# Commonwealth Fisheries Policies review

Draft report 2024

Fisheries Branch, Department of Agriculture Fisheries and Forestry.

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**Acknowledgements**

The authors thank workshop and Have Your Say participants for their input. Thanks is also given to the Australian Bureau of Agricultural and Resource Economics and Sciences for providing the Implementation Review and Tony Smith and Caleb Gardner for providing the Technical review to inform revision of the “National Guidelines to Develop Fisheries Harvest Strategies” and “Commonwealth Fisheries Harvest Strategy Policy”.

**Acknowledgement of Country**

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

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## Executive summary

The Commonwealth Fisheries Harvest Strategy Policy (Harvest Strategy Policy) and Commonwealth Fisheries Bycatch Policy (Bycatch Policy) are fundamental to the Australian Government’s fisheries management framework. The Harvest Strategy Policy provides for a precautionary, evidence-based approach to setting harvest levels for commercially targeted species in all Commonwealth fisheries to ensure long-term biological and economic sustainability. The Bycatch Policy provides a framework for managing fishing related impacts on bycatch species in Commonwealth fisheries.

Both policies include provision for review five years after their commencement. Accordingly, the Department of Agriculture, Fisheries and Forestry (the department) initiated a review process in 2023. The review considered the policy settings and approaches to implementation, informed by separate implementation and technical reviews, and stakeholder feedback.

The fisheries management landscape is changing, and this review provided a timely opportunity to consider whether the Harvest Strategy Policy and Bycatch Policy remain fit for purpose to address emerging challenges, including:

* Short and long-term changes to fish productivity due to marine heatwaves and climate change
* Changing social expectations about management of fisheries resources
* Increasing competition for resource access and sharing marine spaces
* Decreasing data quality to support decision making, including for stock assessments and environmental resource assessments.

This review considers the impacts of these and other challenges under nine key topic areas explored in part 3 (Harvest Strategy Policy), part 4 (Bycatch Policy) and part 5 (First Nations interests) of this report.

The Harvest Strategy Policy and Bycatch Policy are each supported by Guidelines for implementation. The Guidelines provide information to assist with interpretation of the policy settings and provide examples to support development and implementation of fishery-specific harvest strategies and bycatch management plans. Noting best practice approaches are continually evolving and subject to available data and resources, the review also considered the ongoing applicability of the Guidelines, including whether technical guidance could be more useful at the fishery-level.

The review report presents recommendations for the consideration by the Minister for Agriculture, Fisheries and Forestry. If supported, these recommendations will inform the preparation of revisions to the Harvest Strategy and Bycatch policies through a subsequent process which will be subject to further public consultation.

### Summary of recommendations

#### Harvest Strategy Policy

**Setting Target Reference Points**: The review considered whether economic benefits beyond commercial profitability could also be considered when setting biomass target reference points for fish stocks. This included the economic benefits that could be derived from the fishery by recreational and Indigenous fishers, or Australian consumers.

The review recommends the policy’s current default target reference point be retained as the starting point when setting target reference points for a stock, and suggests alternative targets be adopted if there is sufficient evidence available to suggest this would achieve better outcomes for multiple sectors.

**Multi-Species Fisheries**: The review recognises managing multiple stocks within a single fishery is challenging because catching one stock can affect the abundance or distribution of another. The review supports continued adoption of different target reference points within multi-species fisheries, providing all species are managed above limit reference points (minimum stock biomass to ensure ecological sustainability). The review notes new management approaches for multi-species fisheries are being trialled and suggests any new management arrangements be tested to ensure the objectives of the policy will be met before they are adopted.

**Managing the Impacts of Climate Change**: The review heard stakeholders and experts agree that changing ocean conditions due to climate change is influencing the abundance, distribution and resilience of fish stocks. The review finds the policy should continue to allow flexibility in approaches used to account for the impact of climate change. Where climate change is impacting stock abundance, the review considers it may be appropriate to change the baseline from which targets are set. However, further work is needed to develop a standard of evidence to conclude climate change is significantly influencing stock abundance and to ensure minimum stocks levels are protected.

**Rebuilding Overfished Stocks**: The review notes some stocks in Commonwealth fisheries have been managed under rebuilding strategies for many years without evidence of recovery. The reasons for this failure to recover are unclear, but in some instances the impact of climate change is likely to be a factor.

The review considers further work is required to understand why some stocks are not recovering and to determine next steps when failure to recover is found to be due to factors other than fishing. Methods to assess the extent to which spatial and temporal management tools can provide stock protection and support recovery need to be developed.

**Balancing Risk, Cost, and Catch**: The review notes the risk, cost, catch trade off provisions within the policy seek to balance the amount of resources invested in data collection and analysis with the level of catch and risk. The review heard loss of commercial catch data due to fishery closures and other access restrictions is contributing to reduced certainty in stock assessments. Less certainty leads to increased risk, requiring more precaution to be taken when setting catch limits.

The review recommends the policy explicitly require the use of a buffer when setting catch limits commensurate with the level of uncertainty in stock assessments. Further work is also needed to improve estimates of other sources of mortality, including discards.

#### Bycatch Policy

**Policy purpose:** The review found the Bycatch Policy remains an important tool for providing overarching guidance on the management of bycatch in Commonwealth fisheries. The review notes requirements for the management of bycatch species listed under EPBC Act are set out within that legislation, however considers it is valuable for the policy to continue to describe those requirements noting the risk-based approach considers all bycatch species. The Bycatch Policy should be outcomes-focused and flexible, allowing appropriate prioritisation resources to implement the requirements of the policy.

**Data and Reporting:** While reporting obligations are currently being met, consultation suggested enhancing performance reporting for better transparency and confidence in bycatch management. While independent auditing and data collection are mandated, there's room for improvement in meaningful and transparent reporting. Recommendations include collecting detailed species-level data on bycatch and ensuring reliable information to guide management decisions.

**Risk equivalency and assessment:** The Bycatch Policy must address ongoing data collection challenges impacting risk assessment and management. Solutions include focusing on mitigation measures, efficient risk management methods, addressing data gaps for high-risk stocks, and defining unacceptable risks. The necessity of accurate and timely data collection to monitor outcomes and inform adaptive management strategies has been made clear. By integrating robust data systems, the policy can be more responsive and dynamic, aligning with the overarching goals of sustainability and resource management. The precautionary principle is crucial, especially when data is lacking, to prevent environmental degradation.

#### First Nations Interests

The review notes a range of First Nations interests are likely to exist in Commonwealth fisheries. The review considers the Harvest Strategy Policy and Bycatch Policy should include principles and priorities for engagement with First Nations stakeholders to help identify and consider their interests when developing harvest strategies and bycatch management plans.

The review also provides in principle support for the development of a schedule of fish species of importance to First Nations people for fisheries managers consideration when developing fishery-specific harvest strategies and bycatch management plans. Further work is needed to determine the practicalities of how the schedule would be developed and implemented.

#### Guidelines

Noting the Guidelines are non-prescriptive by nature, the review recommends elements of the Guidelines that seek to interpret the policy objectives and principles should be moved into the policies themselves to remove any doubt around their intent.

The review recognises it is important for the policies to maintain flexibility around implementation approaches to suit different circumstances between fisheries. However, the review also considers that in instances where the guidance represents best practice and is applicable in all fisheries, it should be included in the policy to ensure consistency in implementation approaches where possible.

The review recommends remaining elements of the Guidelines that are not moved into the policies be discontinued, but notes stakeholders agreed technical guidance, including examples of modelling tools and assessment methods, remain useful and suggests this could be developed on a fishery-specific basis.

## Introduction

The Commonwealth Fisheries Harvest Strategy Policy (the Harvest Strategy Policy) and the Commonwealth Fisheries Bycatch Policy (the Bycatch Policy) are key policies in the Commonwealth fisheries management framework. The Harvest Strategy Policy sets requirements for the development of harvest strategies in all fisheries managed by the Australian Fisheries Management Authority (AFMA), while the Bycatch Policy provides a framework for managing fishing-related impacts to bycatch species in Commonwealth fisheries.

Harvest strategies are documents developed for a fishery that aim to manage the ecological sustainability and economic returns of that fishery. The key elements of a harvest strategy include operational objectives, performance indicators, harvest control rules, and reference points. Harvest strategies rely on and a variety of data inputs to support appropriate decision making for fisheries and fish stocks.

The Harvest Strategy Policy does not prescribe management arrangements for fisheries that are managed jointly by an international organisation or arrangement, including in the Torres Strait Protected Zone, as these are subject to treaty obligations. However, the Policy does articulate the Australian government’s preferred approach and forms the basis for negotiations in international fora.

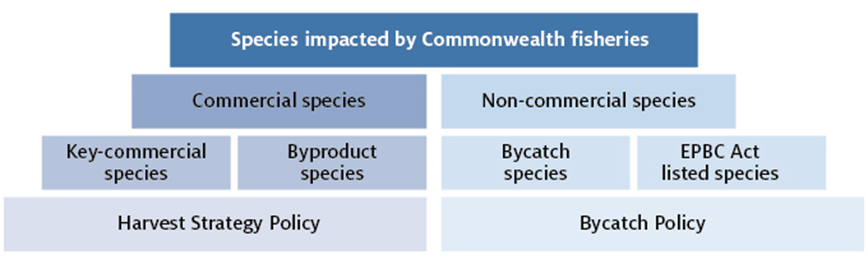
Harvest strategies for Australian Government-managed fisheries are publicly available on the [AFMA website](https://www.afma.gov.au/fisheries-1).

