, occurs rarely. Consequence: negligible, unlikely to detect against background variability. Confidence: high, constrained by logical consideration.

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	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	2	1	2	Vessels rarely anchor on the shelf except when in port or broken down. Anchoring only takes place in shallow waters. Very unlikely that this species would be adversely affected by the process of anchoring or mooring. Intensity: minor, occurs rarely as the likelihood of direct interaction with anchoring/mooring lines is unlikely. Consequence: negligible, unlikely to be detectable at the scale of the population. Confidence: high, logical consideration of interactions. Anchoring and mooring have negligible impact on Gummy Shark populations through direct effects or indirect effects of modification to habitats or associated communities. Although anchoring and mooring are undertaken throughout the range of the fishery, the area of seabed affected is small (<1 nm2).
	Navigation/steaming	1	6	6	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	3	1	1	This key commercial species is not known for reacting to vessels and/or following them or changing behaviour in response to them. Steaming is unlikely to affect a demersal species that lives to about 350 m below the surface. Intensity: moderate, as vessels steaming to fishing grounds daily in some areas. Consequence: negligible as unlikely to be detectable at the scale of the population. Confidence: low, no information.
Addition/ movement of biological material	Translocation of species	1	6	6	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	2	1	1	Translocation of species can have major effects on local communities through imported bait, i.e., the introduction of an exotic pathogen in frozen imported bait. This species is known the eat bait species. The population size of this species might reduce should they eat diseased bait. Bait and foreign feed usage needs to be carefully monitored. Intensity: minor, potential to occur but unlikely to detect, no evidence. Consequence: minor if it occurs. Confidence: low, no evidence.
	On board processing	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	2	1	Most Gummy Shark gutted on board but no discarding whilst hauling or setting Intensity: moderate, waste expected to be taken up quickly by

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
											opportunistic scavengers. Consequence: minor. Confidence low: observer data not specific for this the sub-fishery.
	Discarding catch	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	1	1	Main discards (e.g., are other sharks and rays) are unlikely to affect the species. Consequence: minor, as it is considered to have minimal impact on the behaviour/movement of this species. Confidence: low, as there is insufficient data.
	Stock enhancement	0									
	Provisioning	1	6	6	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	2	1	1	Provisioning occurs through bait lost during manual or automatic baiting. Intensity: minor: Mustad system has high baiting efficiency. Consequence: negligible, insignificant change to growth unlikely to be detectable against background variability. Confidence: low no data
	Organic waste disposal	1			Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Organic waste may be discarded if uncontaminated. Sharks might scavenge if it accessible but unlikely to reach depth. Intensity: negligible. Consequence: negligible. Confidence: high, regulated discharge, logical.
Addition of non-biological material	Debris	1			Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Rubbish must be collected onboard and disposed of ashore. Debris might be discarded accidentally but unlikely to reach depth. Intensity and consequence: negligible. 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
	Chemical pollution	1			Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. Leakage of substances such as fuel, oil, bilge discharges, natural decay of antifouling agents may occur in normal course of operations but unlikely to reach depth. Intensity and consequence: negligible. Confidence: high, logical.
	Exhaust	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	1	1	2	Exhaust emissions released at the surface cannot affect a demersal species. Intensity: negligible. Consequence: negligible. Confidence high: can be evaluated without data.
	Gear loss	1	1	3	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	2	1	2	Fishery management plan requires operators to take all reasonable steps to minimise loss of gear. If a line breaks off, it is generally retrieved by hauling from other end, without substantial loss of gear. Double breakoffs are rare for experienced skippers. Intensity: minor. Consequence: negligible, unlikely to detect against background variability. Confidence: high (previous AFMA Observer program).
	Navigation/steaming	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	1	2	Navigation and steaming unlikely to have a measurable impact on Gummy Shark, a species that lives ~350 m below the surface. Intensity: moderate, steaming occurs throughout the fishery. Consequence: negligible short term disturbance unlikely to change behaviour and movement. Confidence: high, can be evaluated without data.
	Activity/presence on water	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	1	2	Presence on water unlikely to have a measurable impact on Gummy Shark, a species that lives up to ~350 m below the surface. Intensity: moderate, vessels present broadly throughout fishery. Consequence: negligible short-term disturbance unlikely to change behaviour and movement. Confidence: high, can be evaluated without data.
	Bait collection	0	0	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	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	1	1	Longlines and weights might impact the structural components of habitat but footprint of longline is smaller than other demersal methods. Studies of similar fisheries elsewhere suggest impact on vulnerable communities (Muñoz et al. 2011) but unlikely to influence higher predator behaviours or movements. Intensity: moderate, but footprint of gear is very small compared to other gear types, unlikely to be detectable. Consequence: negligible, unlikely to be detectable. Confidence: low no data on how the gear interacts with the benthos.
	Boat launching	0									
	Anchoring/mooring	1	3	4	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	2	1	2	Occurs rarely. Intensity: minor under current conditions and low number of operators. Intensity: minor, depending upon the spatial and temporal coverage. Consequence: negligible. Confidence: high (AFMA Observer Program).
	Navigation/steaming	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	1	1	2	Disruption of the surface waters through steaming may result in mixing that enhances local productivity. The scale of this relative to natural disturbance is considered negligible. Consequence: negligible, unlikely to disturb physical processes. Confidence: high, due to logical consideration.
External Impacts	Other fisheries	1	6	6	Population size	Gummy shark (*Mustelus antarcticus*)	1.2, 1.3, 1.4	4	4	1	Other sub-fisheries in the SESSF and State inshore fisheries also catch Gummy Shark. These are constrained within the overall TAC setting. Fishing mortality due to recreational fishing is considered minor and partly controlled by bag limits. Intensity: major given the likely scale. Consequence: major, CPUE for Gummy Shark could fall below limit reference point. Confidence: low uncertain of interactions and long-term cumulative impacts.

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	Population size	Gummy shark (*Mustelus antarcticus*)	1.1	2	2	1	Occurs at a range of sites throughout SESSF. Intensity: minor, aquaculture installations represent small part of habitat. Consequence: minor, may impact the habitat important to early life stages of Gummy Shark affecting population growth. Confidence: low.
	Coastal development	1	6	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	2	1	Both large and small centres along the coast and ongoing coastal development is likely to have minor impact as most Gummy Shark sub-stocks are well away from these developments. Neonates, juveniles and females in breeding condition are the most likely animals to be impacted. Intensity: moderate, range of activities likely to have local affects. Consequence: minor due to spatial scale. Confidence: low little data on the cumulative effects.
	Other extractive activities	1	4	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	2	2	1	Ongoing oil and gas exploration by seismic survey and expansion of pipelines in Bass Strait is potentially affecting behaviour and movement of chondrichthyan species. 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. Intensity: minor, occurs in restricted locations, may be pollution and disturbance during development and operational stages. Consequence: minor as long term effects expected to be minimal and localized. Confidence: low, information on cumulative effects is unclear.
	Other non-extractive activities	1	5	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	3	1	1	Ongoing shipping, naval activities is likely to have minor effects on Gummy Shark behaviour and movement. Less predictable are the potential effects of the high voltage direct current (HVDC) sub-sea cables (i.e., Bass Link in Bass Strait) on the behaviour and movement of Gummy Shark. All chondrichthyan species have highly developed electroreception and magneto-reception. Intensity: moderate high voltage cables may impact some species. Consequence: negligible, spatial areas restricted, unlikely to detect behavioural changes. Confidence: low little information on 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 anthropogenic activities	1	5	6	Behaviour/ movement	Gummy shark (*Mustelus antarcticus*)	6.1	2	2	1	Tourism, recreational boating, is likely to have minor effects on the behaviour of Gummy Shark behaviour and movement. These effects are localized and only impact a small proportion of the population. Intensity: minor activities could impact wide range species Consequence: minor restricted area rare event short term effects Confidence: low, limited information.

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

Table 2.20. SICA for byproduct/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	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	3	2	2	Fishing occurs throughout the year over the SESSF. Population size likely to be affected before major changes in other sub-components. The EPBC listed conservation dependent School Shark was the most vulnerable species, but since it is assessed and has a rebuilding strategy, further action is not required in this assessment. Therefore, the next most vulnerable species was considered as the Broadnose Sevengill Shark (assessed as Vulnerable in 2020 IUCN Red List). It has a global distribution in temperate waters and is broadly distributed throughout southern Australia from close inshore to 136 m (Last and Stevens 2009). It has large litter sizes (Barnett et al. 2010). Intensity: moderate, at a broader scale throughout fishery. Consequence: minor, ~10 t p.a retained and 4.5 t discarded presumably released alive therefore minimal impact on population dynamics. Confidence: high, evidence suggests that population is increasing (https://www.fish.gov.au/docs/SharkReport/FRDC_Notorynchus-cepedianus.pdf) and a semi-quantitative risk assessment for chondrichthyan bycatch species taken in the SESSF ranked this species with low risk from current commercial fishing as fishing effort has been reduced and the species likely has some refuge at depth (https://www.iucnredlist.org/species/39324/2896914#assessment-information).
	Incidental behaviour	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	Bait collection	0									
	Fishing	1	6	6	Behaviour/ movement	Broadnose sevengill shark (*Notorynchus cepedianus*)	6.1	3	2	1	Demersal longline fishing is passive and is judged to have minimal impacts on the populations of byproduct and bycatch species. Direct impacts on these populations could arise from fishing mortality resulting from animals injured from encounters with longlines and/or by predation from other fish, sea lice, marine birds or marine mammals after capture on longlines. This fishing mortality is difficult to measure precisely but is small compared with the fishing mortality associated with the retained catch. The current AFMA Bycatch Action Plan aims to mitigate these effects. Intensity: moderate. Consequence: minor, as considered to be minimal impact on the population structure and/or dynamics.
	Incidental behaviour	0									
	Gear loss	1	1	3	Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	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. This species 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 retrieved (AFMA Observer, pers. comm.) and interaction with this species is considered unlikely.
	Anchoring/ mooring	1	3	4	Population size	Southern eagle ray	1.2, 1.3, 1.4	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

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
						(*Myliobatis tenuicaudatus*)					likely to affect population size of this benthic species. This species inhabits coastal bays so considered most vulnerable to impact. Intensity: minor, occurs occasionally. Consequence: negligible, unlikely that that this species coming into direct contact with anchors and impact unlikely 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	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	3	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. Intensity; moderate. Navigation/steaming is a large component of the SESSF operations Consequence: negligible as it is unlikely to be measurable. Confidence: high, logical.
Addition/ movement of biological material	Translocation of species	1	6	6	Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	2	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 so may be closer to the surface than other species. Intensity: minor, possible but detection unlikely. Consequence: negligible, as unlikely to be measurable. Confidence: low, no data.
	On board processing	1	6	6	Behaviour/ movement	Broadnose sevengill shark (*Notorynchus cepedianus*)	6.1	3	2	1	Onboard processing only occurs in parts of the fishery where animals are head and gutted and/or trunked. This is most likely to affect behaviour/movement of scavengers such as sharks. Intensity: moderate, onboard processing is common. Consequence: minor behaviour would return to normal rapidly. Confidence: low, no data on behaviour.
	Discarding catch	1	6	6	Behaviour/	Broadnose sevengill shark	6.1	3	2	1	Discarding is common but low rate of discard ~17%. It is most likely to affect behaviour/movement of species by attracting scavengers such as

