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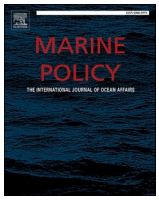

Full length article

Updating requirements for Endangered, Threatened and Protected species MSC Fisheries Standard v3.0 to operationalise best practices

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ABSTRACT

Bycatch in fisheries is a key threat to non-target marine species, particularly for those species that have life histories with low productivity or poor conservation status. In this paper, the requirements of the new Marine Stewardship Council (MSC) Fisheries Standard (hereafter "the Standard") are summarised relevant to Endangered, Threatened and Protected (ETP) species. This covers both how species are designated as ETP, and how performance of management is assessed with respect to ETP species, when scoring fisheries against the Standard. The process used to select these requirements is described, including a review of the requirements for earlier versions of the Standard and the scoring of these requirements in assessment reports for a selection of fisheries that have achieved MSC certification. The review identified a lack of consistency in the implementation of scoring guidelines, which was in part due to a lack of clarity in the requirements of the Standard. The revised Standard has been designed to achieve more consistent implementation of the requirements with respect to management of impacts on ETP species, and to align the requirements more closely with global best practice. The requirements may be used as a template for fisheries managers seeking to prioritise bycatch species for improved management and setting more specific and measurable objectives in relation to population status and minimising mortalities.

1. Introduction

Fisheries bycatch is widely recognized as a key threat to marine species and is particularly problematic for species whose life histories are characterised by late onset of maturity and small numbers of surviving offspring [8,14,39,41,52,55,66,38]. Global estimates of mortalities in fisheries each year likely exceed 720,000 birds (especially longlines, gillnets), 650,000 mammals (especially gillnets, trawls), 85,000 turtles (gillnets, longlines, trawls), with most studies likely underestimating bycatch due to low levels of fishing effort that are independently observed [4,55,65,68]. It has been known for some time that impacts of bycatch on individual species can cause serious population impacts [3,33]. This has resulted in efforts to address bycatch of non-target species at multiple levels, including through actions taken by the Food and Agriculture Organization of the United Nations (FAO), Intergovernmental Organizations, Regional Fisheries Management Organisations (RFMOs) and in national fisheries governance frameworks [26]. Notably, the FAO Code of Conduct for Responsible Fisheries

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(CCRF) encourages states to develop fishing gear and practices that maintain biodiversity, conserve population structures and aquatic ecosystems as well as take appropriate measures to minimize catch of non-target species, particularly endangered species [19]. The FAO has also developed international plans of action for seabirds and sharks [20] and guidelines for reducing bycatch of birds [21], mammals [24] and turtles [22].

While there have been increased efforts to address bycatch of non-target and protected species in fisheries, further efforts are needed to ensure that the key outcomes enshrined in the CCRF are achieved. For example, many international mechanisms allow flexibility in implementation or interpretation, limiting their value as tools that drive reductions in bycatch on the water [30,40]. Conservation goals and objectives should be specific and measurable to improve chances of success [51,59]. Some national management frameworks include such objectives, for example, the New Zealand National Plan of Action for Seabirds [25]. Including objectives in national frameworks is laudable, but if they only apply within their own jurisdictions there is a risk that these species are subjected to unsustainable levels of fishing mortality outside the relevant jurisdiction. There are additional challenges for management of species where conservation objectives are inconsistent with exploitation objectives, for example for species such as sharks that are targeted by fisheries [40].

Where international and national instruments have failed to adequately address sustainability issues, voluntary seafood eco-labelling schemes such as the Marine Stewardship Council (MSC) have arisen to drive change [2,37]. The MSC was started in 1997 with a Fisheries Standard designed to reflect the CCRF and has subsequently evolved through many iterations as it is updated in line with changes to science and management of fisheries . The Fisheries Standard contains specific Performance Indicators (PIs) to assess the sustainability of the fishery in relation to the target stock (Principle 1), the environment (Principle 2) and management systems (Principle 3) [50]. In this third-party certification system, fisheries are assessed by Conformity Assessment Bodies (CABs), who operate independently from the MSC. The CABs score PIs at a level of either <60 (fail), 60–80 (pass with condition), or ≥ 80 (pass with no condition) [50]. Where there is a pass with condition, the fishery has the certificate lifetime (5 years) to put in place actions to bring the score to the ≥ 80 level [45].

Interactions with Endangered, Threatened and Protected (ETP) species are specifically addressed by three PIs. The overall objectives associated with these PIs in the previous version of the Fisheries Standard (hereafter Standard v2.0) were:

- That the fishery does not hinder recovery of ETP species (ETP Outcome PI);
- That the fishery has in place precautionary management strategies designed to meet national and international requirements and ensure the fishery does not hinder recovery of ETP species. Also, the fishery regularly reviews and implements measures, as appropriate, to minimise mortality of the ETP species (ETP Management PI); and
- That relevant information is collected to support the management of fishery impacts on ETP species, including: information for the development of the management strategy; information to assess the effectiveness of the management strategy; and information to determine the outcome status of ETP species (ETP Information PI) [46].

The ETP Performance Indicators had piecemeal updates over time, but there had not been a fundamental review of the ETP requirements since 2008, i.e., relative to whether they are achieving their stated objectives and are in line with best practice globally. Because best practice and science and management of these species have progressed since 2008, the ETP requirements were one of the priority areas for evaluation as part of the Fisheries Standard Review (2018–2022) [47]. Concerns had also been raised by stakeholders that the Standard v2.0 was not ensuring that MSC certified fisheries were safeguarding the recovery of ETP species and minimizing non-target bycatch [11].

At the outset of the Fisheries Standard Review a range of issues were identified that spanned the ETP requirements, including issues with consistency and objectivity [48]. Several projects within the Fisheries Standard Review were relevant for the development of new ETP requirements as part of a new Fisheries Standard v3.0 (hereafter Standard v3.0). In this paper, the focus is on the development of the following core parts of the new ETP requirements: 1) determining which species should be assessed as ETP (designation), and 2) strengthening the Standard v3.0 to ensure greater objectivity in assessing whether the fishery hinders recovery of the species and whether mortalities of ETP species are minimised (performance). Additional topics that were considered alongside these include identification of the appropriate population or species unit to assess, consideration of unobserved (cryptic) mortalities and cumulative impacts. The methods used and resulting changes to the Standard v3.0 are also applicable for the development of policy and other sustainability standards for non-target species globally and to influence national or regional fisheries management frameworks.