The Bycatch Policy is implemented through mechanisms that reduce bycatch, improve mitigation measures for protected species and generally minimise impacts of fishing on the marine environment. Australia pursues bycatch management options that are practical, cost effective to apply and support environmental and fisheries legislative requirements.

### The Australian Government fisheries management framework

Both the Harvest Strategy Policy and the Bycatch policy apply in Commonwealth fisheries managed by AFMA. Commercial species (key commercial and byproduct) are managed under the Harvest Strategy Policy. Non-commercial bycatch species (general bycatch and species listed under the *Environment Protection and Biodiversity Conservation Act* 1999) are managed under the Bycatch Policy and the *Environment Protection and Biodiversity Conservation Act* 1999. This is depicted in Figure 1.

Figure 1 Relationship between the Harvest Strategy Policy and the Bycatch Policy



#### Fisheries Management Act 1991

The objectives for the Australian Government’s management of fisheries are set out in section 3 of the *Fisheries Management Act 1991* (FMA)and include of particular relevance to the Harvest Strategy Policy pursuing the objectives of:

* 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 (which include the exercise of the precautionary principle), 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 (FMA s3(1)(b).
* Maximising the net economic returns to the Australian community from the management of Australian fisheries (FMA s3(1)(c).
* implementing efficient and cost‑effective fisheries management on behalf of the Commonwealth (FMA s3(1)(a).
* ensuring accountability to the fishing industry and to the Australian community in AFMA’s management of fisheries resources (FMA s3(1)(d)).

In 2017, the FMA was amended to include that, in addition to the above objectives, the Minister and AFMA are to have regard to the objective of ensuring that the interests of commercial, recreational, and Indigenous fishers are taken into account (FMA s3(1)(e)).

The Bycatch Policy also responds to requirements and objectives of the Australian Government’s legislative framework for fisheries management, including the FMA. Additionally, the Bycatch Policy references the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as they apply to the management of Commonwealth fisheries.

##### 2005 ministerial direction to the Australian Fisheries Management Authority

In 2005, in response to declining fish stocks, the Australian Government Fisheries Minister issued a [formal direction](https://www.agriculture.gov.au/agriculture-land/fisheries/domestic/harvest_strategy_policy/2005_ministerial_direction_to_afma) under the *Fisheries Administration Act 1991* requiring AFMA to take immediate action in all Commonwealth fisheries, including to:

* cease overfishing and recover overfished stocks to levels that will ensure long-term sustainability and productivity;
* avoid further species from becoming overfished in the short and long term; and
* manage the broader environmental impacts of fishing, including on threatened species or those otherwise protected under the EPBC Act.

Following the Ministerial Direction, the department developed the Harvest Strategy Policy. The Bycatch Policy works in concert with the Harvest Strategy Policy and was most recently updated in 2018.

##### The Harvest Strategy Policy

The ministerial direction required, amongst other things, that AFMA:

… must take a more strategic, science-based approach to setting total allowable catch and/or effort levels in Commonwealth fisheries, consistent with a world’s best practice Commonwealth Harvest Strategy Policy that has the objectives of managing fish stocks sustainably and profitably, putting an end to overfishing, and ensuring that currently overfished stocks are rebuilt within reasonable timeframes...

Accordingly, the objective of the current Harvest Strategy Policy is:

The ecologically sustainable and profitable use of Australia’s Commonwealth commercial fisheries resources (where ecological sustainability takes priority) – through implementation of harvest strategies.

In pursuit of this objective, the Harvest Strategy Policy seeks to set a framework for applying an evidence-based, precautionary and transparent approach to setting harvest levels in Commonwealth fisheries on a fishery-by-fishery basis. It defines biological and economic objectives for Commonwealth fisheries and identifies reference points to be used to achieve these targets. It also sets out expectations for the rebuilding of overfished stocks. The Harvest Strategy Policy is supported by the *Guidelines for the Implementation of the Commonwealth Fisheries Harvest Strategy Policy* (the Harvest Strategy Policy Guidelines). The Harvest Strategy Policy Guidelines provide additional information to support the Harvest Strategy Policy settings and outlines approaches for developing and implementing fishery-specific harvest strategies.

The Minister for Agriculture, Fisheries and Forestry is responsible for the Harvest Strategy Policy, supported by the advice of the Department of Agriculture, Fisheries and Forestry (DAFF). AFMA is responsible for implementing the Harvest Strategy Policy through the development and implementation of fishery-specific harvest strategies.

##### The Bycatch Policy

The objective of the Bycatch Policy is:

… to minimise fishing-related impacts on general bycatch species in a manner consistent with the principles of ecologically sustainable development and with regard to the structure, productivity, function and biological diversity of the ecosystem.

The term ‘bycatch’ refers to those marine species that are not targeted by a fishery but are either incidentally taken and returned to the sea, or incidentally killed or injured as a result of interacting with fishing gear but not taken.

General bycatch describes all bycatch species in a fishery that are not listed under the EPBC Act threatened, migratory and/or marine species. General bycatch species may include catch items with low or no economic value that are not retained for commercial sale. For example, in the Commonwealth Trawl Sector of the Southern and Eastern Scalefish and Shark Fishery bycatch includes species like whiptails, oilfish, toadfish and rockcods.

The Bycatch Policy provides the basis for a transparent and systematic approach to assessing, managing, monitoring and reporting fisheries bycatch in Commonwealth fisheries. This seeks to ensure fisheries managers consider the impact of fishing activities on the long-term sustainability of marine ecosystems.

The Australian Government minister responsible for fisheries and the Australian Government minister responsible for the environment oversee the Bycatch Policy, with the advice and support of DAFF and the Department of Climate Change, Energy, the Environment and Water (DCCEEW). AFMA is responsible for implementing bycatch management in fisheries within the Australian Government’s jurisdiction.

The Bycatch Policy’s central theme of avoiding or minimising bycatch is supported by the *Guidelines for the Implementation of the Commonwealth Fisheries Bycatch Policy* (Bycatch Policy Guidelines). These guidelines aim to provide practical assistance to fisheries managers when implementing the Bycatch Policy, while offering greater regulatory certainty to fishing businesses operating in wild-capture fisheries.

The first edition of the Bycatch Policy was released in 2000. The policy was last updated in 2018 in response to a review completed in 2013 as well as a series of consultative processes. Key revisions to the Bycatch Policy included:

* improved guidance on species classification and policy coverage for all species
* inclusion of a risk-based approach to monitoring, assessing and managing bycatch for all species
* consideration of cumulative impacts on all bycatch species
* inclusion of a performance monitoring and reporting framework

##### EPBC Act listed species

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also imposes certain requirements on Commonwealth fisheries and their management. In accordance with the EPBC Act, DCCEEW undertakes assessments to ensure fisheries management arrangements meet environmental standards and outcomes. Harvest strategies created in accordance with the Harvest Strategy Policy are a key consideration in these assessments.

EPBC Act–listed species comprise those species protected under Part 13 of the EPBC Act, including cetaceans and listed threatened, marine and migratory species (except for conservation-dependent species managed through rebuilding strategies under the Commonwealth Fisheries Harvest Strategy Policy (Harvest Strategy Policy) in line with the requirements of the EPBC Act).

EPBC Act-listed species include:

* Various cetaceans which are listed as threatened and migratory (whales, dolphins and porpoises). All Cetaceans are protected within Commonwealth waters
* Listed threatened species such as the Shy Albatross and several species of sawfish
* Listed marine species such as sea snakes
* Migratory species such as shearwaters, dugongs and marine turtles (also listed as threatened)

DCCEEW administers the EPBC Act and relevant provisions of the Bycatch Policy including assessments about fisheries in relation to impacts on matters of national environmental significance, environmental performance of fisheries, impacts on species listed under the EPBC Act, and the export of products derived from fisheries.

##### Nature Positive law reforms

This review is being undertaken at the same time as the ongoing revision of the EPBC Act and development of Nature Positive legislation. Any changes to EPBC Act-listed species and requirements may have implications for the Policies. All activities are still to be conducted in accordance with the current regulatory requirements until such time as new laws come into force.

##### Interactions between the Policies

The delineation between species covered under the Harvest Strategy Policy (key commercial and byproduct) and the Bycatch Policy (bycatch) is covered within the policies but more specifically within the policy Guidelines. Chapter 3 of the Harvest Strategy Policy Guidelines and chapter 7 of the Bycatch Policy Guidelines give examples of how species may move between the two policies. The Bycatch Policy Guidelines note that the ‘cumulative contribution to catch and gross value of production can be used initially to separate key commercial stocks from byproduct and further distinguish commercial stocks from bycatch’. As fisheries change and evolve, the relative importance of species may change. Further, the Harvest Strategy Policy Guidelines note that ‘it is appropriate to re-categorise stocks as a result of changes to the relative economic importance, but it is not appropriate to re-categorise a key commercial stock as byproduct, where that key commercial stock was fished down to a point of reduced economic importance through overfishing’.

## Scope and review Process

Part 4.4. of both the Harvest Strategy Policy and Bycatch Policy include requirements to review the Policies five years after they commence. Both Policies were last updated in 2018 and accordingly, the current review processes commenced in 2023.

The purpose of this review was to understand whether the Policies remains appropriate for achieving the Australian Government’s fisheries management objectives as set out in relevant legislation. This review considered both the settings of the Policies and approaches to implementation as set out in the Guidelines for both policies.

DAFF is leading the review, with oversight from a steering committee comprised of members from DAFF, DCCEEW, AFMA and the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). This review has been informed by separate implementation and technical reviews, and feedback received through consultation with stakeholders. Relevant findings from each of these inputs are summarised for each of the key policy settings explored by this review, and these were taken into account when drawing conclusions and recommendations.