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
					movement	(*Notorynchus cepedianus*)					sharks. Intensity: moderate because this species is widespread. Consequence: negligible, behaviour would return to normal rapidly. Confidence: low, no data on movement behaviour of these species.
	Stock enhancement	0									
	Provisioning	1	6	6	Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	2	1	1	Provisioning occurs through bait lost during manual or automatic baiting. Intensity: minor, Mustad system has high baiting efficiency. Consequence: negligible, insignificant change to growth unlikely to be detectable against background variability. Confidence: low, no data
	Organic waste disposal	1			Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Organic waste may be discarded if uncontaminated. Sharks might scavenge if it accessible but unlikely to reach depth. Intensity: negligible. Consequence: negligible. Confidence: high, regulated discharge, logical.
Addition of non-biological material	Debris	1			Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Rubbish must be collected onboard and disposed of ashore. Debris might be discarded accidentally but unlikely to reach depth. Intensity and consequence: negligible. Confidence: high, logical.
	Chemical pollution	1			Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. Leakage of substances such as fuel, oil, bilge discharges, natural decay of antifouling agents may occur in normal course of operations but unlikely to reach depth. Intensity and consequence: negligible. 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
	Exhaust	1	6	6	Behaviour/ movement	Pink snapper (*Chrysophrys auratus*)	6.1	1	1	2	Exhaust emissions released at the surface cannot affect a demersal species. Intensity: negligible. Consequence: negligible. Confidence high: can be evaluated without data.
	Gear loss	1	1	3	Population size	Broadnose sevengill shark (*Notorynchus cepedianus*)	1.2, 1.3, 1.4	2	1	2	Longlining occurs throughout the year over the SESSF and occasionally lines and hooks are lost. Gear will persist in the habitat as breakdown times can be extensive. Volume likely to be low and dispersed across inner/outer shelf. Lost gear not resulting in damage/mortality most likely to affect population size of this species. Intensity: minor. Consequence: negligible, gear will tangle but is a greater risk to species than habitat structure and function. 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	Broadnose sevengill shark (*Notorynchus cepedianus*)	6.1	3	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. Intensity: moderate. 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	Broadnose sevengill shark (*Notorynchus cepedianus*)	6.1	3	1	1	Activity/presence on water occurs over the SESSF. Vessels in the area attract (or avoid) animals. This species could have an avoidance reaction to acoustic signals and could use echo-location. Intensity: moderate, presence of vessels occurs throughout. Consequence: negligible. Confidence: low because available data on acoustic

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
											disturbance on a spawning on the behaviour/movement of this species is unknown.
Disturb physical processes	Bait collection	0	0	0							
	Fishing	1	6	6	Behaviour/movement	Broadnose sevengill shark (*Notorynchus cepedianus*)	6.1	3	1	1	Longlines and weights might impact the structural components of habitat but footprint of longline is smaller than other demersal methods. Studies of similar fisheries elsewhere suggest impact on vulnerable communities (Muñoz et al. 2011) but unlikely to influence higher predator behaviours or movements. Intensity: moderate, but footprint of gear is very small compared to other gear types, unlikely to be detectable. Consequence: negligible, unlikely to be detectable. Confidence: low no data on how the gear interacts with the benthos.
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Behaviour/movement	Broadnose sevengill shark (*Notorynchus cepedianus*)	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. This species enters coastal bays to spawn so considered most vulnerable to impact. Intensity: minor, as anchoring occurs seldomly. Consequence: negligible, unlikely to disturb physical processes. 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.

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	Pink snapper (*Chrysophrys auratus*)	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 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 navigation/steaming unlikely to impact and have consequences for the behaviour/movement of this species.
External Impacts	Other fisheries	1	6	6	Population size	School shark (*Galeorhinus galeus*)	1.2, 1.3, 1.4	4	5	2	Fishing occurs throughout the year over the SESSF. Capture of this species from trawl and non-trawl fisheries (e.g., SESSF scalefish auto-line; GHAT gillnet and longline; CTS bottom trawl; State managed fisheries (Tas, Vic, SA) bottom line, gillnet and longline) most likely to affect population size of this species. This species considered to be most vulnerable, given the population status in the SESSF is classified as overfished and EPBC listed as Conservation Dependent. Population considered <20% B_0, has been subject to a rebuilding strategy for some years and has not recovered. Intensity: major, across broad spatial scale. Consequence: severe, as population has not recovered and may become locally extinct in areas of heavier fishing. Confidence: high, based on biomass estimates for this species within the SESSF.
	Aquaculture	1	3	6	Behaviour/ movement	Pink snapper (*Chrysophrys auratus*)	6.1	2	2	1	Aquaculture occurs at sites throughout southeastern Australian in harbours, bays, and estuaries adjacent to inner shelf habitats. This species selected as juveniles 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

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
											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	School shark (*Galeorhinus galeus*)	6.1	3	4	2	Coastal development occurs throughout the SESSF and potentially degrade nursery areas. Evidence suggests that some nursery areas have not recovered from reduced river inputs (Walker et al. 2021). Intensity: moderate, coastal development throughout but not all impacting habitats. Consequence: major, loss of nursery areas adversely affecting long-term recruitment dynamics. Confidence: high, based on studies by Parry and Hirst 2016; Walker 2001; Walker et al. 2021.
	Other extractive activities	1	4	6	Behaviour/ movement	School shark (*Galeorhinus galeus*)	6.1	2	1	1	Ongoing development and expansion of oil and gas pipelines (sub-sea cables), 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, via their migration lanes, which in turn may affect their feeding and navigation (Walker et al. 2005). The auditory and lateral line sensory acuity of this species could be affected by seismic survey. Intensity: minor as activities occur in restricted locations. Consequence: negligible time to return to normal behaviour rapid. Confidence: low as potential effects are unknown for this species.
	Other non-extractive activities	1	5	6	Behaviour/ movement	School shark (*Galeorhinus galeus*)	6.1	3	1	2	High voltage sub-sea cables across Bass Strait could affect the behaviour/movement of this species. Since 20-30% of School Sharks migrate across the BassLink their navigation responses may be disrupted temporarily but expected to be minimal as they are less epibenthic than other chondrichthyans (Walker 2001). Intensity:

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
											moderate, but very localised. Consequence: negligible, unlikely to be detectable. Confidence: high, based on studies by Walker (2001).
	Other anthropogenic activities	1	5	6	Behaviour/ movement	Pink snapper (*Chrysophrys auratus*)	6.1	2	1	1	Major shipping routes, tourism, recreational boating, oil spills, are likely to have minor effects on the behaviour and movement of this species. These effects are localized and only impact a small proportion of the population. Intensity: minor, activities could impact a wide range. Consequence: negligible, unlikely to be detect change in behaviour and behaviour return to normal rapidly. Confidence: low, limited available information.

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

Table 2.21. SICA for 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	Shy albatross (*Thalassarche cauta*)	1.2, 1.3, 1.4	3	2	2	Over the five-year assessment period, there were 15 interactions with seabirds of which nine were killed; four albatrosses were killed of which one was identified as a Shy Albatross. Shy Albatross are an endemic species breeding only on three Tasmanian islands; population last estimated over 14 000 breeding pairs, declining over the 1993-2013 period (Phillips et al. 2016), classified as endangered under EPBC Act. More recently, the estimated number of breeding pairs for the three sub-populations from Alderman (2018) were: 5800 ±700 (Albatross Island, western Bass Strait); 9900 ± 200 (Mewstone Island, southern Tasmania); 120 ± 2 (Pedra Branca, southern Tasmania). The total population is estimated to be ~30 000 mature individuals (Alderman 2018). Also, there has been an overall increase in breeding effort at Albatross Island over the past 20 years and a decrease in the last 10 years (Alderman 2018). Atypical among albatrosses, Shy Albatross is a central-placed forager and remains within 300 km of their colony (except as juveniles); feed on discards from vessels accounting for a significant portion of the diet (Brothers et al. 1997; Gales et al. 1998), therefore, considered most vulnerable to longlining. Intensity: moderate. Consequence: minor, 1-3 fatalities unlikely to be detectable, given the most recent estimated ~5800 breeding pairs at Albatross Island. Confidence: high, population status is known.
	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	Behaviour/ movement	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	6.1	3	2	2	Seabirds including albatross are highly olfactory and are attracted to fishing operations including baited longlines. Intensity: moderate. Consequence: minor, behaviour returns to normal within hours. Confidence: high, observed in other fisheries.
	Incidental behaviour	0									
	Gear loss	1	1	3	Population size	Shortfin mako (*Isurus oxyrinchus*)	1.2, 1.3, 1.4	2	1	2	Gear loss occurs rarely (~1 per year) but not verified and is usually retrieved. Major gear loss may modify species behaviour by attracting them to lost catches and/or entangle them however minor losses not likely to impact. Major gear loss is rare (AFMA) but minor gear loss is unknown. Intensity: minor but gear loss not reported. Consequence: negligible, unlikely to detatect impact, if major gear loss is rare. Confidence: high, major gear losses meant to be reported.
	Anchoring/ mooring	1	3	4	Behaviour/ movement	Shortfin mako (*Isurus oxyrinchus*)	6.1	2	1	2	Anchoring/ mooring may occur along the SESSF inner shelf where fishing effort highest but probably most occurs in sheltered bays in state waters. Some Shortfin Mako 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	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	6.1	3	2	2	Vessels navigate and steam across the inner and outer continental shelf within the SESSF during the year. Albatrosses are highly olfactory and may be attracted to the vessel and strike superstructure causing death or injury. Intensity: moderate- navigation/steaming is a large component of the SESSF operations. Consequence: minor - all strikes recorded and likely to have minimal impact on stocks. Confidence: high, all interactions must be recorded.