The Fisheries Standard Review was a complex process spanning many years [37]. In order to assist the reader on this journey with respect to the revision of the ETP requirements, we have split this paper into sections representing the different phases of the overall review process. Section 2 presents the background research used to identify and characterise the problems with Standard v2.0. In Section 3, options to address the issues identified were reviewed and tested. Section 4 presents the outcome, i.e., the final revisions to the ETP requirements in Fisheries Standard v3.0. Section 5 provides a discussion on specific challenges with selecting applicable reference points, determining when mortalities are minimised and applying ETP requirements to fish and invertebrate species, and Section 6 presents the final conclusion.

2. Identifying and characterising issues with Standard v2.0

This section presents the background research and development that led to the identification of issues with Standard v2.0 in relation to designation of ETP species (Section 2.1) and how they are assessed in terms of outcome and management (Section 2.2).

2.1. Designation

Standard v2.0 included designation requirements to determine which species of bycatch should be scored as ETP in each fisheries assessment, based on national and international agreements. The Fisheries Standard Review research on designation focussed on evaluating consistency between assessments of fisheries that may interact with the same ETP species populations, root cause analyses of inconsistency, reviewing red lists used for designation and exploring rationales behind national ‘protected’ listings.

A total of 165 Public Certification Reports from November 2013 to March 2019 were reviewed to determine how ETP species were designated in fisheries assessments. 860 species, stocks or populations were designated as ETP and the agreements that triggered designation were recorded. The review concluded that there were inconsistencies in how ETP species were designated, specifically: ETP are designated according to many different national or international agreements; some of the agreements listed in the Standard v2.0 are rarely used to designate ETP; using a species case study, 20% of elasmobranchs (sharks, skates and rays) were found to have inconsistent designations, whether against the same Standard, different versions of the Standard, or through different national statuses; and, although ‘Endangered’ and ‘Threatened’ are consistently defined, ‘Protected’ status can be a result of many different factors including science, politics, or cultural reasons. Moreover, some terms—including “recognized” in national legislation and “binding” agreements—were not further defined, leading to issues or confusion in designation during assessments.

A targeted 1-day information-gathering workshop was held in October 2019 to discuss results of ETP designation review, intent behind designation, and explore alternative options that should be considered throughout the review process. IUCN Red List assessments were also reviewed to determine whether regional assessments existed for more relevant analysis of potential ETP taxa compared with global determinations.

Based on this stakeholder engagement and research, a designation proposal option was developed. 'Out of scope' species (species not eligible to be assessed as a target species: birds, mammals, reptiles and amphibians) would be considered ETP if they had a global or regional IUCN Red List status as Vulnerable, Endangered or Critically Endangered only (i.e., national listings would not apply, removing the potential for inconsistencies in assessment across jurisdictions). Fish and invertebrate species would have a two-step process. If there is a stock assessment available (e.g., from the relevant management agency or scientific body), it would not be considered ETP. If there is no stock assessment and the IUCN Red List status is Endangered or Critically endangered, the species would be considered ETP. This option was provided for consultation, impact assessment and further evaluation, described in Section 3.

2.2. Performance

An initial review of the assessment outcomes of the Standard v2.0 ETP requirements was undertaken on a total of 81 fishery assessment reports, selected using a stratified random sample where ETP species had been scored. A database was created with scores and associated rationales for each ETP Performance Indicator for each assessment report in the sample. The rationales used by the CAB and the supporting information sources were categorised by applying a content analysis approach [37]. Most rationales provided to support the assessment that the fishery was highly unlikely to hinder recovery of ETP species (resulting in a score of ≥80, passing with no conditions) indicated that there were no or low levels of interactions with ETP species. However, many of these rationales (52 of 148) relied on expert judgement, including comparing the number taken relative to other fisheries or sources or mortality, rather than relying on independent information or quantitative assessments (Fig. 1). The MSC risk-based framework that is required to be applied when the impacts of the fishery on the ETP species are not analytically determined, was not applied for any fisheries in the sample reviewed, even when there was no evidence provided of a quantitative assessment of impacts.

In addition, only 51% of rationales on management strategies where there were ETP interactions included evidence that measures to minimise mortality of ETP species were implemented, despite this being required at all scoring levels. The root cause identified for many of the issues was a lack of clarity in the requirements on how they should be addressed.

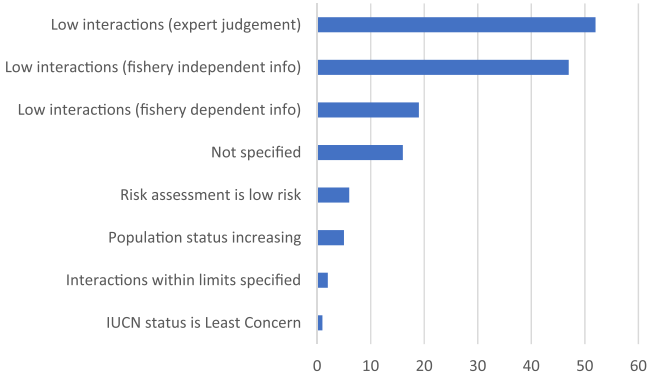

Fig. 1. Counts of summary justifications for meeting the requirement that the fishery is highly unlikely to hinder recovery of the ETP species. Note: More than one reason may be provided per fishery.

A review of best practice of international and national policies on management of ETP species highlighted the importance of two key elements: 1) Ensuring that fisheries' impacts on populations/stocks would maintain or recover populations/stocks to a level that will allow them to persist over time and 2) Minimising bycatch and mortality of non-target species. This is consistent with the CCRF which encourages states to address both issues, something that is also reflected in the FAO International Guidelines on Bycatch Management and Reduction of Discards [19,23].