Importantly, this document, including its conclusions, is a report of the outcomes of the review of the Harvest Strategy Policy and its Guidelines and the Bycatch Policy and its Guidelines conducted by DAFF and does not necessarily reflect government policy.

Any revisions to the Policies resulting from this review will be subject to further public consultation.

### Implementation review

The Harvest Strategy Policy requires that implementation of the policy, through implementation of fishery-specific harvest strategies, be reviewed. It was determined that the review of the Bycatch Policy would also benefit from a similar review. This work was conducted by ABARES. The implementation review was guided by terms of reference developed by the steering committee.

The Priority areas of focus outlined in the terms of reference for the draft implementation of the Harvest Strategy Policy review were:

* the extent harvest strategies have been implemented
* accounting for all sources of mortality
* variability, regime shift and climate change
* testing of harvest strategies
* target reference points and the maximum economic yield objective
* limit reference points and avoidance of overfishing
* rebuilding overfished stocks
* impacts of spatial and temporal management measures

The Priority areas of focus outlined in the terms of reference for the draft implementation of the Bycatch Policy review were:

* Have bycatch mitigation/management strategies being implemented?
  + Is AFMA effectively addressing high risk species?
* Are assessment and management decisions about general bycatch based on the best available science, evidence and information? What is the best available science? Is the precautionary principle being consistently applied?
* Are data collection and analysis systems sufficiently robust to ensure that risk is assessed and managed appropriately?
* Where evidence shows that a general bycatch population has fallen below the limit reference point, have fishery managers responded in a way that facilitates recovery of that population to above the limit? (Cumulative impacts)
* Are any general bycatch species/populations being exposed to an unacceptable risk of recruitment impairment? If yes, why?
* Have annual reports on implementation been submitted/provided by AFMA?

It should be noted that while some byproduct species fall under the scope of the Harvest Strategy Policy and are assessed and managed using harvest strategies, the majority of byproduct is assessed and managed in a similar way to bycatch. The implementation review discusses byproduct under the Bycatch Policy section questions as a result.

The draft implementation review findings are summarised in this report.

### Technical review

To help inform this review of the Harvest Strategy Policy, the Department commissioned the Fisheries Research and Development Corporation to engage the University of Tasmania’s Institute for Marine and Antarctic Studies to undertake a Technical Review. The Technical Review considered recent and developing research relevant to harvest strategies (both in Australia and overseas) and identifies information, methods and approaches that could inform potential improvements to the Harvest Strategy Policy and approaches to implementation. The Technical Review report can be found at **Appendix A**.

### Consultation

The first stage of consultation was a call for written submissions in response to a discussion paper. This process was conducted via the department’s [Have Your Say web platform](https://haveyoursay.agriculture.gov.au/fisheries-policy-reviews) in October and November 2023. Views provided within the submissions are captured within this document.

The second stage of consultation consisted of two stakeholder workshops. The first was held on 27 March 2024, and focussed on the Harvest Strategy Policy. The second was held on 18 September 2024 and focused on the Bycatch Policy. Participants at both workshops included industry representatives, environmental organisations, First Nations experts, independent fisheries consultants, and academic and research institutions. The workshop discussions have substantially informed this draft review report.

## Draft implementation review findings

Key points

The implementation review found that harvest strategies have been implemented in all Commonwealth fisheries. Most domestically managed stocks are not overfished or subject to overfishing.

The implementation review found that since 2018, the number of stocks assessed as overfished and/or subject to overfishing has increased, and no stocks managed under rebuilding strategies have robust evidence of recovery in line with the Policy objectives. Some policy settings, such as accounting for all known sources of mortality, have been difficult to implement due to lack of data.

The implementation review found that the Ecological Risk Assessment (ERA) methodology used to assess the risks posed by fishing to bycatch and byproduct species can be considered, overall, the best available scientific approach to informing management decisions (ERM) relating to these species. However, data collection to support the ERA and ERM process is a key challenge and risk.

The implementation review considered how the requirements of the Harvest Strategy Policy and Bycatch Policy have been implemented in Australian government managed fisheries. The implementation review focused on the priority areas outlined in section 1.1. A summary of the findings are as follows:

### Commonwealth Fisheries Harvest Strategy Policy

* **Harvest strategies have been implemented in all Commonwealth fisheries**. Most harvest strategies for domestically managed Commonwealth fisheries have been updated since the release of the revised Harvest Strategy Policy in 2018. Those that haven’t are in small, low information fisheries.
* **Most domestically managed stocks are being managed to clearly articulated target reference points**, or are subject to rebuilding strategies aiming to recover stocks above the limit reference point. Some target species in small, low information fisheries or with naturally high variation in stock size (e.g. banana prawns, scallops) are not managed to a target reference point because estimation is difficult. Target reference points that have been implemented are consistent with the requirements of the Harvest Strategy Policy.
* **Most domestically managed fisheries are managed to proxy target reference points consistent with the requirements of the Harvest Strategy Policy**. Only the Northern Prawn Fishery and Great Australian Bight Trawl Sector use a bioeconomic model to estimate maximum economic yield for the fishery.

Setting target reference points is explored further in section 3.1.

* **Implementation of the Harvest Strategy Policy’s requirement to account for all known sources of mortality varies across harvest strategies.** Some assessment and harvest strategies explicitly take account of known sources of mortality in addition to commercial catch retained by Commonwealth managed fisheries. Data to support the estimation of mortality from other sources of mortality (discards, catch taken from State and Territory managed fisheries, recreational catch) is often limited. In some of these cases, discarding is thought to be a significant contributor to fishing mortality and is poorly estimated. Where this is not estimated well, this could undermine achievement of the objectives of the harvest strategy.

The balancing of risk, cost and catch is further explored in Section 3.5.

* **Some form of harvest strategy performance testing, mostly management strategy evaluation, has occurred for about half of domestically managed stocks.** Most untested harvest strategies are in relatively small, low information fisheries.

The use of Management Strategy Evaluation testing is explored further in sections 3.2, 3.3 and 3.5.

* **The majority of domestically managed fish stocks in Commonwealth fisheries are not overfished or subject to overfishing.** However,since 2018, the proportion of stocks that are classified as overfished or subject to overfishing has increased. Key challenges include the collection of appropriate data that allows for the assessment of stocks against the limit reference points, managing the mortality of overfished stocks in multispecies fisheries and understanding the impacts of climate change.

The impact of environmental factors such as climate change on the productivity of fish stocks, and recovery of overfished stocks is considered in sections 3.3 and 3.4.

* **Rebuilding strategies are in place or being developed for stocks assessed as overfished.** Two stocks (orange roughy – eastern, and Southern Bluefin Tuna) have been successfully recovered. Some overfished stocks have been managed under rebuilding strategies for many years with no robust evidence that recovery efforts have been successful. For most overfished stocks there are no reliable estimates of discards. Key challenges for rebuilding overfished stocks include reduced access to monitoring data when catches have been reduced by management actions, developing appropriate rebuilding timeframes and ensuring that total mortality (including discards) does not prevent recovery. Understanding the influence of climate change on some stocks, particularly those that have declined, or failed to recover, despite significant management intervention is a key challenge.

Rebuilding of overfished stocks is considered in section 3.4.

* **Spatial and temporal management tools are commonly used in Australian Government managed fisheries, but these are rarely included in harvest strategies.** With the exception of the Northern Prawn Fishery, spatial and temporal management tools have not been tested using management strategy evaluation.

The use of spatial management tools to support rebuilding of overfished stocks is considered in sections 3.4 and 3.5.

### Commonwealth Fisheries Bycatch Policy

* **The Ecological Risk Assessment (ERA) methodology used to assess the risks posed by fishing to bycatch and byproduct species can be considered, overall, the best available scientific approach to informing management decisions (ERM) relating to these species.**

The ERA tools utilise a wide range of data and information derived from fisheries data collection systems and from biological research. In that sense, the analyses that are undertaken on these species (largely ERA) are undertaken using the best available information, but the available data/information varies significantly across fisheries in the degree to which it is representative of bycatch interactions, particularly where independent data collection is absent or low. The ERA methodologies currently used by AFMA are designed to be precautionary and default to high-risk scores for attributes where data or research information is missing.

ERAs have been conducted for all fisheries that require them, with most major fisheries having updated ERAs since 2018. The remaining (smaller fisheries) have not been updated since 2018, with some now over a decade old.

More than 2000 bycatch and byproduct species are assessed using ERA. The vast majority of these species have been found to not be at high risk from fishing, and all but three fisheries have been assessed to not have any species at high risk from fishing. Across all assessed fisheries, five bycatch and 14 byproduct species are currently considered to be at high risk, with the majority of these species coming from three fisheries or sectors. Most of the high-risk species are assessed to be ‘data deficient’ high risk, meaning there is uncertainty as to the actual risk to the species from fishing. The documented management responses for these species are focussed on additional data collection rather than direct management to reduce risk.

* **Implementation of cumulative risk assessments (across multiple fisheries or sectors) in Australian government managed fisheries is yet to occur. Methodological advancements in cumulative risk analysis have occurred but have not progressed to practical implementation.**

The 2022-23 AFMA Annual Report contains information on bycatch and bycatch management across Australian Government-managed fisheries. The coverage of that reporting is variable, with room for improvement in both performance reporting and quantification of general bycatch. The implementation review noted there may be other AFMA reporting processes (outside the annual report) that are public and provide relevant information, but which were not found by the review.