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/ movement of biological material	Translocation of species	1	6	6	Population size	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	1.2, 1.3, 1.4	2	1	1	Translocation of disease may occur when seabirds eat imported bait. Intensity: minor, potential to occur but unlikely to detect, no evidence. Consequence: negligible, could reduce the stock size, but unlikely given the total reported interactions within this assessment period, and there is no evidence of disease in seabirds. Confidence: low, difficult to determine the likelihood of a disease outbreak occurring and difficult to predict which species may be affected, or if it could be transferred from bait to birds. No records of disease outbreaks in the sub-fishery. Risk would be higher if bait is sourced from outside Aust/NZ region.
	On board processing	1	6	6	Behaviour/ movement	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	6.1	3	2	2	On board processing attracts seabirds to discarded offal during fishing operations. Shy Albatross feed on discards from vessels accounting for a significant portion of the diet (Brothers et al. 1997; Gales et al. 1998). MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. Intensity: moderate, onboard processing is common. Consequence: minor, change in behaviour is temporary. Confidence: high, logical.
	Discarding catch	1	6	6	Behaviour/ movement	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	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. These species are considered most likely species as they are known to feed on discards. 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.
	Stock enhancement	0									
	Provisioning	1	6	6	Population size	Shortfin mako (*Isurus oxyrinchus*)	1.2, 1.3, 1.4	2	1	1	Provisioning occurs through bait lost during manual or automatic baiting. Intensity: minor: Mustad system has high baiting efficiency. Consequence:

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
											negligible, insignificant change to growth unlikely to be detectable against background variability. Confidence: low, no data
	Organic waste disposal	1			Behaviour/ movement	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	6.1	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Organic waste may be discarded if uncontaminated. Albatrosses may scavenge on surface. Intensity: negligible. Consequence: negligible, unlikely to be detectable. Confidence: high, regulated discharge, logical.
Addition of non-biological material	Debris	1			Population size	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Rubbish must be collected onboard and disposed of ashore. Debris might be lost accidentally. Birds may die from ingestion of plastics. Intensity: negligible. Consequence: negligible, unlikely to be detectable. Confidence: high, logical.
	Chemical pollution	1			Population size	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	1.2, 1.3, 1.4	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. Leakage of substances such as fuel, oil, bilge discharges, natural decay of antifouling agents may occur in normal course of operations may affect seabirds on water. Intensity: negligible. Consequence: negligible, confined to proximity of vessel and dispersed/diluted rapidly. Confidence: high, major leakages are reported to AMSA.
	Exhaust	1	6	6	Population size	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	1.2, 1.3, 1.4	1	1	1	Exhaust emitted throughout the fishery daily. Seabirds most likely to be impacted 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 seabirds impossible to detect, but they can avoid exhaust fumes. Confidence: low, no information on effects of fumes on seabirds.

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
	Gear loss	1	1	3	Behaviour/ movement	Shortfin mako (*Isurus oxyrinchus*)	6.1	2	1	2	Gear loss occurs rarely (~1 per year) on fishing grounds and is usually retrieved. Abandoned gear may modify fish behaviour by attracting them to structure. Intensity: minor, if gear loss is major. Consequence: negligible - unlikely to detect variation in behaviour. Confidence: high, major gear losses reported.
	Navigation/ steaming	1	6	6	Behaviour/ movement	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	6.1	3	2	1	Noise and echo sounding from fishing operations represents greatest risk to Australian and New Zealand Fur Seals behaviour and movement as they become habituated to fishing vessels. Intensity: moderate. Consequence: minor - unlikely to have had more than minimal impact on stock although evidence of habituation to noise of fishing operations leading to physical interactions. Confidence: low, protected species interactions reported to AFMA/DAWE but not all observable and unknown effects.
	Activity/ presence on water	1	6	6	Behaviour/ movement	Shy albatross (*Thalassarche cauta*), Southern Royal albatross (*Diomedea epomophora*)	6.1	3	2	1	Potential for collision of seabirds with superstructure of vessel. Intensity: moderate. Consequence: minor, while potential collisions with vessels are not reported, this is a minor cause of fatal interaction. Confidence: low, all interactions between the gear and protected species have been recorded, but not with these species and vessels.
Disturb physical processes	Bait collection	0									
	Fishing	1	6	6	Behaviour/ movement	Shortfin mako (*Isurus oxyrinchus*)	6.1	3	1	2	Longlines and weights removes structural components of habitat but footprint of longline is smaller than other demersal methods. Studies of similar fisheries elsewhere suggest impact on vulnerable communities (Muñoz et al. 2011) but unlikely to influence higher predator behaviours or movements. Intensity: moderate, but unlikely to be detectable. Consequence: negligible, Shortfin Mako are aggressive predators that feed near the top of the food web on marine fishes such as Bluefish, Swordfish, Tuna, marine mammals, and other

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
											sharks (NOAA 2021) rather than on benthos. Confidence: high, based on the two studies.
	Boat launching	0									
	Anchoring/mooring	1	3	4	Behaviour/ movement	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	6.1	2	1	2	Anchoring occurs inshore occasionally and might attract fur seals if in vicinity of haul out. Intensity: minor, as occurs over a small area. Consequence: negligible, behaviour returns to normal on departure of vessel. Confidence: high, logical.
	Navigation/steaming	1	6	6	Behaviour/ movement	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	6.1	1	1	1	Navigation /steaming effects through water turbulence might affect marine mammals behaviour in vicinity. Intensity: negligible. Consequence: negligible, unlikely to detect impact. Confidence: high, logical.
External Impacts	Other fisheries	1	6	6	Population size	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	1.2, 1.3, 1.4	4	2	2	Other SESSF fisheries - gillnet, otter trawl, auto-longline; SPF interact with fur seals and therefore likely to have had a severe impact on population size. Intensity: major, fishing occurs often at a broad scale. Consequence: minor, seal populations stable or increasing. Confidence: high logical considering cumulative effects.
	Aquaculture	1	3	6	Behaviour/ movement	Australian fur seal (*Arctocephalus*	6.1	2	2	2	Aquaculture occurs at sites throughout SE Australian in harbours, bays and estuaries adjacent to inner shelf habitats. Salmon aquaculture in Tasmanian

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
						pusillus doriferus), New Zealand fur seal (*Arctocephalus forsteri*)					waters known to attract seals. Mollusc aquaculture more frequent on mainland coast but not attracted to fur seals. Intensity: minor, habituation possible locally. Consequence: minor as it is considered not to greatly impact the stock dynamics. Confidence: high.
	Coastal development	1	6	6	Population size	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	1.2, 1.3, 1.4	3	3	1	Coastal development occurs across the range of the fishery. Frequent, local impacts from pollution, toxins, agricultural run-off, sewage even at small spatial scales could have obvious impact on the health of fur seals. Intensity: moderate, at broader spatial scale, or severe but local. Consequence: moderate, greatest impacts likely to be inshore including waters less than 25 m, and unlikely to extend to entire coastal demersal/pelagic communities however there have been suggestions that fur seals suffer from accumulation of toxic chemical pollutants. Confidence: low because of a lack of data.
	Other extractive activities	1	4	6	Behaviour/ movement	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	6.1	2	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 fur seals as sounds from air guns used in seismic surveys may affect distribution and behaviour. Intensity: minor, 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	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal	6.1	3	2	1	Shipping occurs throughout the area daily and considered to impact distribution of these species. Intensity: moderate, south and east coast shipping routes are busy. Consequence: minor as long-term effects on these species are undetectable. Confidence: low because of a lack of information on shipping-animal interactions.

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
						(*Arctocephalus forsteri*)					
	Other anthropogenic activities	1	4	6	Behaviour/ movement	Australian fur seal (*Arctocephalus pusillus doriferus*), New Zealand fur seal (*Arctocephalus forsteri*)	6.1	2	1	1	These species 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 South East Transition inner shelf and Central East shelf. Intensity: minor as most activities are relatively close to coasts and unlikely to detect long-term impacts. Consequence: negligible, behaviour would return to normal rapidly. Confidence: low, no information.

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

Table 2.22. SICA for habitats 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	0	0							
	Fishing	1	6	6	Habitat structure and function	SET 20 (ribbons of delicate bryozoan communities)	5.1	3	2	1	Demersal longline gear whether automatic or manual is set horizontally along the ocean floor and held in place using anchors - can be many kilometres in length. Weights and anchors may crush fauna. Taut monofilament lines may cut across substrate removing soft or fragile faunal forms and some faunal groups in these depths might take greater than a year to recover. Benthos may become hooked. Highest levels of effort were GAB 16,17, SET 9 (~80% effort) but the most vulnerable habitat identified by Pitcher et al. 2018 were the ribbons of bryozoans on the shelf edges e.g., in SET 20 where 5% effort was deployed. Very low level of reporting of sessile fauna bycatch (starfish and octopus the most numerous on e-log data) but studies of similar fisheries elsewhere suggest impact on vulnerable communities (Muñoz et al. 2011). Intensity: moderate, low effort (5%) in this habitat and gear footprint is small. Consequence: minor, footprint small, gear set usually to avoid reef rocky substrates. Gear is rarely lost implying minimal removal of benthos; limited logbook data does not identify bryozoans being caught. Confidence: low, catch data is minimal, reporting of invertebrates probably unreliable and no data about specific longline effects on seabed.
	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	Habitat structure and function	SET 20 (ribbons of delicate bryozoan communities)	5.1	3	2	1	Taut monofilament lines of longline gear might cut across substrate removing soft or fragile faunal forms without capture. Weights and anchors may crush fauna. Some faunal groups in these depths might take greater than a year to recover. Most vulnerable habitat identified by Pitcher et al. 2018 were the ribbons of bryozoans on the shelf edges e.g., in SET 20 where 5% effort was deployed. Studies of similar fisheries elsewhere suggest impact on vulnerable communities (Muñoz et al. 2011). Intensity: moderate, low effort (5%) in this habitat. Consequence: minor, footprint of gear is small relative to trawls and less damaging. Gear is rarely lost implying minimal snagging and potentially removal of benthos. Confidence: low, no data about specific longline effects without capture on seabed and sessile epifauna.
	Incidental behaviour										
	Gear loss	1	1	3	Habitat structure and function	SET 20 (ribbons of delicate bryozoan communities)	5.1	2	2	1	Habitat may be damaged by normal operation of the gear particularly on unsuccessful retrieval. Line will eventually ball-up potentially snagging and damaging structure. Intensity: minor, major gear loss is rare although minor loss unknown. Consequence: minor. Confidence: low, all major gear loss is reported but not minor gear loss. Also, there is no data about specific effects of lost gear on habitats.
	Anchoring/ mooring	1	3	4	Habitat structure and function	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	5.1	2	1	2	Anchoring occurs occasionally inshore: most effort is in GAB 16 & 17 therefore anchoring in inner shore bays most likely. Anchors may crush habitat or disturb or damage structures if dragged. Intensity: minor, anchoring considered to affect only a very small percentage of the area of the habitat. Consequence: negligible, 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, 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	Water quality	Southern Pelagic Province-coastal (P7)	1.1	3	1	2	Navigation/steaming to and from fishing grounds daily was considered to influence water quality by disrupting the water column. Intensity: moderate, 80% effort concentrated southeast of Kangaroo Island. Consequence: negligible, not detectable against normal background variation. Confidence: high, logical.
Addition/ movement of biological material	Translocation of species	1	6	6	Habitat structure and function	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	5.1	2	1	1	Translocation of species on vessel hull or in bilge water might occur but MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. Potential for translocation of species on fishing gear. Intensity: minor, unlikely to be detectable. Consequence: negligible but there is the potential for impacts to be very large. Confidence: low, no data.
	On board processing	1	6	6	Substrate quality	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	3.1	3	1	1	Offal and offcuts from onboard processing would be discharged when appropriate (not while hauling or setting gear). Substrate quality most likely to be impacted from discarding of fish parts may result in accumulation of discarded material on the benthos leading to sediment disturbance and detrital build-up although most discarded material likely to be scavenged before it settles. Intensity: moderate as onboard processing heading and gutting common. Consequence: negligible as any effects undetectable. Confidence: low, no data.
	Discarding catch	1	6	6	Substrate quality	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	3.1	3	1	1	Discarding occurs regularly throughout the fishery and most likely to impact substrate quality due to benthic accumulation of carcasses disturbing fine sediments and detrital accumulation. Operators generally discard waste over the course of fishing operations leading to no localised accumulations of waste. Intensity: moderate over the scale of the fishery, waste expected to be taken up quickly by opportunistic scavengers and most before reaching substrate. Consequence:

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
											negligible, because discarding is not localised and therefore measurable impacts unlikely to be detectable. Confidence: low, no data.
	Stock enhancement	0									
	Provisioning	1	6	6	Water quality	Southern Pelagic Province-coastal (P7)	1.1	2	1	1	Provisioning occurs through bait lost during manual or automatic baiting. Loss of baits would affect water quality through nutrient input. Intensity: minor. Mustad system has high baiting efficiency. Consequence: negligible. Confidence: low, no data.
	Organic waste disposal	1	6	6	Water quality	Southern Pelagic Province-coastal (P7)	1.1	1	1	1	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels. Discards most likely to be disposed while steaming and would affect pelagic zone. Scavengers likely to account for majority. Intensity: negligible -discarding etc strictly regulated by MARPOL. Consequence: negligible, unlikely to detect possible short-term increase in productivity associated with additional nutrient. Confidence: low, no data
Addition of non-biological material	Debris	1	6	6	Water quality	Southern Pelagic Province-coastal (P7)	1.1	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels therefore any debris would be accidental. Plastics particularly present a problem for birds or marine mammals ingesting whole and from breakdown into micro-elements which are absorbed through the water into the food web. Intensity: negligible. Consequence: negligible, impact unlikely to be detectable. Confidence: high, regulated.
	Chemical pollution	1	6	5	Water quality	Southern Pelagic Province-coastal (P7)	1.1	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits domestic and operational waste discharge from vessels therefore any large chemical spill would be accidental and localised. Intensity and consequence: negligible, any

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
											minor leakage or spillage localised and readily dispersed. Confidence: high, regulated.
	Exhaust	1	6	6	Air quality	Southern Pelagic Province-coastal (P7)	2.1	1	1	2	Exhaust from vessels may impact the air quality of the species within Southern Oceanic Pelagic habitat (e.g., birds). Intensity: negligible, impact area is only within metres of the vessel. Consequence: negligible, due to rapid dispersal unlikely to detectable. Confidence: high, logical.
	Gear loss	1	1	3	Habitat structure and function	SET 20 (ribbons of delicate bryozoan communities)	5.1	2	1	2	Occasionally line and hooks are lost. Gear will persist in the habitat as breakdown times can be expected to be long. Gear will ball-up potentially damaging vulnerable communities like bryozoans. Intensity: minor, gear rarely lost. Consequence: negligible, unlikely to detect any impact. Confidence: high, major gear loss reported, although minor gear loss uncertain.
	Navigation/ steaming	1	6	6	Habitat structure and function	GAB 16,17; SET 9	1.1	3	1	2	Fishing activity introduces noise from navigation/steaming into habitat. 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. Shelf habitats of GAB where effort is concentrated likely to be most vulnerable. Intensity: moderate, 80% effort concentrated in those GAB 16,17, SET 9. Consequence: negligible, unlikely to detect impact over the spatial scale. Confidence: high logical.
	Activity/ presence on water	1	6	6	Water quality	Southern Pelagic Province-coastal (P7)	1.1	3	1	2	Presence of vessels introduces noise and visual stimuli changing the habitat. Impact on pelagic environment and air unlikely to be detectable and would return to normal with departure of vessels. Intensity: moderate, 80% effort concentrated southeast of Kangaroo Island. Consequence: negligible unlikely to have any impact. 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
Disturb physical processes	Bait collection	0									
	Fishing	1	6	6	Habitat structure and function	SET 20 (ribbons of delicate bryozoan communities)	5.1	3	1	1	Habitat structure and function, hence processes supporting function, considered subject to possible modification through contact with longlines. Substratum supporting faunal communities may be removed, altering substratum processes. Intensity: moderate, 5% of fishery effort in this habitat, small impact footprint and rocky outcrops avoided. Consequence: negligible, undetectable. Confidence: low, no data.
	Boat launching	0									
	Anchoring/ mooring	1	3	4	Habitat structure and function	Fine sediments of inner shelf GAB 16,17, SET 9, 19	5.1	2	1	2	Direct impact (damage or mortality) that occurs when anchoring or mooring most likely to affect habitat structure and function. Intensity: minor, anchoring considered to affect only a very small percentage of the area of the habitat, and impossible to detect. Consequence: negligible 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	Water quality	Southern Pelagic Province-coastal (P7)	1.1	1	1	2	Navigation/steaming to and from fishing grounds daily was considered to influence water quality by disrupting the water column. Intensity: negligible, effect localised to metres of vessels. Consequence: negligible, not detectable against normal background variation. Confidence; high, logical.
External Impacts	Other fisheries	1	6	6	Habitat structure and function	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	5.1	3	2	2	Other fisheries operating over the same grounds with potential to impact the benthos include Danish seine, gillnet, and demersal trawl. Demersal trawling has largest impact of all gear types but inshore trawl closures in this area: only 0.01-7% trawled (Pitcher et al. 2018). Intensity: moderate, effort occurs over a broad spatial scale. 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 majority of gears have very small seafloor footprint and trawling less intense. Confidence: high, surveys by Pitcher et al. 2018, Williams et al. 2011.
	Aquaculture	1	3	6	Water quality, substrate quality	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	1.1, 3.1	2	1	2	Aquaculture occurs at sites throughout SE Australian in harbours, bays and estuaries adjacent to inner shelf habitats. Farming of tuna, oysters, abalone, finfish, mussels, microalgae and trout occurs from Denial Bay to Lacepede Bay particularly in Spencer Gulf (https://www.epa.sa.gov.au/soe-2018/coast/pressures-on-the-coast). Most likely risk posed to the water quality of the pelagic province and substrate quality of inshore habitats. Mollusc aquaculture has a nutrient depletion effect. Intensity: moderate, occurs broadly along the coast but locally severe (aquaculture leases). Consequence: negligible, possible detectable impact on water quality in inshore habitats but unlikely to detect in offshore habitats where fishery is based. Time to recover from local impact on the scale of days to weeks, at larger spatial scales recovery time of hours to days. Confidence: high, studies show nutrient are quickly dispersed (Wild-Allen and Andrewartha 2016).
	Coastal development	1	6	6	Water quality	Southern Pelagic Province-coastal (P7)	1.1	3	2	1	Coastal development can affect water quality of coastal pelagic 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. Evidence suggests that some nursery areas have not recovered from reduced river inputs therefore affecting water quality (Walker et al. 2021). Intensity: moderate, range of activities likely to have local affects such as removal or degradation of inshore pelagic habitats, particularly nursery habitats. Consequence: minor, greatest impacts likely to be inshore including waters less than 25 m but detection further out onto

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
											the inner shelf unknown. Confidence: low, little data on the cumulative effects.
	Other extractive activities	1	4	6	Habitat structure and function	Inner shelf soft sediments of GAB 16, 17; SET 9, 19	5.1	3	1	1	Until 2003, 13 oil wells were drilled in the GAB with half close to fishing grounds west of Kangaroo Island. Since 2003, but only seismic surveys have been conducted. At least 37 species considered to be sensitive to underwater noise pollution including seismic noise (Senate Enquiry 2017) and have been forced away from important habitat. Sessile fauna and benthos most likely to be affected by noise associated with seismic activity and extractive or associated shipping activities. Intensity: moderate, activity occurs across broad area but infrequently in immediate area of fishery. Consequence: negligible, unlikely to detect change to the internal dynamics of habitat or populations of species making up the habitat, time to recover is between likely to be hours to days. Confidence: low, no data.
	Other non-extractive activities	1	5	6	Habitat structure and function	Southern Pelagic Province-coastal (P7)	5.1	3	2	1	Three major shipping routes pass through the area of the fishery probably daily (Commonwealth of Australia, 2015). The core fishery area southeast of KI is a military flying and firing zone (Commonwealth of Australia, 2015). Noise and visual stimuli may potentially impact habitat structure and function. Intensity: moderate, moderate at broader spatial scale, or severe but local. Consequence: minor, unlikely to detect. Confidence: low, no data.
	Other anthropogenic activities	1	4	6	Habitat structure and function	Southern Pelagic Province-coastal (P7)	5.1	2	1	1	Potentially recreational activities such as whale watching and charter fishing occur in the area but limited by area and season. Small vessels may impact habitat and structure from alteration of environment with noise or visual stimuli. Intensity: minor, unlikely to be detectable. Consequence: negligible-any change would be undetectable against background variability. Confidence: low, no data.

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

Table 2.23. SICA for communities 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	0	0							
	Fishing	1	6	6	Functional group composition	Southern Inner Shelf 0-110 m	2.1	3	2	2	Fishing occurs daily throughout the fishery on the Southern inner shelf community; targeting Gummy Shark and other sharks therefore most likely to affect species composition of shark functional group. School Shark have declined significantly but some other species have increased e.g., Broadnose Sevengill Shark. Minor changes in relative abundance of community constituents up to 5%. Intensity: moderate. Consequence: minor, as key species populations appear to be stable or improving over past decade or have rebuilding strategies in place. Minor changes in relative abundance of other constituents. Confidence: high, data exists.
	Incidental behaviour	0									
Direct impact without capture	Bait collection	0									
	Fishing	1	6	6	Species composition	Southern Inner Shelf 0-110 m	3.1	3	1	1	Sharks and fish might be attracted to bait plumes with or without out being caught. Mortality effects on escaped but injured fish might affect species composition of community. Intensity: moderate. Consequence: negligible unlikely to detect impact from injured fish or sharks. Confidence: low, no data but logical.
	Incidental behaviour	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
	Gear loss	1	1	3	Species composition	Southern Inner Shelf 0-110 m	1.1	2	1	2	Lines could continue to ghost fish but once the bait is gone the gear does not continue to fish and 'ball up'. Intensity: minor. Consequence: negligible, rare occurrence. Confidence: high, lost gear is reported.
	Anchoring/ mooring	1	3	4	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	2	1	2	Anchoring occurs in inshore bays occasionally. Fish may be attracted to vessel light or occasional discard of food scraps. Intensity: minor, does not occur often and in restricted locations. Consequence: negligible unlikely to detect. Confidence: high logical.
	Navigation/ steaming	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	3	1	2	Steaming and navigation occur daily and may alter the distribution of pelagic or bird community by attraction to the vessel while present. Intensity: moderate steaming and navigation occur daily. Consequence: negligible, distribution of demersal communities undetectable. Confidence: high, logical.
Addition/ movement of biological material	Translocation of species	1	6	6	Species composition	Southern Inner Shelf 0-110 m	1.1	2	1	1	Translocation of species most likely to affect species composition of the community if new species are added. Bait- mackerel, squid or Pacific saury (*Cololabis saira*) - might carry pathogens putting bird communities at risk. No evidence of disease in birds and mitigation devices to prevent birds taking bait while setting is used. Invasive species could be transported on the hull or in bilge water if discharged. Intensity: minor, unlikely to detect- occurrences not reported. Consequence: negligible. Confidence: low, no evidence.
	On board processing	1	6	6	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	3	1	1	Onboard processing most 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: low no data.
	Discarding catch	1	6	6	Distribution of the community	Southern Inner Shelf 0-110 m	4.1	3	1	1	Discarding catch most likely to attract scavengers temporarily changing the distribution of the community. Discarding occurs daily with ~17% of catch