Objectives for management of target species tend to be expressed in terms of MSY or other biomass-based reference points [53]. Objectives for non-target species, particularly birds, mammals and reptiles, are varied and include goals:

- to ensure sustainability, which is itself not universally defined (e.g., FAO international plan of action for sharks [20]),
- to maintain a favourable conservation status associated with the ability of a species to maintain itself on a long-term basis (e.g., Agreement on Conservation of Albatross and Petrels (ACAP), Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS), Memorandum of Understanding on the Conservation of Migratory sharks) [1,5,10]
- to ensure good environmental status such that long term viability is ensured [18], and to prevent changes that are not irreversible within a specific timeframe [9].

Although most of these objectives tend to be nonspecific, difficult to measure, and challenging to define in concept and practice, ASCOBANS sets an interim population objective for harbour porpoise to restore populations to, or maintain them at, 80% or more of carrying capacity [36]. The International Union of the Conservation of Nature (IUCN) uses extinction risk theory in combination with quantitative measures of population decline over a time period relative to each species' generation time, in addition to quantitative population and range size thresholds where available for small ranging species [35,42] in order to estimate each species' relative risk of extinction category.

Some national requirements contain more specific and measurable population objectives. For example, in the US, the Marine Mammal Protection Act of 1972 sets an objective for species to recover to or be maintained at 'Optimal Sustainable Population' with 95% probability [62]. Populations are considered depleted if estimated to be below Maximum Net Productivity Level – considered the lowest point in the range of Optimal Sustainable Population, or below 50–70% of a historical population size representing carrying capacity [27].

The review of best practice also showed that objectives for minimising mortalities of ETP species are generally not specific or measurable, although some metrics exist e.g., for seabirds in relation to number of birds caught per 1000 hooks (see examples from Australia, Chile, Falkland Islands and South Africa in [30]) or the Zero Mortality Rate Goal set as 10% of PBR in the US MMPA [62]. Also, many objectives are caveated with terms such as 'to extent practicable', or 'as appropriate' [40].

Based on the research, two options were developed for further review and consultation to improve the objectivity of the performance requirements and better align with current best practices. The first option proposed a quantitative population objective for assessing a fishery's impact on an ETP population's ability to recover within a certain timeframe: the fishery is unlikely to hinder recovery to 50% of unimpacted levels within two generation times or 20 years, whichever is shorter. The MSC Standard (both v2.0 and 3.0) defines the concept of the fishery not hindering recovery of the population as: if the impact of the fishery is low enough that the status of the population can improve, the fishery will not hinder that improvement [46,50]. It is therefore not

reliant on consideration of whether the population is capable of recovering if there are other things that will prevent it, e.g., environmental changes or other anthropogenic impacts. The timeframe for recovery proposed (2 generations or 20 years, whichever is shorter) was suggested for this proposal because it is consistent with the timeframes allowed for rebuilding of Principle 1 (target) stocks in Standard v2.0.

The second option proposed a less specific population recovery objective of '*favourable conservation status,*' defined as the level at which a species can maintain itself on a long-term basis, with the intention that guidance would be provided if this option was selected to assist with application of expert judgement for this assessment. Both options included a requirement to evaluate the fishery's progress on minimizing mortalities of ETP species, with specific requirements to demonstrate that mortalities have been reduced.

3. Development and evaluation of proposals to address issues in Standard v2.0

In this section, the process for the development and evaluation of the proposals to address the issues identified in Section 2 are described. Along with the research to identify issues, comments from an initial consultation period (June-July 2020) were used to develop options for further refinement and testing. The proposals were then subject to the following additional stages of reviews and testing:

- expert review (June-July 2021),
- stakeholder consultation via workshops and online surveys (May-Aug 2021 and Feb-April 2022),
- pilot testing (June-Sept 2021, Feb 2022),
- MSC Technical Advisory Board (TAB) and Stakeholder Advisory Council (STAC) reviews (twice a year throughout the process), and
- auditability review by Assurance Services International (Oct 2021).

The methods used for the policy development and stakeholder consultation process are described in more detail in [37]. The sections below focus on the main outputs from these processes in relation to ETP designation and performance.

3.1. Designation

In 2020, stakeholders were asked to evaluate the designation proposal described in Section 2.1 of this paper. Although stakeholders noted that consistency would improve with this proposal, issues were raised on the use of IUCN Red List for fish and invertebrate species. Concerns related to infrequent IUCN assessment updates and to taxonomic differences between IUCN assessments, which were generally resolved at species level, compared to the stock-level fishery assessments. Other stakeholder issues centred around not including national listing criteria and on the inherent assumptions in the proposal that the presence of a stock assessment was a good indicator for effective management.

Considering these issues, options were developed for further review and testing. The main change made was that this set of performance indicators include not just ETP species but all of what the MSC refers to as 'out of scope' species. These species include birds, mammals, reptiles and amphibians, regardless of their conservation status. This change ensured that the Standard v3.0 would better align with the CCRF objective of minimising bycatch of all non-target species.

For fish and invertebrates, three options were proposed for determining whether the species should be considered ETP: 1) listed in Appendix 1 of CITES or CMS; 2) as for option 1 but also species listed as 'Critically Endangered' on IUCN Red List; 3) as for option 1&2 but also species listed as 'Endangered' on IUCN Red List. However, the MSC TAB and STAC raised concerns on the options proposed that echoed the stakeholder consultation concerns about relying on IUCN Red List criteria for these species' groups. To address this and to reconcile some of the key differences between fishery management and conservation objectives, in 2021 the MSC TAB proposed an additional option (referred to as Option 4), which was further refined through a process involving both MSC TAB and STAC in a series of meetings in April-May 2021 [37]. This option focussed on the fish and invertebrate ETP species and included a two-step process, firstly to identify species that are should potentially be considered as ETP and secondly, to remove from that list some of those stocks or populations of the species that have a healthy stock status, are well managed or less vulnerable to fisheries impacts. Specifically, the steps are:

1) Assemble a list of species that merges CITES (Appendix 1 and 2), CMS (Appendix 1 and MOUs), IUCN categories Critically Endangered and Endangered, and local populations or populations in more than one national listing of the States or jurisdictions relevant for the assessment.
2) Introduce modifications to the list to remove specific populations listed by IUCN as Endangered or in national listings (*i.e.*, no removals from CMS, CITES or IUCN Critically Endangered listings) based on life history characteristics, management status and stock status.

Modifications were not allowed for CMS and CITES Appendix I and IUCN listed as Critically Endangered species, even if local populations are well managed or have a healthy stock status to ensure that MSC-certified fisheries are not directly targeting species with a high risk of extinction in the wild.