* **The key challenge for implementation of the Bycatch Policy is likely to be ensuring continued sufficient resourcing that enables**:
  + Data collection that is sufficiently robust to ensure that risk is addressed and managed appropriately
  + Cumulative risks to be accounted for across fisheries
  + Updated research on biological parameters for relevant species over time (noting that climate change may drive changes in species productivity and distribution etc)
  + ERAs to be reviewed and updated over time in all fisheries
  + Data collection to support performance reporting

## Review of key policy settings of the Commonwealth Fisheries Harvest Strategy Policy

As outlined in section 1, this review has been informed by separate technical and implementation reviews, together with stakeholder feedback. Collectively, these inputs have been considered when drawing conclusions about whether the Harvest Strategy Policy’s settings remain appropriate for achieving the Australian Government’s fisheries management objectives as set out in relevant legislation.

Overall, the review found the Harvest Strategy Policy continues to provide an effective framework for the management of Commonwealth fisheries. All fisheries managed by the Australian government are being managed under harvest strategies and the majority of fish stocks were not classified as overfished or subject to overfishing in the most recent Fishery Status Reports (2024). The Policy establishes consistent requirements for harvest strategies, while providing enough flexibility to accommodate the unique circumstances of each fishery, and its requirements for evidence based and precautionary approaches to setting harvest levels remain appropriate.

While the review considers the Harvest Strategy Policy has largely been effective and continues to represent world’s best practice, it identified several areas that could be refined to better recognise emerging interests and address evolving challenges for fisheries. This includes consideration of the broader suite of benefits to the Australian community that can be gained from fisheries management, the implications of environmental change and increasing use of the marine estate (the spatial squeeze), and challenges rebuilding overfished stocks. The review explores these issues further under six key topic areas as follows:

* Setting target reference points
* Multi-species fisheries
* Managing the impacts of climate change and shifting baselines
* Balancing risk, cost, catch
* Rebuilding overfished stocks
* First Nations interests

The following sections outline the current policy settings, technical and implementation review findings, and stakeholder feedback relevant to each of these topics, and draws conclusions and recommendations.

### Setting target reference points

Key points

Target Reference Points (TRPs) express the desired biomass level for stocks in a fishery. The current Harvest Strategy Policy seeks to maximise net economic returns to the Australian community by pursuing TRPs that maximise fishery-wide commercial profitability – described as maximum economic yield.

Almost all fisheries use a proxy TRP because modelling maximum economic yield relies on data that is prohibitively costly to collect.

While the Harvest Strategy Policy Guidelines currently provide methodologies for consideration of the economic benefits of the recreational and Indigenous sectors, the review considered the Harvest Strategy Policy should specify that economic benefits beyond commercial profitability should be considered when setting TRPs. This included the economic benefits that could be derived from the fishery by recreational and Indigenous fishers, or Australian consumers by setting different TRPs.

Notwithstanding this broader approach to setting TRPs, the review recommends the current default TRP of B48 be retained as the starting point for setting TRPs, and suggests alternative TRPs should be adopted if there is sufficient evidence available to suggest this would achieve better outcomes.

#### Current policy settings

The Harvest Strategy Policy requires the use of **target reference points** (TRPs) to guide desirable levels of catch, and these are usually expressed as a proportion of unfished biomass (B0) on a stock basis. Requirements and guidance for reference points can be found primarily under part 3.6 of the Policy.

A biomass TRP expresses the desirable biomass level of a stock to achieve management objectives. The current objective of the Harvest Strategy Policy is the ecologically sustainable and profitable use of Australia’s Commonwealth commercial fisheries resources (where ecological sustainability takes priority) – through implementation of harvest strategies (part 2.1). This is interpreted in the current policy as a biomass TRP for key commercial stocks that produces **maximum economic yield** (BMEY) from the commercial fishery. Maximum economic yield (MEY) represents the point at which the difference between total fishing revenue and total fishing costs is greatest.

Where BMEY is unknown or cannot be estimated using bioeconomic modelling, the current Policy states that a proxy value of 0.48 times unfished biomass (referred to hereafter as B48) or 1.2 times the biomass at **maximum sustainable yield** (BMSY) should be used. Maximum sustainable yield (MSY) is the maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions. The relationship between B0, BMSY and BMEY can vary, depending on the fish stock and the nature of the fishery. The current Policy specifies a proxy of B40 (0.4 times unfished biomass) for BMSY and B48 is derived from the assumption that typically, BMEY is higher than BMSY, as fishing costs tend to increase as stock biomass decreases.

The current Policy allows alternative targets to be applied to a fishery provided they can be demonstrated to be compliant with the Policy objective.

#### Technical Review findings

Managing fisheries through the active pursuit of an MEY target generally results in more profitable fisheries (when compared with an MSY target), while at the same time avoiding both biological and economic overexploitation. The Technical Review notes growing recognition that the Fisheries Management Act’s objective to maximise net economic returns to the Australian community from the management of fisheries should include consideration of a broader suite of economic benefits when setting TRPs - this may include consumer benefits, and the interests of recreational and First Nations fishing sectors, in addition to the profitability of commercial fishers.

The Harvest Strategy Policy Guidelines currently assert that maximising the net economic return from a fish stock or fishery to the Australian community will in most cases be consistent with maximising net economic returns for the commercial fishery. However, the Technical Review found that consumer benefits are likely to improve with a lower biomass target (below commercial BMEY) as higher catch and effort levels may reduce fish prices due to higher supply, while recreational and First Nations fishers may benefit from a higher biomass target (above BMEY)as fish will be more abundant and accessible.

The Technical Review notes that the Commonwealth is the only jurisdiction in Australia that has adopted BMEY as the preferred TRP for key commercial stocks. This means that stocks that straddle adjacent Commonwealth and state-managed fisheries are sometimes managed to different biomass targets. The Policy should consider how it could facilitate improved consistency in setting TRPs for shared stocks.

The Technical Review suggests a biomass TRP (BTARG) could be determined for each fishery based on consideration of the trade-offs between multi-sector management objectives. Ideally, BTARG would be derived via bioeconomic modelling to establish a TRP for the stock that maximises net economic returns for multiple sectors. However, the Technical Review recognised that calculation of BMEY for a fishery is already complex as it requires an assessment of stock dynamics and economic factors that drive profitability, including the price of fish and costs of fishing which fluctuate regularly.

In practice, only the Tiger Prawn stock in the Northern Prawn Fishery has developed the bioeconomic models required to fully implement a non-proxy BMEY target. Most other fisheries managed by the Australian Government use the proxy BMEY targets because calculating fishery level MEY with a sufficient level of confidence is prohibitively costly. However, the Technical Review found that the basis for setting the proxy BMEY target at B48was not clear, and that research had found values for BMEY higher than B48.The Technical Review supports the use of a default TRP, though suggests B50 as the starting point (rather than B48) as a slightly higher TRP may better accommodate non-commercial interests.

#### Implementation review

The draft implementation review identifies 37 of the 57 domestically managed Commonwealth stocks that are not overfished have clearly articulated TRPs. Stocks that are not managed to a TRP are generally small, low information fisheries or target species with high natural variability in stock size (e.g. banana prawns, scallops).

Of the 37 stocks with TRPs, 31 are TRPs based on proxies varying between B40 and B75 (or catch per unit effort-based targets between CPUE40 and CPUE48). Four stocks in the Northern Prawn Fishery use a multi-species bioeconomic model to estimate MEY at the fishery level and two stocks in the Great Australian Bight Trawl Sector have direct estimates of MEY.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The commercial fishing industry considered that the Policy’s approach to reference points should incorporate a high degree of flexibility, including responsiveness to ‘pulse events.’ They also submitted that considering a broader range of economic objectives in TRPs than commercial MEY would need to be underpinned by regular and consistent monitoring of the catch of non-commercial sectors.

First Nations experts recommended that biomass targets should ensure sufficient abundance for cultural fishing, citing examples of harvest strategies in fisheries managed by the New South Wales Government and the Torres Strait Protected Zone Joint Authority. These harvest strategies were developed with input from First Nations stakeholders and set TRPs higher than the default proxy for BMEY.

The conservation sector considered overall that the Harvest Strategy Policy’s approach to reference points should be revised to better account for uncertainty associated with climate change and to focus on stock resilience. They submitted that the current MEY proxy of B48 was useful as a resilience ‘buffer’ above BMSY but somewhat arbitrary, and that calculating MEY itself was unattainable for most Commonwealth fisheries.