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
											discarded. Intensity: moderate. Consequence: negligible, much of discarded catch returned to the water alive. Confidence: low no data.
	Stock enhancement	0	0	0							
	Provisioning	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	2	1	1	Provisioning through bait loss during manual baiting might affect behaviour/movement of sharks. Intensity: minor, baiting occurs 1.8 million hooks pa (majority hand baited) but loss of bait much less. Consequence: negligible, behaviour would return to normal rapidly. Confidence: low, no data.
	Organic waste disposal	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	1	1	2	Scavengers could be attracted to food scraps temporarily. MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Organic waste may be discarded if uncontaminated. Intensity: negligible. Consequence: negligible any organic waste likely to break down quickly or consumed Confidence: high, regulated.
Addition of non-biological material	Debris	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Intensity: negligible if MARPOL rules adhered to. Consequence: negligible because debris by this fishery expected to be accidental not routine. Confidence: high, regulated.
	Chemical pollution	1	6	5	Species composition	Southern Coastal pelagic 0-200 m	1.1	1	1	2	MARPOL regulations via Protection of the Sea (Prevention of Pollution from Ships) Act 1983 prohibits rubbish generated during general fishing vessel operations to be discharged at sea. Might cause mortality affecting species composition. Intensity: minor unless there is a major spill. Consequence: negligible as minimal localized impact only. Confidence: high, regulated.

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
	Exhaust	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	1	1	2	Might repel birds temporarily but few vessels. Intensity: negligible, detection of exhaust remote. Consequence: negligible communities not likely to be affected Confidence: high logical.
	Gear loss	1	1	3	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	2	1	2	Fishery management plan requires operators to take all reasonable steps to minimize loss of gear. According to AFMA review of automatic longlining (2003) if break offs occur line is generally retrieved by hauling from other end, without substantial loss of gear, although not always successful; and once bait gone does not continue to fish, effect of lost gear is likely to be low as gear does ball up. Intensity: minor. Consequence: negligible if infrequent occurrence Confidence: high, gear loss must be reported.
	Navigation/ steaming	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	3	1	1	Navigation/steaming introduces noise and visual stimuli to environment might affect distribution by attracting birds to vessels. Intensity: moderate. Consequence: negligible impact on communities Confidence: low no data.
	Activity/ presence on water	1	6	6	Distribution of the community	Southern Coastal pelagic 0-200 m	3.1	2	1	2	Noise and visual stimuli might affect distribution of species temporarily particularly birds that are highly visual and olfactory. Intensity: minor 5 or less vessels unlikely to be detectable. Consequence: negligible. Confidence: high, logical.
Disturb physical processes	Bait collection	0	0	0							
	Fishing	1	6	6	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	3	1	1	Longlines and weights might impact the structural components of habitat but footprint of longline is smaller than other demersal methods. Very low level of reporting of sessile fauna bycatch but studies of similar fisheries elsewhere suggest impact on vulnerable communities (Muñoz et al. 2011). Intensity: moderate. Consequence: negligible, unlikely to be detectable. Confidence: low no data.
	Boat launching	0				Southern Inner Shelf 0-110 m					

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	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	2	1	2	Vessels might anchor at night or when broken down and anchoring may damage benthic structure and therefore community. Intensity: minor, unlikely to be detectable. Consequence: negligible, very localised disturbance and occurs rarely. Confidence: high, logical.
	Navigation/ steaming	1	6	6	Bio- and geo-chemical cycles	Southern Inner Shelf 0-110 m	5.1	1	1	2	Steaming and navigation occur daily and may alter the turbulence in water column and pelagic communities. Intensity: negligible unlikely to detect. Consequence: negligible, unlikely to detect. Confidence: high logical.
External Impacts	Other fisheries	1	6	6	Species composition	Southern Inner Shelf 0-110 m	4.1	3	3	2	Other SESSF fisheries - gillnet, shark, auto-longline; SPF; state and recreational fisheries affect the same communities and therefore likely to have had a moderate impact on species composition. Intensity: moderate, trawl closures reduce fishing intensity in this community. Consequence: minor. Confidence: high logical to consider cumulative effects of variety of fishing methods.
	Aquaculture	1	3	6	Bio- and geo-chemical cycles	Southern Inner Shelf 0-110 m	5.1	2	1	2	Aquaculture occurs at sites throughout SE Australian in harbours, bays and estuaries adjacent to inner shelf habitats. Farming of tuna, oysters, abalone, finfish, mussels, microalgae and trout occurs from Denial Bay to Lacepede Bay particularly in Spencer Gulf (https://www.epa.sa.gov.au/soe-2018/coast/pressures-on-the-coast). Input of waste affecting the water and substrate quality leading to alteration of bio-geochemical cycles locally. Management implemented fallowing protocols although recovery rates are 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. Confidence: high, studies show nutrient inputs quickly dispersed. Therefore, impacts if any, are difficult to measure against other anthropogenic sources (Wild-Allen and Andrewartha 2016).

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 development	1	6	6	Species composition	Southern Inner Shelf 0-110 m	1.1	3	2	1	Coastal development where the largest population centres occur can affect quality of inner shelf habitats impacting species composition. Intensity: moderate, range of activities likely to have local affects such as removal or degradation of inshore habitats, particularly nursery habitats. Consequence: minor, some studies show severe effects on chondrichthyans from coastal/inland development and run-offs (Walker, 2001) Confidence: low, no data.
	Other extractive activities	1	4	6	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	3	1	1	Until 2003, 13 oil wells were drilled in the GAB with half close to fishing grounds west of Kangaroo Island. Since 2003, but only seismic surveys have been conducted. At least 37 species considered to be sensitive to underwater noise pollution including seismic noise (Senate Enquiry 2017) and have been forced away from important habitat. Sessile fauna and benthos most likely to be affected by noise associated with seismic activity and extractive or associated shipping activities but more mobile elements of community might be affected. Intensity: moderate, activity occurs across broad area but infrequently in immediate area of fishery. Consequence: negligible, unlikely to detect change to distribution of community- time to recover within hours. Confidence: low, no data.
	Other non-extractive activities	1	5	6	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	3	2	1	BassLink cables across Bass Strait, gas pipelines. Benthic communities most likely to be affected by noise associated with seismic activity or associated shipping activities. Three major shipping routes pass through the area of the fishery probably daily (Commonwealth of Australia, 2015). The core fishery area, southeast of KI, is a military flying and firing zone (Commonwealth of Australia, 2015). Noise and visual stimuli may potentially impact benthic or pelagic community distribution. Intensity: moderate as impact of activity confined to small ship surrounds. Consequence: minor unlikely to detect. Confidence: low-no data. Intensity: moderate, shipping lanes occur on upper slope frequently. Consequence: minor. 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
	Other anthropogenic activities	1	4	6	Distribution of the community	Southern Inner Shelf 0-110 m	3.1	2	1	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). Intensity: minor, unlikely to detect direct and indirect impacts on pelagic or demersal communities. Consequence: negligible. Confidence: low no information.

2.3.11 Summary of SICA results

Table 2.24. 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	0	0	0	0	0
	Fishing	*	2	2	2	2
	Incidental behaviour	0	0	0	0	0
Direct impact without capture	Bait collection	0	0	0	0	0
	Fishing	1	2	2	2	1
	Incidental behaviour	0	0	0	0	0
	Gear loss	1	1	1	2	1
	Anchoring/ mooring	1	1	1	1	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	1	1
	Discarding catch	1	2	2	1	1
	Stock enhancement	0	0	0	0	0
	Provisioning	1	1	1	1	1
	Organic waste disposal	1	1	1	1	1
Addition of non-biological material	Debris	1	1	1	1	1
	Chemical pollution	1	1	1	1	1
	Exhaust	1	1	1	1	1
	Gear loss	1	1	1	1	1
	Navigation/ steaming	1	1	2	1	1
	Activity/ presence on water	1	1	2	1	1
Disturb physical processes	Bait collection	0	0	0	0	0
	Fishing	1	1	1	1	1
	Boat launching	0	0	0	0	0
	Anchoring/mooring	1	1	1	1	1
	Navigation/ steaming	1	1	1	1	1
External Impacts	Other fisheries	4	**5**	2	2	**3**
	Aquaculture	2	2	2	1	1
	Coastal development	2	**4**	3	2	2
	Other extractive activities	2	1	2	1	1
	Other non-extractive activities	1	1	2	2	2
	Other anthropogenic activities	2	1	1	1	1

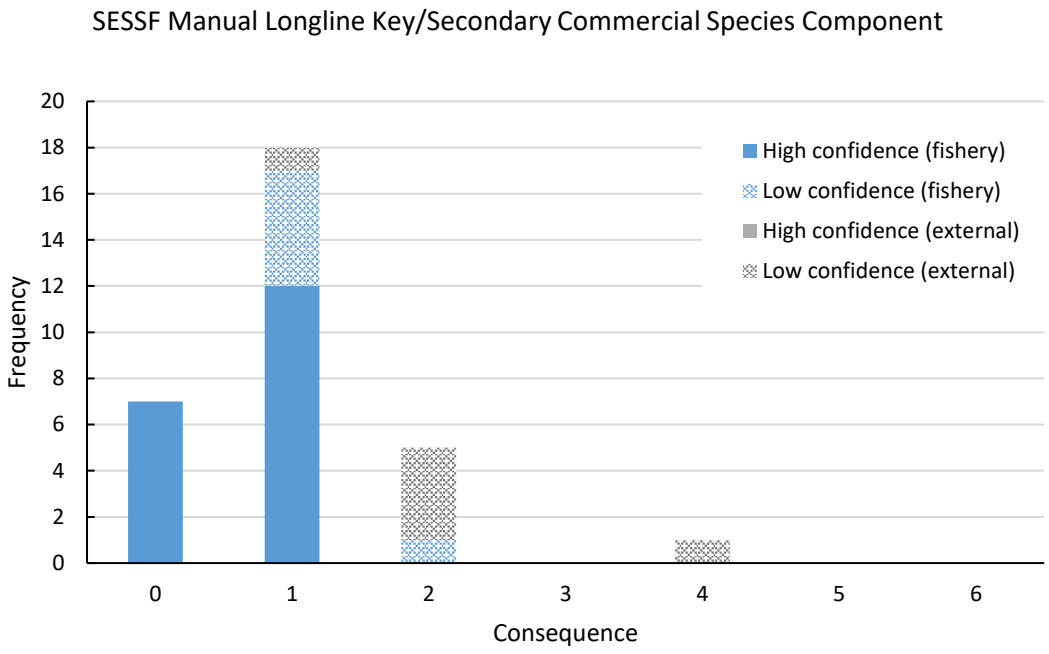


Figure 2.5. Key/secondary commercial species SICA: Frequency of consequence score by high and low confidence.