Public consultations on the inclusion of 'out of scope' species and the four options for fish and invertebrates in 2021 yielded 76 responses to an online survey, of which 51 commented on the ETP section [49]. Most stakeholders agreed that the proposal to include out of scope species was acceptable (n=35, 69%). Stakeholders were asked to rank the fish and invertebrate ETP options and the results indicated that the option that most stakeholders preferred was Option 4 (30 respondents (59%) ranked as most acceptable option). A thematic analysis [7] of comments associated with the Likert responses was completed and 19 stakeholders (37%) commented that Option 4 was comprehensive, inclusive, precautionary and objective. However, some comments indicated that this option needed further refinement to reduce ambiguity (n=10, 20%).

In addition, three conformity assessment bodies were commissioned to conduct independent pilot testing on all the draft Standard v3.0 changes, including these designation options, on a total of six fisheries. One independent fisheries assessor was also commissioned to assess three fisheries on the ETP proposals only. For the pilot testing, the designation proposals were applied, and no major issues were identified by those testing it.

Based on the feedback received, the option that was retained would have all out of scope species automatically be scored in what is now called the 'ETP/OOS species' performance indicators. Option 4 was revised to include CMS Appendix 2 for fish and invertebrate species based on an analysis undertaken that showed that species listed in CMS agreements and MoUs overlapped with those covered in CMS Appendices I and 2. In this option, modifications for re-classification of species, in order to allow fish and invertebrates to be assessed as Principle 1 and potentially carry the MSC eco-label, would be allowed only for those species that are not "sharks" (Selachimorphs and Rhinotpristiformes) due to the generally poor status of these species [16]. For other fish and invertebrates, modifications for re-classification would be allowed for species that are listed in national ETP legislation, CITES Appendix 2 or listed by IUCN as Endangered (and as Critically Endangered when evaluated as 'needing update' as defined by the IUCN). To allow the species to be assessed as a target species under MSC Principle 1 and potentially carry the ecolabel, two of three modification criteria would need to be met:

1) Life history: species is inherently resilient to exploitation as determined by high productivity attributes (using a semi-quantitative risk

assessment process called Productivity Susceptibility Analysis (PSA) productivity score of greater than 2) (see [45]);
2) Management: the stock is subject to measures or tools, reflected in reference points, intended to achieve stock management objectives in response to targeted exploitation;
3) Stock status: the stock is at a level that maintains high productivity (highly likely to be fluctuating around MSY) based on stock assessment subject to peer review.

In Feb 2022, the auditability, feasibility and accessibility of this option were assessed by a consultant through applying it to 20 selected species. Minor issues were identified with cross-references and wording in the proposed option, and it was suggested that the modification criteria for management should more closely align with PIs on harvest strategy and harvest control rules. The reasoning behind not allowing modification of shark species was also questioned given that some shark species have been subject to directed fisheries and showed no signs of problematic depletion levels.

The 2022 stakeholder consultation focussed on the effectiveness, feasibility and acceptability of the entire Standard v3.0. In a thematic analysis of comments received on designation, concerns were raised about exclusion of sustainable stocks of some ETP species from being Principle 1 species as modification is not allowed for shark species in the proposal (n=8) and about the term 'shark' being too narrowly defined (n=2). Following review, these issues were addressed by redefining the term 'shark' to include all Chondrichthyans and allowing the modification criteria to apply to sharks listed on CITES Appendix 2 or CMS Appendix 2 (but not for IUCN endangered or critically endangered sharks) reflecting that CITES Appendix 2 or CMS Appendix 2 listings may apply to some healthy shark stocks that could otherwise meet the performance requirements for Principle 1.

The results of internal impact testing indicated that the final option provides a clear and precautionary approach to ETP/ OOS designation and one which aligns with best practice (e.g., CCRF). This option is transparent to stakeholders and auditable by CABs. Whilst the proposal does add some complexity it is well supported by NGOs, academics and fishery partners as reflected by consultation feedback.

3.2. Performance

In 2021, a panel of six experts with collective global experience across species groups were asked to review the intent and requirements for options described in Section 2.2 of this paper (outcome performance and minimising mortalities). There was mixed feedback on the proposed outcome option that the fishery is unlikely to hinder recovery to 50% of unimpacted levels over the shorter of 2 generation times or 20 years. Although there was support for use of a quantitative threshold, it was noted that for some species groups the 50% of unimpacted levels reference point could be below conservation goals specified by management authorities.

The alternative option was to use the term 'favourable conservation status' defined as the level at which a species can maintain itself on a long-term basis. The experts' feedback on this alternative definition indicated that it was not appropriate for depleted populations. In addition, the definition was not specific enough to ensure a consistent approach to assessing impacts. All experts agreed that the definition should not be linked to IUCN Red List status because the intent of the Red List is to triage species at high risk of extinction rather than to assess the impacts of fisheries on a specific population or species. A suggestion was made to use the term 'favourable conservation status' but define it more explicitly, setting a minimum threshold for recovery (e.g., 50% carrying capacity) while allowing flexibility to set higher species-specific objectives. It was also suggested to change the recovery timeframe to better align with realistic recovery times for long-lived species by using the shorter of 3 generation times or 100 years, consistent with the IUCN Red List timeframes for evaluating decline.

On the proposed requirements to minimise mortality, experts noted the importance of this objective, since an ETP species may be at favourable conservation status but if there are high mortalities in the fishery, these should still be minimised. It was also noted that although this is a complex concept to define, the options proposed were too subjective. It was suggested that the emphasis should be on applying best practice measures where these exist and ensuring that terminology is explicitly defined. Expert feedback on demonstrating reductions in mortalities included providing guidance to ensure that reported declines are due to introduction of management measures, not reduced abundance of the ETP species. It was also suggested to include some examples of how this requirement should be applied in scoring guidance.

Stakeholders were consulted through the MSC public consultation process on the two options proposed and a thematic analysis of comments indicated concerns with the complexity and data burden to assess the requirements (n=7) and concerns about lack of specificity and objectivity in the proposed options (n=10).