##### Stakeholder workshop, March 2024

* Participants generally agreed that it was appropriate and consistent with the Policy’s current objective for harvest strategies to consider multi-sector benefits in addition to maximising economic yield for commercial fishers.
* Participants noted that, while biomass targets may incorporate multi-sector interests, the Policy should not provide for the allocation, or reallocation, of catch. Allocation and access issues should be addressed under the *Commonwealth Fisheries Resource Sharing Framework 2020*.
* Many participants agreed that the Policy should provide for targetsto be calculated (where possible) on a fishery-by-fishery basis, taking into account broader considerations such as increased uncertainty arising from climate change, interests of consumers, and interests of non-commercial users such as Indigenous and First Nations fishers.
  + In some fisheries the most suitable target might be based on maximising economic yield for commercial fishers,whereas in others it may be appropriate for targetsto specifically account for broader non-commercial considerations.
* Participants noted bioeconomic modelling is complex and costly, and agreed the Policy should continue to accommodate the use of a default target.
* The workshop considered changing the current default target from B48, which is currently used as the proxy for BMEY, to a different default target based on broader considerations.
  + There was some support for a change from B48 to B50 as a default, as suggested by the Technical Review, on the basis that this maintained a precautionary approach and might be more consistent with the broader objectives of the Fisheries Management Act.
  + Some participants noted B50 is emerging as a common default target among other jurisdictions, and this could present an opportunity to align targets for shared stocks.
  + Many participants queried whether a move from B48 to B50 would offer any significant benefit to non-commercial fishers and suggested the default target be maintained at B48 unless the benefits of a change can be quantified.
  + Industry participants raised concerns that moving from B48 to B50 would reduce their total allowable catch (TAC) over the long-term.
  + It was noted setting higher targets to account for non-commercial sectors would need to be accompanied by data collection to help achieve and maintain the higher target.
  + The *Commonwealth Fisheries Resource Sharing Framework 2020* was identified as the policy tool for achieving cross-sectoral allocation.
* Participants were generally supportive of maintaining flexibility in setting targets on a fishery-by-fishery basis, based on the circumstances relevant to each fishery.
  + For example, a lower target such as B40 could be adopted in fisheries with primarily commercial interests to benefit consumers, or a higher target such as B60 where there is greater interest from non-commercial fishers (subject to issues identified above).
  + It was noted higher targets might result in higher catch rates and larger fish for recreational and Indigenous fishers, but further analysis is required.
  + While some participants advised caution around reducing biomass targets in fisheries with primarily commercial interests as this may increase risk to long-term stock sustainability, others were highly supportive of this suggestion for fisheries where there are robust data collection and management controls in place.
* It was suggested that if targets were to change in the Policy, then there should be a transition period for adoption.

#### Conclusions

The objective of the current Policy is the ecologically sustainable and profitable use of Australia’s Commonwealth commercial fisheries resources (where ecological sustainability takes priority) – through the implementation of Harvest Strategies. This is currently reflected in the Policy through its focus on MEY in Commonwealth fisheries.

The review notes the Policy objective’s current focus on profitability and MEY is based on the legislative objective under the Fisheries Management Act to ‘maximise net economic returns (NER) to the Australian Community from the Management of Australian fisheries. While the current Policy settings aim to maximise net economic returns the Australian community through the pursuit of MEY and provision of a greater tax base, the Technical Review suggests the Policy could be amended to require a broader suite of economic benefits to the Australian community be considered when setting biomass TRPs (BTARG), including for consumers, recreational and First Nations fishers. This approach would be consistent with the additional objective included in the Fisheries Management Act in 2017 – being that AFMA must ‘have regard to the objective of ensuring that the interests of commercial, recreational, and Indigenous fishers are taken into account’.

This review notes using bioeconomic modelling to determine appropriate targets is complex and is currently only used for the Northern Prawn Fishery. Including other sectors interests in quantitatively determining a TRP would make this even more complex and data intensive. Recognising there is unlikely to be any Commonwealth stocks that currently have the necessary biological, commercial economic and non-commercial benefit data to enable a target to be reliably modelled, the review suggests the Policy should continue to specify a default TRP.

The Technical Review suggested the Policy’s current default target of B48 could be replaced with B50 to better reflect the broader suite of economic benefits being considered as part of the TRP. However, there was no compelling evidence presented or discovered as a part of this review to support moving the default target from B48 to B50. Other interests could work to either decrease or increase the target. Results would also likely be highly location and stock specific. In the absence of this evidence the review finds that the starting point for the stock level biomass target should remain at B48.

The review notes the existing default target of B48 which is described in the current Policy as a proxy for BMEY, is already likely to benefit broader interests because it is more conservative than an MSY target (B40) which commonly adopted in other jurisdictions and fisheries globally. While B48 is consistent with maximising economic yield from the commercial fishery, it also reduces ecological risk and enhances benefits for Indigenous and recreational fishers by maintaining the stock at a higher biomass level (compared to B40).

Stakeholders supported flexibility within the Policy to allow the adoption of alternative biomass TRPs (other than B48) where there is sufficient evidence this would better pursue the objectives of multiple sectors. For example, in fisheries with significant non-commercial interests, it may be appropriate to set an even higher TRP, to support improved interactions with fish species of importance to recreational and Indigenous fishers. Conversely, it may be beneficial in some fisheries with predominantly commercial fishing interests to set a target closer to B40 (as a proxy for BMSY) to promote increased catch for the benefit of consumers in the Australian market.

As noted above, there are currently few fisheries, if any, where sufficient information is available about non-commercial interests to enable consideration of a TRP other than the B48 default. The review considers the Policy should still seek to enhance benefits to the broader Australian community to the extent possible with available information and based on resources available to support establishment of appropriate management, monitoring and reporting regimes for non-commercial harvest. Recognising the Fisheries Management Act also requires that AFMA must ‘implement efficient and cost-effective fisheries management on behalf of the Commonwealth’, the costs associated with the obtaining sufficient data to better understand and quantify non-commercial interests when setting TRPs must be weighed against the potential benefits.

This review notes that even in circumstances where limited information is available to support the consideration of non-commercial interests when setting TRPs, these interests can be accounted for using other mechanisms. For example, the Policy requires all known sources of fishing mortality to be estimated and accounted for when setting commercial TACs.

This review also finds that, while the Harvest Strategy Policy can adopt alternative biomass TRPs where there is information available to demonstrate this would achieve better outcomes for multiple sectors, any formal allocation of catch between sectors should continue to be considered in accordance with the *Commonwealth Fisheries Resource Sharing Framework 2020*.

Further, any formal allocation of catch between sectors should continue to be considered in accordance with the *Commonwealth Fisheries Resource Sharing Framework 2020*. This review finds that a formal resource sharing arrangement should be in place before a higher biomass TRP for a fishery is considered based on non-commercial interests. The resource sharing arrangement must include requirements for the relevant sector or jurisdiction to collect data and manage non-commercial harvest to support achievement of the TRP.

#### Recommendations

1. **The Policy should reflect that a broader suite of economic benefits to the Australian community are incorporated into biomass TRPs (BTARG), including for consumers, recreational and First Nations fishers.**
2. **The starting point for setting the stock level target reference point (BTARG), when this cannot be reliably modelled, should remain at B48. The Policy should continue to allow for the adoption of a higher or lower TRP in fisheries where there is sufficient information available to demonstrate this would better pursue the objectives of the *Fisheries Management Act 1991*.** 
   * For example, an alternative TRP may be adopted if there is evidence to suggest this would better maximise economic yield, support recreational and/or Indigenous interests, enhance consumer benefits, or align with targets set in other jurisdictions for better outcomes for shared stocks.
   * A resource sharing agreement should be in place before a higher biomass TRP for a fishery is considered based on non-commercial interests.
3. **If the TRP for a stock is changed, the Policy should enable a transition period for implementation to allow the commercial sector to adjust.**

### Multi-species fisheries

Key points

Managing multiple stocks within a single fishery is challenging because catching one stock can affect the abundance or distribution of another. For this reason, the Harvest Strategy Policy allows stocks in multi-species fisheries to be managed to different TRPs.

Different tools and approaches for assessing and managing stock abundance in multi-species are being considered for the Southern and Eastern Scalefish and Shark Fishery. The outcomes of this work may help inform approaches in other multi-species fisheries.

The review supports continued adoption of different TRPs within multi-species fisheries, providing all species are managed above limit reference points (minimum stock biomass to ensure ecological sustainability). New management approaches for multi-species fisheries must be tested to ensure the objectives of the policy will be met.

#### Current policy settings

The current Harvest Strategy Policy allows for harvest strategies that seek to manage multiple key commercial stocks within a single fishery. Part 3.6 of the Policy provides for the use of multi-species harvest strategies that manage stocks with the aim of maximising economic yield for the fishery overall, as opposed to pursuing a TRP of BMEY for each stock individually. Additionally, the Policy requires that all individual stocks within a multi-species fishery are maintained above their limit reference point 90% of the time.

The Harvest Strategy Policy Guidelines note there are two interactions that should be considered when determining TRPs for stocks in a multi-species fishery:

* technical interactions are the catch of multiple species or stocks within the same operation, for example, in the Northern Prawn Fishery, endeavour prawns are often caught by fishers targeting tiger prawns
* ecosystem interactions are the direct or indirect effect of the catch of one species or stock on the abundance or distribution of another.

Ecosystem interactions and stock structure can also be impacted by changing environmental conditions. While the Harvest Strategy Policy Guidelines outline several approaches that can be used to consider both technical and ecosystem interactions in multi-species fisheries, there is no agreed framework for determining TRPs for multiple stocks within a fishery to achieve maximum economic yield from the fishery overall.

#### Technical Review findings

Developing effective multi-species harvest strategies is complex. In general, not all stocks in a multi-species fishery can be managed to an optimal level due to interactions between stocks at both a technical and ecosystem level.

Technical and ecosystem interactions between stocks in a multi-species fishery can lead to situations where the catch of non-overfished stocks is constrained by the status of overfished stocks. This risks an underutilisation of quota for some species as well as the possibility that lower value species are discarded in order to continue fishing for higher value species.

Another challenge of managing multi-species fisheries is that current approaches are data intensive, including individual assessments of the abundance of each stock. To address this and other challenges, the Fisheries Research and Development Corporation (FRDC) is currently funding a project (2018-021) to develop a new multi-species harvest strategy for the Southern and Eastern Scalefish and Shark Fishery. The project is investigating methods such as ‘pretty good multi-species yield,’ multi-species maximum economic yield, and indicator/trigger species for implementation in multi-species harvest strategies. Explanations of these concepts can be found in the Technical Review of the Harvest Strategy Policy at Appendix A.