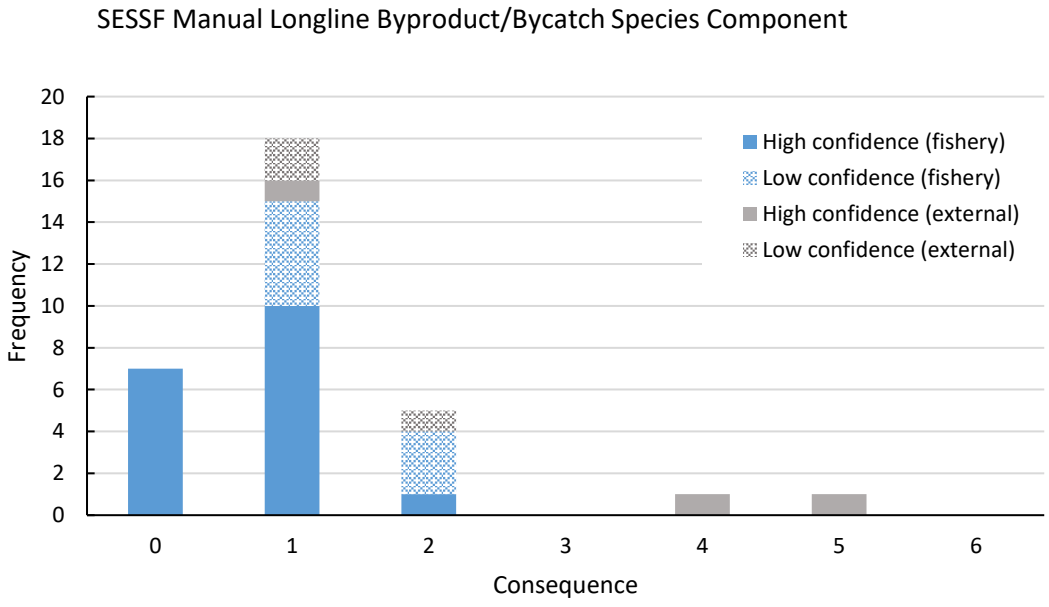


Figure 2.6. Byproduct and bycatch species SICA: Frequency of consequence score by high and low confidence.

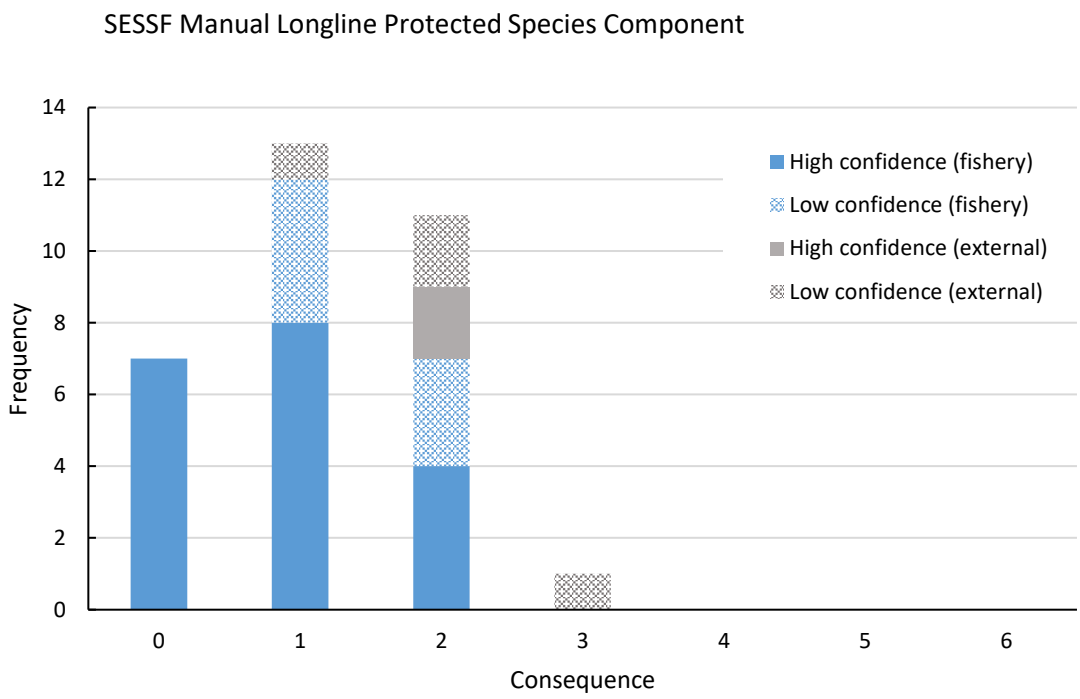


Figure 2.7. Protected species SICA: Frequency of consequence score by high and low confidence.

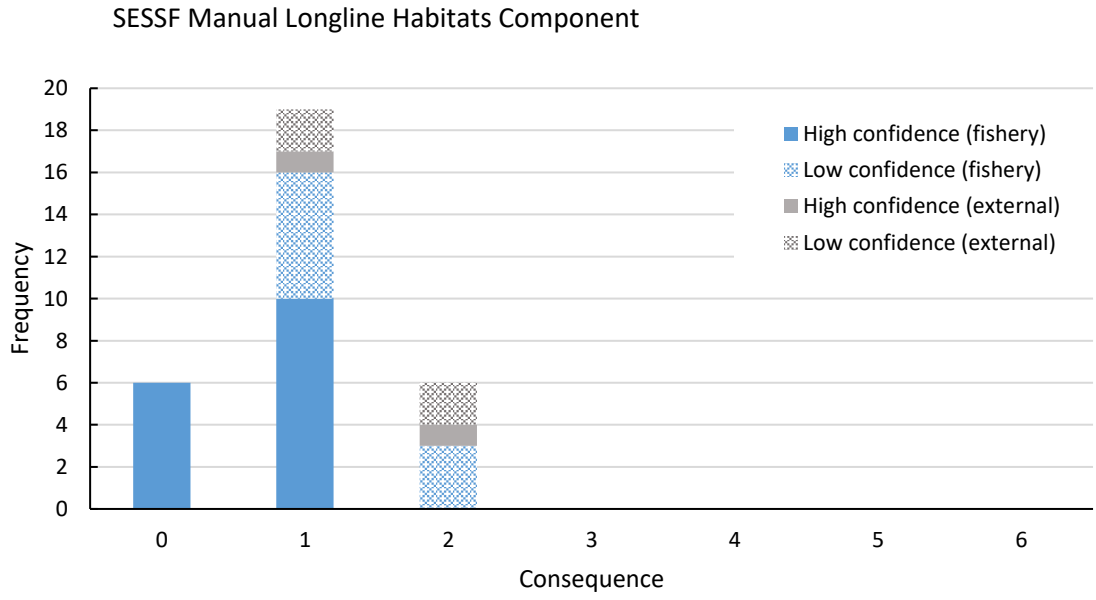


Figure 2.8. Habitats SICA: Frequency of consequence score by high and low confidence.

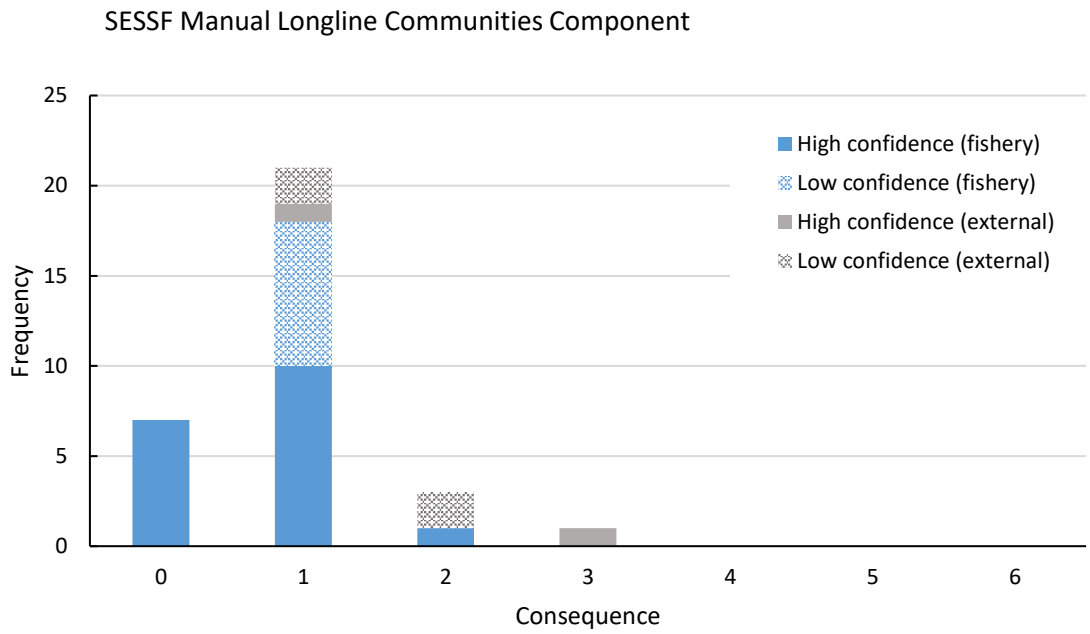


Figure 2.9. Communities SICA: Frequency of consequence score by high and low confidence.

2.3.12 Evaluation/discussion of Level 1

All ecological components were eliminated at Level 1 (there were no risk scores of 3 – moderate – or above for each component) for any internal hazard (Table 2.24**;** Figure 2.5 **-** Figure 2.9).

Gummy Shark is the key commercial species in this sub-fishery, which is subject to Tier 1 stock assessments (e.g. Punt et al. 2016), and therefore was not assessed from the direct impacts from fishing. There were no other significant risks for these species from other internal activities. Similarly, for byproduct/bycatch species, if a stock assessment exists, the species is not further assessed for the risk from fishing. Therefore, School Shark, which is assessed as a Tier 1 (e.g. Thomson 2012), and among the most important byproduct species landed by weight in this sub-fishery, was excluded from further assessment from fishing.

Historically, longline fisheries have presented serious threats to seabirds, particularly albatrosses (Baker et al. 2007). This fishery has a specific Bycatch and Discarding Workplan which incorporates a Threat Abatement Plan for Seabirds. Consequently, a variety of mitigation measures such as bycatch reduction devices (tori lines, brickle curtains, bycatch trigger limits, caps on hooks per boat are in place) and bycatch is continually monitored. A total of 15 interactions with seabirds were recorded over the five-year assessment period, which resulted in the deaths of three albatrosses including a Shy Albatross (*Thalassarche cauta*). This assessment also found fishing to occur off the coast of SA/Vic and around Albatross Island, the latter supporting one of the three main breeding colonies along western Bass Strait. While an analysis of albatrosses over the 1993-2013 period reported the population to be in decline (Phillips et al. 2016), recent population estimates of ~30 000 mature individuals of Shy Albatross (Alderman 2018), which includes ~5800 estimated

breeding pairs at Albatross Island, suggests a low interaction with this sub-fishery, thereby representing a minor risk to the sub-population of Shy Albatross in western Bass Strait.