Based on the feedback received from experts and stakeholders, a revised proposal was developed with the following key elements:

- Outcome performance was evaluated on whether the fishery is unlikely to hinder recovery of the ETP species or population to favourable conservation status, defined as a level equivalent to at least 50% carrying capacity, or higher depending on the life history characteristics of the ETP unit, e.g. by applying impact reference points consistent with this level.
- Management performance evaluated whether "measures expected to minimise mortality" are in place, defined as measures that have been shown to minimise mortalities through spatial and/or temporal restrictions or closures; minimise mortalities through modification of fishing gears and practices or maximise the live release of individuals while ensuring the safety of the fishing crew.
- Management implementation evaluated whether there is evidence that the management measures are progressing towards or have achieved the favourable conservation status and outcomes to minimize mortality.

This revised set of ETP species performance requirements was pilot tested at the same time as the ETP designation requirements (see Section 3.1 of this paper). Clarifications were made to ensure requirements were more specific and auditable following this review.

Consultation on the resulting ETP performance requirements was conducted in 2022 as part of the consultation on the entire draft Standard v3.0. Overall, results were polarised in terms of support for the increased objectivity of requirements on fishery impact and requirements directing mortality minimisation. A thematic analysis of comments indicated some concern that there would be insufficient information to assess many species against the new favourable conservation status requirement (n=8). This highlighted the importance of ensuring that the MSC Risk-Based Framework is appropriate to assess these species, a topic being addressed as part of a concurrent workstream of the Fisheries Standard Review ([31] (this issue)). Stakeholders also found that the definition of minimising mortality was still too subjective (n=4). Improvements were made to the requirements to demonstrate that reductions or minimisation of mortalities are occurring. This was achieved by linking it to clear trends of decline or by demonstrating that best practice mitigation measures are applied and demonstrating the fishery is highly unlikely to hinder recovery of the ETP/OOS species (to Favourable Conservation Status).

Internal impact assessments were iteratively updated throughout this project to evaluate whether the options achieved the objectives and what their impact would be on MSC program acceptability, complexity and accessibility [37]. The conclusions were that the revised set of ETP species performance requirements met the objectives of improving objectivity and capturing advances in best practice. Its acceptability was evaluated as high given that the option brought together the most

supported elements of all options considered within this project topic. Whilst the option would add complexity and data challenges through incentivising more quantitative approaches of assessing ETP population status, routes remained available for data poor fisheries, so accessibility was unlikely to be adversely impacted. Additionally, concerns over complexity and feasibility raised during the consultation and pilot testing were addressed with clarifications in requirements and guidance.

4. Fisheries Standard v3.0

The MSC published the final version of Standard v3.0 in October 2022. A summary of the final ETP requirements in relation to designation and performance are outlined below.

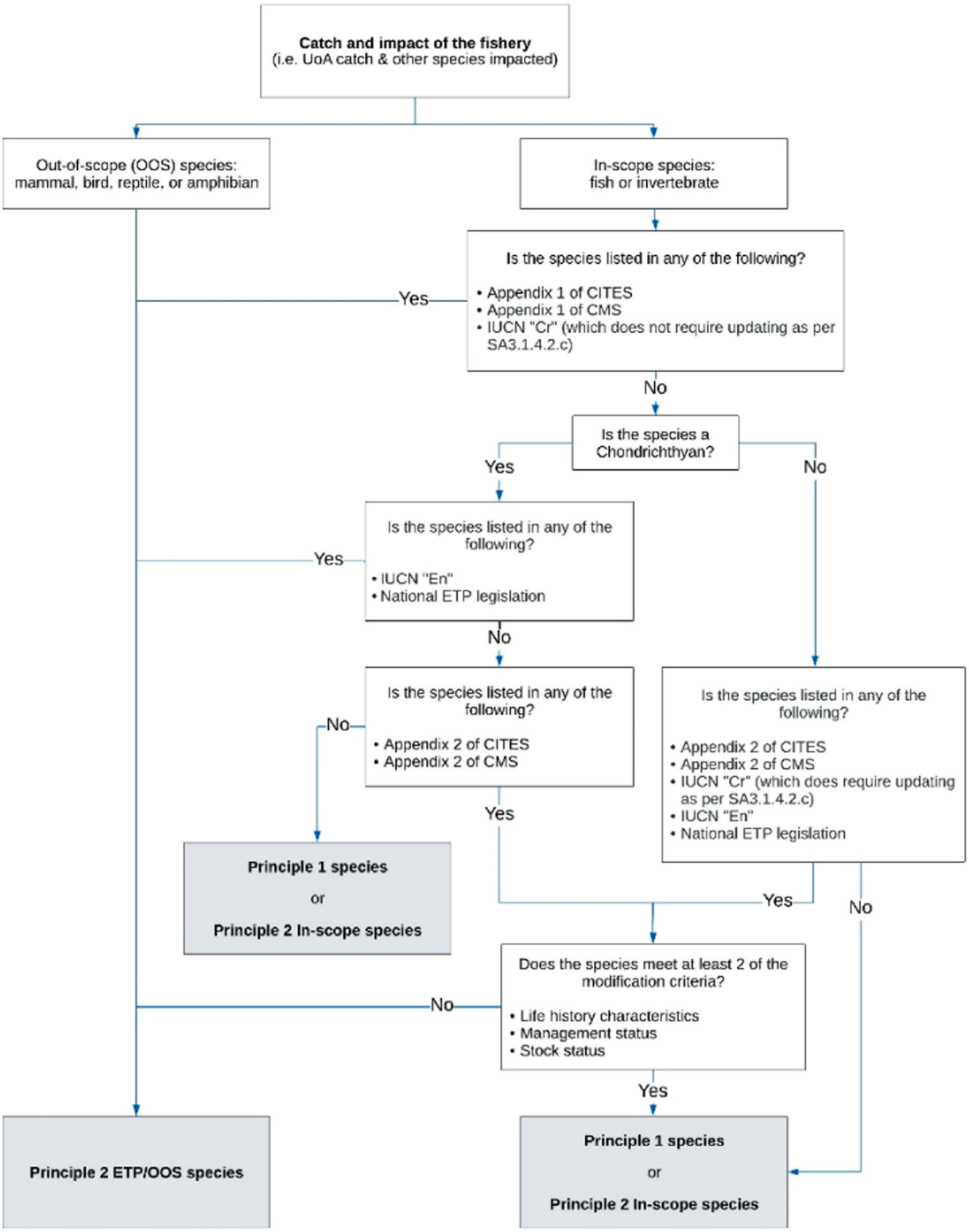

Fig. 2. Decision tree for ETP/OOS species categorisation.