#### Implementation review

Most fisheries managed by the Australian Government are multispecies fisheries. As noted in the previous section, the Northern Prawn Fishery has a multispecies model to estimate MEY at the fishery level (for the tiger prawn sub-fishery) but retains MSY based limit reference points for individual stocks. Reference points in other multi-species fisheries are set on an individual stock basis, with some stocks having TRPs set based on their role in the fishery (e.g. sawshark which a byproduct species in the Southern and Eastern Scalefish and Shark Fishery).

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The commercial fishing industry submitted that multi-species fisheries management should recognise that detailed assessment may not be possible for all species managed by a fishery. They supported the indicator species concept generally as a method of reducing costs associated with data collection. Industry also suggested that in multi-species fisheries, there should be a more adaptive, in-season approach to total allowable catch settings to avoid ‘choke species’ constraining the catch of other target species.

##### Stakeholder workshop, March 2024

* Participants suggested that the Policy should provide clear guidance on the treatment of species that are not managed to the default TRP within the context of the overall multi-species target for the fishery.
* Participants discussed the tools and approaches being considered as part of AFMA’s multi-species harvest strategy project for the Southern and Eastern Scalefish and Shark Fishery and broadly agreed that the Policy should be flexible enough to accommodate these methods where they are consistent with Policy’s objectives.
* Some participants recommended caution when considering implementing the indicator species approach and suggested there should be robust justification for less frequent monitoring of non-indicator species.
* Some participants suggested that the Policy should reconsider and clarify acceptable levels of uncertainty and risk in a multi-species fishery context.

#### Conclusions

The Harvest Strategy Policy currently provides for individual stocks within multi-species to be managed to different TRPs to achieve maximum economic yield from the fishery overall. This allows for a range of TRPs across stocks, but also acknowledges that all species and stocks must be maintained above the limit reference point.

This review notes a number of new harvest strategy approaches are currently being developed and tested for multi-species fisheries and there is no consensus on a preferred approach. Recognising best practice approaches for managing multi-species fisheries are likely to change over time, the Policy should maintain flexibility to use any method that is proven to be consistent with its objective and requirements. As per the current Policy, formal Management Strategy Evaluation (MSE) testing should be used to assess whether novel approaches can deliver on objectives and requirements of the policy, noting that MSE may not be cost-effective for all Commonwealth fisheries, and risk-based evaluation methods may provide an alternative option for testing providing these methods provide the same level of confidence in the performance of the harvest strategy.

Consistent with conclusions regarding the setting of TRPs, this review considers multi-sector interests could also be considered when setting TRPs for stocks in multi-species fisheries where this is information available to support this.

#### Recommendations

1. **The Policy should continue to allow for individual stocks in multi-species fisheries to be managed to different TRPs to achieve overall fishery-level objectives.**
2. **The Policy should specifically clarify that all stocks in multi-species fisheries must be maintained above the limit reference point (B20) at least 90% of the time.**
3. **The effectiveness of novel management approaches for multi-species fisheries should be tested and compared using Management Strategy Evaluation methods (or suitable alternative such as risk-based evaluation).**

### Managing the impacts of climate change and shifting baselines

Key points

Stakeholders and experts agree that changing ocean conditions due to climate change is influencing the abundance, distribution and resilience of fish stocks.

The current Harvest Strategy Policy requires that variability in ocean conditions - including the influence of climate change - is considered when developing harvest strategies, but there is no consensus on best practice. The policy should continue to allow flexibility in approaches used to account for the impact of climate change.

Where climate change is impacting stock abundance, it may be appropriate to change the baseline from which targets are set. However, further work is needed to develop a standard of evidence to conclude climate change is significantly influencing stock abundance.

Provisions within the policy may be needed to ensure minimum stock levels are protected if dynamic baselines are used to set limit reference points.

#### Current policy settings

Part 3.3 of the Harvest Strategy Policy acknowledges that **variability in ocean conditions**, due to natural variability, climate change or other factors, can affect the productivity of stocks and suggests that fisheries managers should ‘seek to account for that variability when developing and implementing harvest strategies.’

Part 3.6 of the Policy sets out the requirement for **limit reference points** which is expressed as a biomass level below which the risk of recruitment impairment is considered unacceptably high. The Policy requires that all stocks must be maintained above the limit reference point (LRP) at least 90% of the time. Where information to support selection of a stock-specific LRP is not available, a default value of 0.2 times the unfished biomass is used (B20) and LRPs must not be set below B20.

#### Technical Review findings

There is increasing evidence that fish populations are changing over time due to changing ocean conditions driven by climate change. The Technical Review notes rapid changes, being driven by ocean warming and other climate drivers, are becoming an increasingly significant challenge for fisheries management.

Stock assessments typically measure the status of a stock relative to its unfished or pre-fished level (B0), that is, a fixed point back in time when the stock was not subject to fishing. Shifting baselines due to environment factors are a challenge for implementation of the Harvest Strategy Policy because it is premised on a stable value of unfished biomass (B0). Where a static B0 is used, the reference points also remain static – that is, they do not change in response to environmental factors that influence stock distribution and abundance over time.

The Technical Review suggests the Policy should more explicitly recognise that baselines are changing, and harvest strategies should adapt accordingly. One method put forward in the Technical Review to account for changes to unfished biomass due to environmental factors is the use of a dynamic reference point (dynamic B0). The Technical Review notes that dynamic B0 estimates B0 (unfished biomass) each year as the biomass which would occur in that year in the absence of fishing, given current environmental conditions.

The Technical Review considers that it may be appropriate to use dynamic reference points where there is clear evidence that stock status is largely being driven by environmental factors. The Harvest Strategy Policy Guidelines already provide information on how harvest strategies may account for environmental variability using dynamic B0. The Harvest Strategy Guidelines caution against modifying harvest strategies based on assumed but untested major environmental variability - as opposed to possible fishing related causes for stock declines - without a firm evidence base to support changes. The Technical Review suggests the Guidelines should set out the standard of evidence required to support the use of dynamic reference points as an appropriate management response to changing stock distribution and abundance.

The Technical Review recognises that methods for estimating dynamic B0 rely on data rich assessments, which are not currently available for most species. It notes AFMA has developed and is currently trialling a Climate Risk Framework to ensure climate risks are formally and explicitly considered in its decision-making processes, including those related to total allowable catch and effort advice. This framework may provide an important alternative methodology for decision making for data poor stocks. The Technical Review suggests this framework, once trialled, could be incorporated into the Policy or Harvest Strategy Guidelines as a mechanism to integrate climate risk into TAC/Total Allowable Effort setting.

#### Implementation review

The draft implementation review notes that accounting for stock variability, regime shift and climate change when developing and implementing harvest strategies is complex, particularly in the context of managing stocks above the LRP. AFMA is implementing approaches in some fisheries to account for environmentally driven variability in stock size by using non-equilibrium or ‘dynamic’ approaches. These dynamic assessments are supported by regular data collection (i.e. surveys) to estimate available/exploitable biomass. Most stocks, particularly in the south-east of Australia, are managed using equilibrium approaches (e.g. approaches that assume a stable biomass in the absence of fishing).

There has been substantial investment in research and analyses to support the consideration of variability, regime shift or climate change, including research into how fisheries management can adapt to climate change impacts. AFMA has also now formally required its Resource Assessment Groups to explicitly consider climate change impacts and has enlisted the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to develop climate and ecosystem reports to support these considerations.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The commercial fishing sector suggested that fisheries managers should focus more on keeping stocks moving in the right direction and less on management action trigger points against specific biomass reference points. Further, they considered that management triggers related to LRPs for byproduct species should be removed from harvest strategies due to the risk of discarding. They submitted that climate change impacts are not always detrimental to stock productivity and may at times offer opportunities as well as challenges for fisheries management. The commercial fishing sector also suggested that the use of dynamic reference points in harvest strategies could lead to inflexibility in management arrangements.

The conservation sector considered overall that the Harvest Strategy Policy does not adequately consider climate change impacts on fishery productivity. They submitted that LRPs for most stocks are currently set too low to address climate change-related uncertainty, particularly in finfish fisheries.

##### Stakeholder workshop, March 2024

* Participants suggested that when recognising changing ocean conditions, the Policy should be clear about which environmental drivers of stock change are being considered.
* Participants noted that determining whether the cause of changes in stock status is due to environmental factors is often difficult, and consideration of appropriate standards of evidence would be important.
  + Noting data limitations may prevent evidence about the environmental drivers for stock change from being conclusive, it may be more important to allocate resources to identifying and responding to changes in abundance, rather than determining the cause of change.
* There were a range of views on the use of dynamic reference points.
  + Participants suggested that there should be clear upper and lower limits for the setting of dynamic reference points.
  + Some participants noted challenges with practical implementation of dynamic reference points, including:
    - lack of data for most species
    - potential social licence difficulties with the possible perception that fisheries managers are ‘shifting the goalposts’ by moving away from static reference points to excuse management failure.
  + Participants suggested that the Policy should be flexible enough to allow for the use of dynamic reference points (and other emerging methods to account for climate impacts on stocks), provided they are implementable, appropriately tested, and consistent with the overall requirements and objectives of the Policy.
* Participants suggested that when incorporating tools for integrating climate change impacts, the Policy should pursue an appropriate balance between responsiveness and stability in management arrangements.