Habitats in this area were also not assessed at risk from fishing despite 80% of the effort being deployed there. Soft sediments are not likely to be particularly damaged by the lines and weights and no vulnerable assemblages were identified by Pitcher et al. (2018) in this area. However, a small amount of effort in habitats on the Tasmanian coasts that supported octocorals and bryozoan communities could put those communities at risk. However, there was little evidence of epifauna or habitat being snagged on hooks and given the very small footprint of this gear, these communities were considered minor risk only. The sharks being targeted by this fishing method could have put this functional group at risk but fishing closures, reduction in fishing pressure and TAC appears to have allowed some sharks to recover i.e., evidence for increasing population of Broadnose Sevengill Shark. However, populations of School Shark (*Galeorhinus galeus*) remain in a vulnerable state and Gummy Shark are not overfished.

Significant external hazards included other fisheries in the region which presented moderate risk to communities, major risk to key commercial species and severe risk to byproduct/bycatch species. Also, the coastal development external hazard presented a moderate risk to protected species and major risk to byproduct/bycatch species.

2.3.13 Components to be examined at Level 2

As a result of the SICA analysis, there are no components that are to be examined at Level 2.

2.4 Level 2 Analysis

2.4.1 Species Components

A Level 2 analysis for the each of the three species components was not required in this assessment. Units excluded from this analysis are listed in Table 2.25.

2.4.2 Units excluded from analysis (Step 1)

Table 2.25. Species/species groups/taxa excluded from the PSA and SAFE because they were either not identified at the species level, misidentifications or outside the fishery's jurisdictional boundary. EM: Electronic-Monitoring.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Chondrichthyan	Rajidae	Rajidae - undifferentiated	Skates	37031000	Added 9 species to list
BC	Chondrichthyan	Hexanchidae	Hexanchidae - undifferentiated	Sixgill and Sevengill Sharks unspecified	37005000	Added 1 species to list (37005004)
BC	Chondrichthyan	Dasyatidae	Dasyatidae - undifferentiated	Stingrays - unspecified	37035000	Added 2 species to list (37035010, 37035004)
BC	Chondrichthyan	Scyliorhinidae	*Cephaloscyllium* spp.	Draughtboard Sharks (mixed)	37015906	Added 2 species to list (37015013, 37015031)
BC	Chondrichthyan	Brachaeluridae and related families - undifferentiated	Brachaeluridae and related families - undifferentiated	Blind, nurse, carpet and zebra sharks	37013000	Insufficient taxonomic resolution.
BC	Teleost	Platycephalidae	Platycephalidae - undifferentiated	Flatheads - unspecified	37296000	Added 1 species to list (37296038)
BC	Teleost	Moridae	*Lotella* and *Pseudophycis* spp.	Southern rock cod	37224900	Added 2 species to list (37224011, 37224023)
BC	Chondrichthyan		Skates and rays, unspecified	Skates and rays	37990018	Accounted for by 3703100 (Rajidae) and Dasyatidae (37035000) which has been expanded to species. Also, added Giant manta ray (37041004) since it was recorded in logbooks prior to 2015.
BC	Teleost	Mixed fish	Mixed fish	Fish (mixed)	37999999	Insufficient taxonomic resolution
BC	Chondrichthyan	Sharks - other	Sharks - other	Sharks (mixed)	37990003	Insufficient taxonomic resolution. Accounted for in other shark group codes
BC	Chondrichthyan	Chimaeridae	Chimaeridae - undifferentiated	Ghostsharks	37042000	Insufficient taxonomic resolution. One species of family Chimaeridae in species list (37042003).
BC	Chondrichthyan	Pristiophoridae	Pristiophoridae - undifferentiated	Sawsharks	37023000	Insufficient taxonomic resolution; species already in list
BC	Teleost	Percichthyidae, Serranidae	Percichthyidae, Serranidae - undifferentiated	Seabasses and rockcods - unspecified	37311000	Insufficient taxonomic resolution.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Chondrichthyan	Centrophoridae, Dalatiidae, Squalidae, Somniosidae and Etmopteridae	Centrophoridae, Dalatiidae, Squalidae, Somniosidae and Etmopteridae - undifferentiated	Gulper sharks, sleeper sharks, dogfishes	37020000	Insufficient taxonomic resolution.
BC	Teleost	Melanonidae, Moridae, Euclichthyidae	Melanonidae, Moridae, Euclichthyidae - undifferentiated	Pelagic morid and eucla cods	37224000	Insufficient taxonomic resolution.
BC	Chondrichthyan	Somniosidae, Centrophoridae	*Centroscymnus* and *Deania* spp.	Roughskin dogfishes (mixed)	37020904	Insufficient taxonomic resolution.
BC	Chondrichthyan	Order Rajiformes - undifferentiated	Order Rajiformes - undifferentiated	Skates and rays (mixed)	37990030	Insufficient taxonomic resolution; Rajidae expanded to species and added to list.
BC	Teleost	Lutjanidae	*Lutjanus* spp.	Sea perch	37346905	Insufficient taxonomic resolution.
BC	Chondrichthyan	Trygonorrhinidae	*Trygonorrhina* spp.	Fiddler rays unspecified	37027999	Added to existing eastern fiddler ray in species list (37027006). Only one species in fishery area.
BC	Teleost	Polyprion americanus and Polyprion oxygeneios	*Polyprion americanus* and *Polyprion oxygeneios*	Hapuku and bass groper	37311902	*Polyprion americanus*: outside fishery range - This species could be *P. moeone* (not confirmed). *Polyprion oxygeneios* already appears in the species list.
BC	Teleost	Latridae	*Latridopsis* spp.	Trumpeters (mixed)	37378900	Latridopsis forsteri already in species list. Added L. ciliaris (37378003) to species list.
BC	Teleost	Triglidae	*Lepidotrigla* spp.	Butterfly gurnard (mixed)	37288901	Insufficient taxonomic resolution. One existing species in list (37288007).
BC	Teleost	Congridae, Colocongridae	Congridae, Colocongridae - undifferentiated	Conger eels	37067000	Insufficient taxonomic resolution.
BC	Teleost	Pentacerotidae	Pentacerotidae - undifferentiated	Boarfishes	37367000	Insufficient taxonomic resolution.
BC	Teleost	Balistidae, Monacanthidae	Balistidae, Monacanthidae - undifferentiated	Leatherjackets - unspecified	37465000	Insufficient taxonomic resolution.
BC	Chondrichthyan	Somniosidae	*Centroscymnus* spp.	Roughskin dogfishes (mixed)	37020906	Insufficient taxonomic resolution.
BC	Invertebrate	Octopodidae	Octopodidae - undifferentiated	Octopuses	23659000	Insufficient taxonomic resolution.
BC	Chondrichthyan	Triakidae	Triakidae - undifferentiated	Hound sharks	37017000	Insufficient taxonomic resolution.
BC	Chondrichthyan	Sphyrnidae	Sphyrnidae - undifferentiated	Hammerhead sharks - unspecified	37019000	Insufficient taxonomic resolution.
BC	Teleost	Serranidae	*Aethaloperca* and *Anyperodon* spp	Rockcod (*Aethaloperca* and *Anyperodon*)	37311901	Insufficient taxonomic resolution.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Invertebrate	Order Teuthoidea - undifferentiated	Order Teuthoidea - undifferentiated	Squids	23615000	Insufficient taxonomic resolution. Gould's squid (23636004) exists in list.
BC	Teleost	Apogonidae, Dinolestidae	Apogonidae, Dinolestidae - undifferentiated	Cardinalfishes	37327000	Insufficient taxonomic resolution.
BC	Chondrichthyan	Squatinidae	Squatinidae - undifferentiated	Angel sharks	37024000	Insufficient taxonomic resolution.
BC	Teleost	Ophidiidae	*Genypterus* spp.	Ling (mixed)	37228901	Insufficient taxonomic resolution. Two existing species in list (37228002; 37228002).
BC	Teleost	Scombridae	Scombridae spp. (tribes Scomberomorini and Scombrini)	Mackerels (mixed)	37441911	Insufficient taxonomic resolution. Two existing species in list (37441001; 37441002; 37441003; 37441004).
BC	Chondrichthyan	Centrophoridae	*Deania calcea* and *Deania quadrispinosa*	Platypus sharks (mixed)	37020905	Insufficient taxonomic resolution. Existing species in species list - *Deania quadrispinosa* (37020004).
BC	Teleost	Macrouridae and Bathygadidae	Macrouridae and Bathygadidae - undifferentiated	Whiptails and rattails (mixed)	37232000	Insufficient taxonomic resolution.
BC	Teleost	Scaridae	Scaridae - undifferentiated	Parrotfishes unspecified	37386000	Insufficient taxonomic resolution.
BC	Teleost	Cheilodactylidae	*Nemadactylus* sp. [see Smith et al, 1996]	King morwong	37377014	Misidentification (recreationally caught). Existing *Nemadactylus* species in list.
BC	Teleost	Arripidae	*Arripis trutta* and *Arripis truttaceus*	Australian salmon	37344900	Insufficient taxonomic resolution.
BC	Teleost	Uranoscopidae	Uranoscopidae - undifferentiated	Stargazers	37400000	Insufficient taxonomic resolution.
BC	Invertebrate	Palinuridae	Palinuridae - undifferentiated	Spiny Lobsters - unspecified	28820000	Insufficient taxonomic resolution.
BC	Teleost	Carangidae	Carangidae - undifferentiated	Trevallies and scads - unspecified	37337000	Insufficient taxonomic resolution. Four existing species in list.
BC	Teleost	Mullidae	Mullidae - undifferentiated	Goatfishes (mixed)	37355000	Insufficient taxonomic resolution.
BC	Chondrichthyan	Scyliorhinidae	Scyliorhinidae - undifferentiated	Catsharks - unspecified	37015000	Insufficient taxonomic resolution. Five species in list; 2 species expanded from *Cephaloscyllium* spp (37015906).
BC	Chondrichthyan	Squalidae	Squalidae - undifferentiated	Dogfishes (mixed)	37020923	Added 3 species to list (37020038, 41, 49).
BC	Teleost	Labridae	Labridae spp. - except *Cheilinus trilobatus*	Wrasses (mixed)	37384901	Insufficient taxonomic resolution. Existing Labridae species in list.
BC	Teleost	Tetraodontidae	Tetraodontidae - undifferentiated	Toadfishes unspecified	37467000	Insufficient taxonomic resolution.
BC	Teleost	Fish Oceanic (mixed)	Fish, oceanic (mixed)	Fish, oceanic (mixed)	37990020	Insufficient taxonomic resolution.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Teleost	Scorpaenidae, Triglidae and Peristediidae	Scorpaenidae, Triglidae and Peristediidae - undifferentiated	Scorpionfishes, gurnards, and latchets	37990084	Insufficient taxonomic resolution.
BC	Invertebrate	Sepiidae	*Sepia* spp.	Cuttlefish (mixed)	23607901	Insufficient taxonomic resolution.
BC	Invertebrate	Octopodidae	*Octopus* spp.	Octopus (mixed)	23659901	EM data [3 animals ret., 1 animal dis.]. Insufficient taxonomic resolution.
BC	Invertebrate	Class Gastropoda	Class Gastropoda - undifferentiated	Gastropods	24000000	EM data [1 animal dis.]. Insufficient taxonomic resolution.
BC	Invertebrate	Class Asteroidea	Class Asteroidea - undifferentiated	Starfish	25102000	EM data [1 animal ret., 10 animals dis.]. Insufficient taxonomic resolution. Species 25154011 already in species list.
BC	Invertebrate	Brachyura	Brachyura - undifferentiated	Crabs	28850000	EM data [1 animal dis.]. Insufficient taxonomic resolution.
BC	Invertebrate	infraorder Brachyura	Infraorder Brachyura - all spp. except mud, sand, snow, and spanner crabs	Crabs (mixed)	28850901	EM data [1 animal dis.]. Insufficient taxonomic resolution.
BC	Chondrichthyan	Orectolobidae	Orectolobidae	Wobbegong (mixed)	37013900	EM data [20 animals dis.]. Existing species inlist (3713003- *O. maculatus* - spotted wobbegong).
BC	Chondrichthyan	Scyliorhinidae	*Apristurus* spp.	Catsharks (mixed)	37015901	EM data [1 animal ret., 106 animals dis.].
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus brachyurus* and *Carcharhinus obscurus*	Bronze whaler shark	37018902	EM data [1 animal ret.]. Both species in species list.
BC	Chondrichthyan	Carcharhinidae	*Carcharhinus* spp.	Whaler sharks (mixed)	37018904	EM data [5 animals ret.]. Two species in species list - *C. brachyurus* (37018001) and *C. obscurus* (37018003)
BC	Chondrichthyan	Squalidae	*Squalus* spp.	Greeneye dogfishes (mixed)	37020901	EM data [1 animal dis.]. Four species in species list - *Squalus megalops* (37020006) and three additional species expanded from family Squalidae.
BC	Chondrichthyan	Etmopteridae	Etmopterus spp.	Lantern sharks (mixed)	37020907	1 species in list (E. bigelowi; 37020027) in existing list.
BC	Chondrichthyan	Centrophoridae	*Deania* spp.	Deania Gulper Sharks (mixed)	37020913	EM data [1 animal dis.]. Existing species in species list - *Deania quadrispinosa* (37020004).
BC	Chondrichthyan	Somniosidae	Somniosidae - undifferentiated	Sleeper sharks	37020924	EM data [1 animal ret., 1 animal dis.]. Existing species with family Somnidae in species list.
BC	Chondrichthyan	Pristiophoridae	*Pristiophorus* spp.	Sawshark (mixed)	37023900	EM data [134 animals ret.; 20 animals dis.]. Two species in existing list (37023001; 37023002).