4.1. Designation

The designation requirements for ETP and Out of Scope (ETP/OOS species) are captured in a decision tree (Fig. 2). All birds, mammals, reptiles and amphibians will automatically be assessed in the ETP/OOS Performance Indicators regardless of their population status or whether they are listed on international or national ETP species lists. All fish and invertebrates (i.e., including sharks) that are listed on CITES Appendix I, CMS Appendix I or have a global IUCN Red List status of Critically Endangered (unless IUCN assessment is listed as "needing update") will also automatically be considered ETP (i.e. modification criteria cannot be applied). The decision on whether fish or invertebrate species will be assessed in these PIs depends on 1) whether or not they are Chondrichthyans; 2) where they are listed; and 3) whether they meet the modification criteria. Chondrichthyans that are listed as IUCN Endangered or in national ETP legislation are automatically designated as ETP (i.e. modification criteria cannot be applied). Chondrichthyans that are designated on CITES or CMS Appendix 2 are subject to modification criteria. Other fish and all invertebrates are subject to modification if they are listed on Appendix 2 of CITES or CMS, IUCN Endangered, or IUCN Critically Endangered (if IUCN assessment is listed as "needing update") or listed in national ETP legislation.

Where permitted, fish and invertebrate species can be removed from the ETP designation (but still assessed as either an MSC target (Principle 1) or "in scope" species (PI 2.1.1–2.1.3) in Standard v3.0) if at least two of the following modification criteria are met:

1. Life history characteristics: the species is inherently resilient to exploitation as demonstrated by high-risk productivity attributes (consistent with productivity score of greater than 2 when applying MSC Productivity Susceptibility Analysis)
2. Management status: the stock is subject to measures or management tools, reflected in either Limit Reference Points or Target Reference Points (or equivalent), intended to achieve stock management objectives in response to directed exploitation.
3. Stock status: the stock is at a level that maintains high productivity, consistent with a stock being at or fluctuating around a level consistent with Maximum Sustainable Yield (MSY).

4.2. Performance

In Standard v3.0, the core performance issues identified at the start of the Fisheries Standard Review were addressed as described in Table 1. Changes from other projects or affecting other parts of the Standard v3.0, but relevant for ETP species, are provided in Supplement 1.

For the key performance requirements, the impact of a fishery will now be assessed to determine whether it is likely to hinder recovery of the ETP/OOS species to favourable conservation status. This term is defined as a level equivalent to at least 50% carrying capacity unless a higher level has been defined based on the life-history characteristics of the species. The requirements point to several possible reference points that could be used, if they are set at a level of at least 50% carrying capacity, including: Optimum Sustainable Population, Maximum Net Productivity Level, Maximum Sustained Fishing Mortality or other fishing mortality or biomass-based reference points. As noted in Table 1, there is guidance provided with examples of application of methods to estimate impact and their associated population objectives (see Supplement 2).

The requirements were also strengthened to achieve the objective of minimising mortalities of ETP species. First, a definition of the concept "measures that minimise mortality" was specified, defined as measures that have been shown to minimise mortalities through spatial or temporal gear restrictions or closures, modification of fishing gears or practices, or maximising live release of individuals while ensuring the safety of the fishing crew. The existing requirement to evaluate whether management measures are expected to minimise mortality was

Table 1
Performance issues identified in relation to ETP species, how they were addressed in Fishery Standard v3.0 and rationales.

Issue	How addressed	Rationale for proposal
Improve consistency in identification of specific population or species unit to assess	Improvements to designation requirements (see Section 4.1) and requirement added to identify the specific ETP/OOS unit on the basis of biological distinctiveness or for conservation and management purposes. Guidance with examples provided to assist with identification of the appropriate unit for different species groups.	Requirements reflect best practice in identifying specific populations or management units for different taxa.
Reduce subjectivity of the objective of ensuring fishery does not hinder recovery of ETP species	ETP outcome requirement population objective of Favourable Conservation Status defined in relation to population recovering to point at or above 50% carrying capacity within timeframe of 3 generations or 100 years, whichever is shorter. Fishery can either demonstrate through quantitative assessment that they achieve the objective of not hindering recovery to favourable conservation status through quantitative impact assessment OR by providing evidence that the impact is negligible.	Requirements reflect advances in best practice and bring together elements of most supported options through expert review, pilot testing and consultation.Increased data challenges but there is alternative route for data-deficient fisheries to use risk-based framework, so accessibility is unlikely to be adversely impacted.
Reduce subjectivity of the objective of minimising mortalities	Definition provided for "Measures that minimise mortalities": those that have been shown to minimise mortalities through spatial or temporal gear restrictions or closures, modification of fishing gears or practices, or maximising live release of individuals while ensuring the safety of the fishing crew. Requirement added that the measures in place are expected to minimise mortalities of ETP species are justified based on adoption of best practice where it exists, or by comparison with similar fisheries or trials or application in the fishery itself.Requirement to evaluate management strategy effectiveness now required at 80 score level and changed to require evidence that the management has reduced or minimised the morality of ETP species. Evidence required of demonstrable reductions in mortalities since management implementation, i.e., with data showing clear trend in decline of mortalities OR	Objective based on best practice and operationalized through consideration of best practice approaches, expert review, pilot testing and consultation. Resulting option provides an objective and auditable requirement that is feasible to implement.