#### Conclusions

While stakeholders and experts agree that changing ocean conditions are influencing the abundance, distribution and resilience of fish stocks, this review finds there is no consensus on a best practice approach for taking these changes into account in harvest strategies.This is to be expected given the variability in the impacts and drivers across species and fisheries. Despite this, it remains critically important that harvest strategies continue to consider the influence of environmental factors such as climate change on fish stocks and harvest strategies are robust to change.

There are mixed views on whether the implementation of a dynamic B0 is appropriate in circumstances where stocks are in a state of decline, even where there is strong evidence to suggest this decline is primarily being driven by environmental factors. This is because the use of dynamic B0 means the LRP would shift with a changing baseline – that is – if B0 is lower, then B20 will consequently be lower in absolute terms. While the adoption of a dynamic B0 may enable fishing to continue for longer when stock decline is environmentally determined, this review considers that measures must be taken to prevent the stock falling below a level that presents an unacceptable risk of recruitment impairment. The Technical Review suggested this could be achieved by establishing a minimum absolute biomass beyond which fishing must cease, however further work is required to determine how this threshold would be determined.

As noted in the previous section, modelling tools and assessment approaches to support decision making continue to evolve. The Policy should enable novel approaches to be adopted, provided they are tested using MSE, or other appropriate methods.

#### Recommendations

1. **The Policy should explicitly recognise that baselines are changing for many species and that harvest strategies should adapt accordingly.**
2. **The Policy should continue to allow flexibility in approaches used to account for environmental factors such as climate change in harvest strategies.**
3. **Further work is needed to determine the standard of evidence required to conclude environmental factors are the primary driver of stock abundance, if this is being used to support use of an alternative management approach, such as dynamic B0.**
4. **When setting LRPs, the Policy should require a minimum absolute biomass beyond which targeted fishing must cease. This could be expressed in terms of absolute biomass, relative abundance, or fishing mortality.**
5. **Novel approaches for taking the influence of environmental factors such as climate change into account in harvest strategies – such as the use of dynamic B0 - should be tested using MSE or other appropriate methods to confirm compliance with the Policy objective.**

### Rebuilding overfished stocks

Key points

When fish stocks are assessed as overfished or subject to overfishing, the Harvest Strategy Policy requires the stock be managed under a rebuilding strategy.

Some stocks in Commonwealth fisheries have been managed under rebuilding strategies for many years without evidence of recovery. The reasons for this failure to recover are unclear, but in some instances the impact of climate change is likely to be a factor.

The review considers further work is required to understand why some stocks are not recovering and to determine next steps when failure to recover is found to be due to factors other than fishing. Methods to assess the extent to which spatial and temporal management tools are contributing to stock protection and recovery need to be developed.

#### Current Policy settings

Part 3.13 of the Policy includes requirements for **rebuilding overfished stocks.** The Policy defines ‘overfished’ as a fish stock with a biomass below its biomass LRP. Stocks that become overfished risk recruitment impairment which can impact on the long-term productivity of the stock. This review notes this can occur when a stock experiences too much fishing, or for reasons other than fishing, such as environmental change. Regardless of why it became or remains ‘overfished’, the current Policy requires that if a stock is identified as overfished, immediate action is required to cease overfishing and recover stocks to levels that ensure long-term sustainability and productivity of the ecosystem, that is, to the LRP. A rebuilding strategy must be developed and implemented until the stock is above the LRP with a reasonable level of certainty.

A rebuilding strategy developed in accordance with the Policy is consistent with the requirements under the EPBC Act for fish stocks listed as ‘conservation dependent’. Species listed as conservation dependent may still be fished, providing they are subject to a plan of management that provides for management actions necessary to stop further decline and support recovery so that chances of long-term survival are maximised. Adequate monitoring and data collection must be in place to assess the status of the stock and rebuilding progress.

If a rebuilding strategy is unsuccessful in stopping decline and supporting recovery of a conservation dependent stock, it may no longer meet the requirements to be listed in this category and may be considered for listing under a higher threatened species category under the EPBC Act. When a species is listed in the vulnerable, endangered or critically endangered categories, fishing may be considered as a key threatening process and prohibited. If a conservation dependant species becomes vulnerable, endangered or critically endangered, these species must then be managed under the relevant provisions of the EPBC Act.

Part 3.14 of the Policy provides that **rebuilding timeframes** should be specified relative to the minimum timeframe for rebuilding in the absence of Commonwealth commercial fishing (TMIN). Rebuilding timeframes should take into account variations in species productivity and recruitment, the relationship between spawning biomass and recruitment, and the stock’s current level of depletion.

#### Technical Review findings

The Technical review notes there are several stocks that have been managed under rebuilding strategies for some time with little evidence of recovery. The Technical Review suggests where there is sufficient evidence to determine failure to recover has been primarily influenced by environmental factors, it may be useful to categorise these stocks an ‘environmentally determined’ rather than ‘overfished’.

#### Implementation review

The draft implementation review notes the 2024 ABARES Fisheries Status Reports identified the number of stocks considered as subject to overfishing and/or overfished has increased in recent years.

While two stocks (orange roughy – eastern, and Southern Bluefin Tuna) have been successfully recovered, 10 domestic stocks managed by the Australian Government were classified as overfished in the 2024 Fishery Status Reports. Some of these stocks have been overfished for many years with no evidence to suggest recovery. Three stocks have recently become overfished suggesting that the harvest strategy they were managed under was not fully effective. The Harvest Strategy Policy provides that rebuilding timeframes should be specified relative to the minimum timeframe for rebuilding in the absence of Commonwealth commercial fishing. While not a mandatory requirement, none of the rebuilding strategies for overfished stocks specify recovery timeframes in relation to TMIN (the time it would take to recover in the absence of Commonwealth commercial fishing).

Key challenges include the collection of appropriate data that allows for the assessment of stocks against the limit reference points, managing the mortality of overfished stocks in multispecies fisheries, and understanding the influence of climate change on some stocks, particularly those that have declined, or failed to recover, despite significant management intervention. The draft implementation review notes lack of data is a key barrier to assessing whether rebuilding strategies are likely to be successful.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The commercial fishing industry noted that after 20 years of management interventions to rebuild stocks in the Southern and Eastern Scalefish and Shark Fishery (including closures, significantly reduced TACs and effort buy-out) it has become clear that some stocks may never recover. They suggest the cost of attempting to assess these collapsed stocks is not within the capacity of the fishery and there does not appear to be any obvious method to assess fish stocks with little or no catch from fishing grounds that are now mostly closed. They submitted that a better strategy might be to use the closure to fishing of habitat as a proxy for eventual biomass increase back to the LRP. The commercial fishing industry also suggested there should be less focus on rebuilding timeframes and more focus on which direction the species is heading i.e. rebuilding or declining.

The conservation sector noted failure of rebuilding strategies to meet their rebuilding targets, particularly in the Southern and Eastern Scalefish and Shark Fishery. They believed this to be driven by overemphasis on industry interests and inadequate monitoring and accounting of discard mortality. They also noted there are no prescriptive, time-bound rebuilding arrangements to guide stocks from LRPs towards TRPs. In their view, this is a key driver of ongoing sub-optimal status of key fish stocks.

#### Conclusions

As noted in Section 3.3, there is a growing body of published work in Australia and around the world that provides a quantitative evidence base for the impact of climate change on fish stocks. There are several examples of stocks that are declining and/or failing to recover despite significant reductions in fishing effort, particularly in southeastern Australia.

Under the current legislative and policy framework, once identified as overfished, immediate action is required to cease overfishing and rebuild stocks to a level that ensures long-term sustainability and productivity. This is currently defined in the Policy as the LRP. Implementing rebuilding requirements in the context of unprecedented changes to the productivity, distribution, and resilience of fish stocks due to a changing climate presents challenges, particularly if declining stock status is not being driven by fishing mortality. In such cases, the expectation that fisheries management interventions will be able to maintain fisheries ecosystems in a state consistent with its past may not be realistic.

Further work is required to understand why long-term overfished stocks are failing to recover, including whether underestimated discards, other non-commercial sources of mortality, or environmental factors are contributing factors. Consideration should be given to the standard of evidence required to attribute factors other than fishing as the primary driver of decline and failure to recover and the implications of such a finding. If fishing mortality is found to be a contributing factor in driving a stock below the LRP, then action must be taken to reduce this mortality and protect the ongoing sustainability of the stock.

The review notes however, that if stock decline and failure to rebuild is being driven primarily by environmental causes rather than fishing mortality, adherence to the current policy settings may lead to continuing catch reductions for declining/non-rebuilding species, and in multi-species fisheries associated reductions to target species may be needed to regulate overall fishing effort. In such cases is may be appropriate to allow fishing to continue where it can be demonstrated this would not contribute to further decline or hinder the recovery of the stock.

Further work is needed to determine the appropriate course of action in situations where it can be demonstrated no amount of fisheries intervention will recover stocks above the LRP due to the influence of factors other than fishing. For example, in situations where environmental factors are proven to be the primary cause of decline and non-recovery, and there is no prospect of the stock returning to levels where it could be fished in accordance with the provisions of the Harvest Strategy Policy, it may be more appropriate for the species to be managed under the provisions of the Commonwealth Fisheries Bycatch Policy.

Consideration should also be given to whether spatial management tools, such as closed areas or Marine Parks, could be relied upon to protect non-recovering stocks that are recategorised as bycatch and no-longer commercially targeted. The review notes arrangements for the protection of stocks that are unlikely to recover to the LRP would need to be consistent with the requirements of the EPBC Act.