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Chondrichthyan	Squatinidae	*Squatina* spp.	Angel shark (mixed)	37024900	EM data [6 animals dis.]. One species in existing list (37024001; *Squatina australis* - angelshark).
BC	Chondrichthyan	Rhinidae	Rhinidae - undifferentiated	Wedgefishes - unspecified	37026000	No species with family Rhinidae in list [logbook: 40 kg ret., 30 kg dis.]
BC	Chondrichthyan	Rhinobatidae, Glaucostegidae, Trygonorrhinidae	Rhinobatidae, Glaucostegidae, Trygonorrhinidae - undifferentiated	Guitarfishes	37027000	1 species in list (Trygonorrhinidae) in existing list.
BC	Chondrichthyan	Dasyatidae	*Dasyatis* spp.	Pelagic stingrays	37035999	EM data [1 animal dis.]. Species in existing list.
BC	Chondrichthyan	Myliobatidae	Myliobatidae - undifferentiated	Eagle rays	37039000	EM data [492 animal dis.]. One species in existing list.
BC	Chondrichthyan	Mobulidae	Mobulidae - undifferentiated	Devilrays	37041000	EM data [1 animal dis.]. No species in existing list.
BC	Chondrichthyan	Chimaeridae	*Hydrolagus* spp.	Ghostsharks	37042901	EM data [3 animals ret.; 5 animals dis.]. One species in existing list.
BC	Teleost	Chlorophthalmidae, Paraulopidae and Bathysauroididae, Bathysauropsidae	Chlorophthalmidae, Paraulopidae and Bathysauroididae, Bathysauropsidae - undifferentiated	Cucumberfishes and greeneyes and lizardfishe	37120000	Insufficient taxonomic resolution.
BC	Teleost	Moridae	*Mora moro* and *Lepidion* spp.	Ribaldos	37224901	EM data [1 animal dis.]. Species in existimg list; Lepidion species in existing list.
BC	Teleost	Moridae	Moridae - undifferentiated	Morid cods (mixed)	37224903	Added 12 species to list.
BC	Teleost	Macrouridae	*Macrourus* spp.	Whiptails - macrourid	37232901	EM data; insufficient taxonomic resolution. No species with family Macrouidae in existing species list. [2 animal ret., 2 animal dis.].
BC	Teleost	Berycidae	Berycidae - undifferentiated	Alfonsinos	37258000	EM data; insufficient taxonomic resolution. Six species with family Berycidae in existing species list.
BC	Teleost	Zeidae, Cyttidae	Zeidae, Cyttidae - undifferentiated	Dories and lookdown dories	37264000	One Zeidae and one Cyttisdae in species list. Added mirror dory (*Zenopsis nebulosus*; 37264003) to species list.
BC	Teleost	Scorpaenidae	*Helicolenus barathri* and *Helicolenus percoides*	Ocean and coral perch	37287901	EM data; insufficient taxonomic resolution. Both species already in existing species list.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
BC	Teleost	Neosebastidae	*Neosebastes* spp.	Gurnard perches	37287927	EM data; insufficient taxonomic resolution. Two species with family Neosebastidae in existing species list.
BC	Teleost	Sebastidae	Sebastidae - undifferentiated	Ocean perch family	37287949	EM data; insufficient taxonomic resolution. Three species with family Sebastidae in existing species list.
BC	Teleost	Triglidae and Peristediidae	Triglidae and Peristediidae - undifferentiated	Searobins and armour gurnards	37288000	EM data; insufficient taxonomic resolution. Three species with family Triglidae in existing species list.
BC	Teleost	Triglidae	Triglidae	Searobins	37288900	EM data; insufficient taxonomic resolution. Three species with family Triglidae in existing species list.
BC	Teleost	Sparidae	Sparid spp.	Snappers - pagrid	37353903	EM data; insufficient taxonomic resolution.
BC	Teleost	Cheilodactylidae	Cheilodactylidae - undifferentiated	Morwongs	37377000	EM data; insufficient taxonomic resolution. Five species with family Cheilodactylidae in existing species list.
BC	Teleost	Cheilodactylidae	*Nemadactylus* spp.	*Nemadactylus*, Morwongs (mixed)	37377904	EM data [1 animal ret., 2 animals dis.]. Insufficient taxonomic resolution. Three species with genus *Nemadactylus* in existing species list.
BC	Teleost	Labridae	Labridae - undifferentiated	Wrasses	37384000	EM data; insufficient taxonomic resolution. Three species with family Labridae in existing species list.
BC	Teleost	Monacanthidae	Monacanthidae	Leatherjackets (mixed)	37465903	EM data; insufficient taxonomic resolution
BC	Teleost	Triodontidae	Triodontidae - undifferentiated	Threetooth puffer	37468001	Only one species in Family Triodontidae.
BC	Teleost	Anguilliformes and Synbranchiformes	Anguilliformes and Synbranchiformes	True and swamp eels	37990019	Insufficient taxonomic resolution.
BC	Chondrichthyan	Order Squaliformes - undifferentiated	Order Squaliformes - undifferentiated	Dogfish sharks (mixed)	37990071	Insufficient taxonomic resolution.
PS	Seabirds	Avians	Avians	Birds	40000000	Insufficient taxonomic resolution; Accounted for in 40040000; 40041000; 40041050; 40041999.
PS	Seabirds	Diomedeidae	Diomedeidae - undifferentiated	Albatrosses	40040000	Insufficient taxonomic resolution. Family in existing list.
PS	Seabirds	Procellariidae	Procellariidae - undifferentiated	Petrels and shearwaters - unspecified	40041000	Insufficient taxonomic resolution. Family in existing list.

ROLE IN FISHERY	TAXA	FAMILY NAME	SCIENTIFIC NAME	COMMON NAME	CAAB CODE	RATIONALE
PS	Seabirds	Procellariidae	*Puffinus* spp. - undifferentiated	Shearwaters	40041050	Insufficient taxonomic resolution. Family in existing list.
PS	Seabirds	Procellariidae	*Puffinus* spp.	Shearwaters (mixed old AFMA Code)	40041999	Insufficient taxonomic resolution. Family in existing list.
PS	Marine mammals	Otariidae	Sealions	Sealions	41131999	Insufficient taxonomic resolution; Accounted for in 4113199.
PS	Marine mammals	Otariidae and Phocidae	Otariidae and Phocidae	Seals	41132999	Insufficient taxonomic resolution.
BC	Algae	Phaeophyceae	Phaeophyceae	Brown algae	54000000	Insufficient taxonomic resolution.
BC		Substrate or rocks that are non-living	Substrate or rocks that are non-living	Substrate or rocks	99000002	
BC		Human attributed objects (e.g., pipeline) or garbage	Human attributed objects (e.g., pipeline) or garbage	Human attributed objects	99000003	
BC		Identity unknown or bad data	Identity unknown or bad data	Unknown or other	99999999	

2.4.3 Habitat Component

A Level 2 analysis for the Habitat component was not conducted in this assessment.

2.4.4 Community Component

A Level 2 analysis for the Community component was not conducted in this assessment.

3 General discussion and research implications

3.1 Level 1

In this case, 25 out of 32 possible activities were identified as occurring in this sub-fishery, including the six external scenarios. Thus, a total of 25 activity-component scenarios were considered at Level 1. This resulted in 124 (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).

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Appendix. State Trip Limits

Trip limits for State managed species in waters relevant to Victoria

FINFISH (Victoria, non-trawl methods)		
Australian anchovy	No take	
Australian salmon		
Blue sprat		
King George whiting		
Pilchard		
Sprat		
Wrasse		
Barracouta	200 kg	Combined 200 kg
Leatherjackets		
Snapper	50 kg	
Striped trumpeter	20 kg	
Yellowtail kingfish	10 individuals	

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 and references within).
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., South and Eastern Scalefish and Shark Fishery - Otter trawl).
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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