(continued on next page)

Table 1 (*continued*)

Issue	How addressed	Rationale for proposal
	demonstration that minimised met when outcome score is at least 80 and the management implementation (in terms of applying best practice measures or those that have been demonstrated to work) achieves 100.	
Improve assessment of unobserved mortalities	Existing requirement that unobserved mortalities are considered was updated to include that information related to unobserved mortalities shall be documented in the assessment report.	Revised requirement improves transparency and consistency as it makes expectations for the assessment teams clearer and will therefore strengthen outcomes.
Consider the feasibility of assessing cumulative impacts of multiple MSC fisheries on ETP species	In Standard v2.0, a scoring issue on ensuring the fishery was within quantitative limits (where these exist) also contained a requirement at SG80 that multiple MSC fisheries within the jurisdiction setting the limit should collectively ensure they are below this limit. Instead, the new requirements on ensuring individual fisheries did not hinder recovery to favourable conservation status were applied (see row 2 of this table).The requirements for each individual fishery to minimise mortalities of ETP species, and to demonstrate that this is occurring, were also strengthened (see row 3 of this table).	In Standard v2.0, cumulative impacts requirements only applied for ETP species when quantitative limits were set, and then they were only applied in the specific jurisdiction setting the limits. This meant that if a highly migratory species crossed jurisdictions and only one set a limit, the cumulative impact would only apply to MSC certified fisheries within the jurisdiction applying the limits. This created inconsistencies in incentives for different management approaches and across fishery assessments.Because cumulative impacts were addressed at the SG80 level, if MSC fisheries within that jurisdiction were determined to collectively be hindering recovery, they would each get a condition and have to minimise their own mortalities. Consequently, if this was not triggered, there was not a set of requirements that were consistently applied to ensure that all fisheries minimised their mortalities.In addition, since so few jurisdictions set quantitative limits for ETP species, this requirement was rarely applied. The Standard v3.0 requirements to minimise mortalities applies to all fisheries and ETP/OOS species, regardless of whether there are quantitative limits set or what other jurisdictions or management approaches are doing. This addresses issues with consistency in approaches across jurisdictions and management frameworks. In Standard v3.0 the focus on demonstrating that each fishery is minimising its mortalities was determined to be a more effective way of ensuring that collectively MSC fisheries are doing the most they can to ensure that they are not hindering recovery. In addition, the market-based benefits of the MSC program should help incentivise multiple fisheries to deal with this issue collectively per the MSC's Theory of Change [37].

improved by setting out that this must be justified based on the use of either best practice mitigation measures, comparison with similar fisheries and species, or from trials or application in the fishery itself. A requirement was added that there be evidence which indicates that the measures introduced have reduced mortality of the ETP species, either through evidence demonstrating that reductions are occurring (e.g., trend data with decline in mortalities since measure was introduced) or if the fishery is able to demonstrate both that a) it does not hinder recovery of the ETP species to favourable conservation status and b) it has a comprehensive strategy, including all possible best practice measures where these exist, to minimise mortalities of that species.

5. Discussion

5.1. Developing applicable reference points

One of the main challenges faced in developing Standard v3.0 to ensure that a fishery does not hinder recovery of ETP species was where to set the "bar" on the target level of recovery of an ETP species. In contrast to the management of target species, where the concept of MSY has been used in fisheries science since the 1950 s, variously as a management goal or a biological reference point [53,61], there has not been one well-defined and consistently applied conservation goal or reference point across other species groups – indeed, this is one reason that impacts on non-target species have been difficult to assess [44]. Many different terms are used, and not all of them are linked to measurable population objectives. Several impact reference points have been developed over time, including Potential Biological Removal applied to marine mammals and seabirds [15,63], Reproductive Value Loss Limit applied to marine turtles [12] and Sustainability Assessment of Fishing Effects [67]. There is an assumption that if the anthropogenic mortalities within the population remains below the corresponding impact reference point, the population reference point will be maintained [44]. This assumption has been tested for specific approaches such as Potential Biological Removal in marine mammals and seabirds using simulations or Management Strategy Evaluation (MSE) [54,56,63].

The variation in level that the population reference point should be set at is also related to the probability of achieving that objective and the timescale for it to happen. For example, the value of 50% of carrying capacity is used by [63] in simulations for PBR for maintaining populations at Maximum Net Productivity Level (MNPL – see Supplement 2) over a timescale of 20 years with 95% probability, but populations starting at 30% carrying capacity recovered over 100 years. In contrast, ASCOBANS sets an interim objective of maintaining populations at, or restoring populations to, 80% or more of carrying capacity [60]. Hammond et al. [34] converted this interim goal into a quantitative objective that populations of small cetaceans in the North Sea recover to, or be

maintained at, 80% of carrying capacity on average, within a 100-year period. He used this to develop a catch limit by applying a Removals Limit Algorithm. As the importance of establishing reference points to manage impacts of human activities on wildlife becomes clearer, methods have proliferated [43]. For example, new tools are being developed to project or predict the outcomes of different bycatch rates on marine mammal populations to assist data-deficient fisheries to comply with the fisheries import provisions of the US Marine Mammal Protection Act [58,64].

To provide a specific and measurable objective but still allow for the flexibility in approaches, we drew on best practice to define the term Favourable Conservation Status by a minimum population recovery objective over a specified timescale, with the probability of achieving this reflected in the different scoring levels. Specific reference points that are considered equivalent to this level are specified in the Standard v3.0, with the caveat that they can be applied only when they are set at a level of at least 50% carrying capacity. So, for example, MSY could be an appropriate reference point for assessing the ETP species if it is set at this level – for example, consistent with the surplus production approach [57]. Where there are no reference points, or reference points are not appropriate, the MSC's Risk-based Framework is applied (see Good et al. [32]).

5.2. Determining when mortalities are minimized

Another challenge faced in developing requirements for species that are exploited and those that are not, is the concept of minimising mortalities. The new designation requirements automatically mean that all birds, mammals, reptiles and amphibians are assessed under the new performance requirements, including that they need to apply measures that are expected to minimise mortality, based on best practice or trials or application in the fishery or similar fisheries, but also that they need to demonstrate that they are in fact reducing or minimising mortalities. Implementing measures that are effective in minimising mortality is an area that needs improvement in many management frameworks for all non-target species. For example, a review of RFMO performance in relation to bycatch of cetaceans indicated that some RFMOs have conservation measures developed to mitigate bycatch, but these are often focussed on a specific gear type, e.g. Inter-American Tropical Tuna Commission and Western and Central Pacific Fisheries Commission focussed on purse seines [17]. Other RFMOs do not have conservation measures on cetaceans at all despite risk of bycatch, such as International Commission for the Conservation of Atlantic Tunas [17]. These results are consistent with a study on RFMO management of bycatch more generally, which indicated that binding measures only address a third of bycatch problems [28].

The overall objective of the PIs on management of ETP/OOS species includes that incidental catches of ETP/OOS species are minimised and where possible eliminated. This will mean that, even where there are not national or regional requirements to do so, fisheries that wish to become MSC certified will need to implement measures that have been shown to minimise mortalities and document that they are working. The recording of the species interactions to underpin this is assessed under the Information PI (see [13]). This operationalises one of the key objectives of the CCRF in a robust and consistent manner. While it is acknowledged that cumulative impacts across anthropogenic threats are important to consider for many of ETP/OOS species, there are not yet enough fine-scale assessments for most of these species that would allow the proportional contribution of impact for each MSC certified fishery to be assessed. As noted in [37], when setting the Standard, the MSC seeks to respond to the evolution and uptake of best practice in scientific understanding and fisheries management. Until this best practice is established for evaluations of proportional fisheries impacts ETP/OOS species whilst considering other impacts, the expectation that each MSC certified fishery minimises mortalities of ETP/OOS species is currently the most effective and consistent way to deliver mitigation of combined fisheries impacts and ensure accountability at the fishery level. In the meantime, information on ETP/OOS mortalities for fisheries assessed with the Standard v3.0 are required to be reported in publicly available assessment reports, which may facilitate future analyses of cumulative impacts. Any future advances in science and management best practice in this area should be considered for future reviews of the Standard.

In practise it can be challenging to minimise mortalities across all ETP/OOS species simultaneously, as the effects of mitigation approaches can vary between taxa [29]. The revised requirements on minimising mortalities recognise this challenge. One of the ways that a fishery can demonstrate that it is has minimised mortalities in Standard v3.0 is that there is a comprehensive strategy (including monitoring) for managing the ETP/OOS species in place, it has implemented all best practice measures (which should consider impacts on other species) if available, and it can demonstrate that it is not hindering recovery of the ETP/OOS species to favourable conservation status. This will help prioritise quantitatively demonstrating reductions in mortalities of ETP/OOS species in situations where best practice measures do not exist, or the conservation status of the species is likely to be impacted by the fishery.

5.3. Considering application of ETP requirements to fish and invertebrates

Even where national legislation for targeted fish and invertebrates have potentially conflicting objectives, the new MSC requirements for designation are able to account for this to deliver a consistent outcome. For example, a species listed as "Conservation Dependent" under the Australian Environment Protection and Biodiversity Conservation Act 1999 [6] is considered as being listed in the national ETP legislation in the MSC designation framework. However, the national "Conservation Dependent" category allows for fishing to continue under a management plan designed to support recovery of the stock or species [6]. In the MSC designation framework catches of nationally listed species would be subject to the modification criteria to determine if that species should be scored as ETP or not. For example, if the species had low resilience (Productivity risk >2) and a stock status that was below the population size or biomass that could support MSY, even if there are management measures in place that are reflected in a limit or target reference point, the species would be categorised as ETP and catches would need to be minimized. This is in line with the MSC objective to ensure that the fishery does not hinder recovery to Favourable Conservation Status. Unless the species is a shark, if the management measures result in stock status improving to MSY, the fishery would meet the modification criteria and be allowed to be assessed under the MSC's rigorous Principle 1 Performance Indicators.

The development of Standard v3.0 considered trade-offs between exploitation and conservation when determining that all fish and invertebrate species (including sharks) that are listed on CMS and CITES Appendix I and IUCN listed as Critically Endangered species are automatically designated as ETP species without possibility of applying the modification criteria, even if local populations are well managed or have a healthy stock status. The benefits of exploiting such a sub-population were considered marginal and did not outweigh the risks of perverse consequences (e.g., of providing a market incentive to exploit specific species) that could lead to the extinction of a species.

A recent review highlights that many target tuna and billfish species have recovered through management, but species like sharks that are incidentally caught in these fisheries continue to decline [39]. This historic and ongoing susceptibility to overexploitation in both targeted fisheries and where taken as incidental catch, coupled with their important ecological role as a high trophic level species suggested a more precautionary approach in our designation framework was warranted.

6. Conclusion

Through the process of revising the ETP requirements, we believe we

have achieved a clear, consistent, and objective set of designation and performance criteria in Standard v3.0. Our approach reviewed best practices implemented in fisheries management frameworks and adapted these to a globally applicable Standard. The MSC's revised ETP requirements are expected to lead to 'on the water' changes in fishery operations, particularly when prioritizing species for impact assessments and management responses that demonstrably reduce mortalities.

This is the first seafood ecolabelling program to contain specific, measurable objectives to quantitatively assess population level impacts of individual fisheries and demonstrate that mortalities are minimised for ETP species. Coupled with the improvements in evidence used to support the assessment (see [13]), the revised ETP requirements in the Standard v3.0 maximises the likelihood that the MSC objectives relating to ETP species are met and are consistent with global best practices. These requirements also provide a robust framework for management of impacts on ETP species in fisheries globally.

CRediT authorship contribution statement

Stephanie D. Good, Shaun McLennan, Matt Gummery and Rohan J.C. Currey contributed to conceptualisation of the project. Stephanie D. Good developed the methodology for the ETP performance review and development, Shaun McLennan and MG developed the methodology for the ETP designation and development, Stephanie D. Good did the investigation relating to the ETP performance requirements. Shaun McLennan, Matt Gummery and Stephanie D. Good did the investigation relating to the ETP designation requirements. Rebecca Lent, Timothy E. Essington, Bryan P. Wallace, Richard A. Phillips, Tom Peatman, G. Barry Baker, Keith Reid, Rohan J.C. Currey reviewed the ETP performance and designation requirements and provided suggestions for improvement. Richard A. Phillips provided PhD supervision for Stephanie D. Good and Rohan J.C. Currey provided overall project supervision. Stephanie D. Good and Shaun McLennan developed final ETP requirements. Stephanie D. Good wrote the original draft of the paper. Shaun McLennan, Matt Gummery, Rebecca Lent, Timothy E. Essington, Bryan P. Wallace, Richard A. Phillips, Tom Peatman, G. Barry Baker, Keith Reid, Rohan J. C. Currey provided edits to the paper and Stephanie D. Good finalised the paper.

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Declaration of Competing Interest

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Data availability

Data will be made available on request.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.marpol.2024.106117.

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