#### Recommendations

1. **Recognising some stocks are currently failing to recover, further work is required to understand why - including whether underestimated discards, other non-commercial sources of mortality, or environmental factors are contributing factors.**
2. **The impact of environmental factors should be considered when testing whether fisheries management responses (such as reduced TACs, gear changes, spatial closures) are likely to reverse declines and recover stocks above the LRP.**
   * Consideration should be given to the standard of evidence required to conclude factors other than fishing are the primary driver of stock decline or failure to recover.
3. **Rebuilding strategies should continue to be developed for stocks managed under the Harvest Strategy Policy when they fall below the LRP, unless there is sufficient evidence to indicate fishing has not contributed to stock decline and continued fishing would not hinder recovery. Rebuilding strategies should continue to:** 
   * be focused on recovering stocks above the LRP
   * outline the expected time to recovery to the LRP relative to the time it would take to recover the stock in the absence of any fishing
   * consider the impact of all sources or mortality, including those that cannot be managed or constrained by the Australian government
   * outline performance measures and how these will be monitored and assessed.
4. **Where there is sufficient evidence to indicate fishing would not hinder recovery, and there is no realistic prospect of returning the stock to a level that could be fished under the provisions of the Harvest Strategy Policy, the stock would be classified as ‘bycatch’ and managed under the Commonwealth Fisheries Bycatch Policy and relevant provisions of the EPBC Act.** 
   * The Harvest Strategy Policy should articulate the circumstances under which a stock should be re-categorised as a bycatch species.
5. **Further work across relevant government agencies is required to consider appropriate steps for protecting stocks that have declined below the LRP and are failing to recover primarily due to factors other than fishing. For stocks in this category, management strategies should:**
   * focus on protecting the remaining stock to the extent possible
   * outline recovery trajectories expected in the absence of any fishing
   * consider the impact of other sources or mortality that cannot be managed or constrained by the Australian government
   * consider whether spatial and temporal management tools could be relied upon to protect non-recovering stocks
   * outline performance measures and how these will be monitored and assessed
   * identify how implementation of the management strategy will be resourced.

### Balancing risk, cost and catch

**Key points**

The risk, cost, catch trade off seeks to balance the amount of resources invested in data collection and analysis with the level of catch while ensuring the appropriate level of risk to fish stocks is not exceeded. Risk in this context is both the risk of breaching the LRP and risking recruitment impairment and the risk of not maximising net economic returns to the Australian community.

Reduced data contributes to reduced certainty in stock assessments. Less certainty leads to increased risk, requiring more precaution to be taken when setting catch limits.

The policy should explicitly require the use of a buffer when setting catch limits commensurate with the level of uncertainty in assessments. Further work is also needed to improve estimates of other sources of mortality, including discards.

The review supports the use of non-conventional stock assessments in the absence of commercial catch data provided their effectiveness is appropriately tested.

Current policy settings

Section 3.5 of the Harvest Strategy Policy requires a risk-based management approach to developing and implementing harvest strategies in Commonwealth fisheries—that is, more caution is used when uncertainty about stock status increases. The **risk–cost–catch trade-off** seeks to balance the amount of resources invested in data collection, analysis and management of a stock or fishery with the level of catch taken from that stock or fishery, while ensuring acceptable levels of risk to the stock are not exceeded.

In the context of the current Harvest Strategy Policy, the risk being managed is principally that of breaching the LRP and not achieving MEY. Costs are the expenses associated with the collection and analysis of data to inform management, and the processes and activities required to administer and operationalise a harvest strategy (including monitoring and compliance). Catch in this context is a proxy for the level of precaution taken in a harvest strategy. When a higher level of catch (yield) is provided for without additional investment in monitoring and compliance, there is greater risk of breaching the LRP or not meeting MEY targets, so the risk-catch-cost trade-off requires more information to be acquired to ensure this is not the case. Alternatively, catch levels need to be reduced.

Commonwealth fisheries vary in size and complexity and not all fisheries can support highly specified and high information harvest strategies. Harvest strategies can be formulated around data poor assessments with due consideration of the level of uncertainty in the assessment outputs. This risk associated with this uncertainty can be better understood through MSE testing or through applying a buffer or discount to the recommended biological catch or effort level. The Harvest Strategy Guidelines outline a tier structure for achieving risk equivalency with potential default buffers that could be applied to data rich, data moderate and data poor assessments.

In relation to catch, section 3.2 of the Harvest Strategy Policy sets out that harvest strategies for Commonwealth-managed fisheries must **account for all known sources of fishing mortality** on a stock, including recreational and Indigenous fishing, discards, and fishing under the management of another jurisdiction. A commercial TAC may be derived by subtracting the estimated catches of other sectors (and any other sources of mortality including discards) from the Recommended Biological Catch (RBC).

#### Technical Review findings

The Technical Review notes various problems have led to the deterioration of quality and quantity of data available to support reliable stock assessments, account for all sources of mortality, and calculate appropriate targets. This includes shifting baselines for unfished biomass as discussed in Section 3.3, as well as monitoring cost pressures, restrictions on access to fishing grounds, and limited data on non-commercial sources of mortality.

Traditional stock assessment methods that rely on comprehensive fisheries data are becoming less reliable due to a combination of:

* Shrinking commercial fleets, generally fishing in smaller areas for a smaller suite of stocks;
* Rebuilding strategies that prevent targeting of these stocks – thereby reducing the magnitude and accuracy of the data collected;
* High cost of fishery independent surveys for those species; and
* Changing access to fishing grounds due to fishing area closures, declaration of marine parks and offshore energy developments.

Much of the data used to support stock assessments, including catch rates and size and structure of catch, is obtained from the commercial fisheries sector. When parts of the population are unfished due to spatial restrictions on commercial fishers, this presents challenges for obtaining sufficient data for stock assessments. The flow on effect is that more fishery independent surveys are required (at additional cost) or more precautionary approaches to setting catch limits need to be implemented.

The Technical Review suggests the Harvest Strategy Policy Guidelines should better document the complexities in assessing the impacts of spatial restrictions on stock status and refer to tools, such as the ecosystem model Atlantis, which are capable of assessing these impacts in the absence of commercial catch data. However, the Technical Review also noted that further development and application of tools such as Atlantis is still required, and currently the data required to support the use of such ecosystem models is limited.

#### Implementation review

Sections of the Implementation Review that summarise recent stock status; accounting for all sources of mortality; variability, regime shift and climate change; and barriers to implementation are relevant to risk, cost, catch.

The draft implementation review notes the number of stocks classified as “uncertain” in ABARES annual Fishery Status Reports is increasing. A stock is classified as uncertain in circumstances where ABARES consider there is not enough information to determine the stock status with a reasonable level of certainty. The implementation review notes that accounting for all sources of mortality has been challenging for many stocks. Understanding total mortality is an important ingredient to adequately assessing risk.

The implementation review also notes that stock variability, regime shift and climate change are a complex set of processes to understand, analyse and if necessary, account for within a harvest strategy (or rebuilding strategy). A recent international workshop demonstrated that this is a challenge being faced by fisheries all over the world and that there are limited examples of progress or change to the harvest strategies globally (Smith, Fulton, and Punt, 2023). Understanding any increases in risk due to climate is also important for adequately assessing the risk, cost, catch trade off.

The draft implementation review notes spatial and temporal management tools are commonly used in Australian Government managed fisheries. While not generally included within harvest strategies, closures are implemented to complement harvest strategies when required to support the recovery of stocks that have declined below the LRP. The use of spatial and temporal closures to deliver on the Policy objectives is rarely explicitly tested through formal MSE processes.

Many of the barriers, challenges and emerging issues identified by the draft implementation review relate to data and this can impact assessment of risk, cost, catch trade-offs. These can arise because of, for example, a lack of data to construct a reliable index of abundance or limited data on important components of total mortality, such as discards or catches from other fisheries/sectors. The amount of data (both fishery-dependent and fishery-independent) available for use in many stocks has decreased in recent years, often due to either general declines in effort or where AFMA have implemented management measures to reduce fishing mortality on overfished stocks. The reduction in available data has impeded AFMA’s ability to commission robust stock assessments for some stocks.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The commercial fishing industry considered that managing fisheries through uncertainty may see costs become disproportionate to the value of some fisheries. They expressed support for the expansion of risk-based assessments in the absence of perfect information and in the context of high monitoring costs. Industry also called for increased clarity regarding the application of the precautionary principle in the Harvest Strategy Policy. They noted that with the reduction in size of fishing fleets in some fisheries, the regulatory burden is being shared across fewer operators, and that management policy should recognise this when seeking to balance risk, catch and cost. The commercial fishing industry considers that cost recovery should be applied to all users of fishing resources, including the recreational fishing sector.

In contrast, the conservation sector submitted that the Harvest Strategy Policy’s objective is insufficiently precautionary and does not explicitly recognise uncertainty. They consider there to be inadequate application of the precautionary principle in the management of Commonwealth fisheries, and has contributed to adverse impacts on stocks, particularly in the Southern and Eastern Scalefish and Shark Fishery.

##### Stakeholder workshop, March 2024

* Participants noted the risk, cost, catch provisions in the policy require more precaution to be adopted in setting catch limits when there is less certainty around stock status.
* Participants noted that risk, catch, cost considerations have changed due to spatial squeeze, fleet reductions and closures.
  + It was suggested that although the policy does not constrain fisheries managers from considering the impact of closed areas, it should be more explicit about the challenges faced due to spatial squeeze.
  + It was also suggested by some participants that closure areas could be considered more holistically in the context of assessing risk – for example, before implementing a fishery-specific closure to achieve a management outcome, consider whether another closed area could be providing the desired level of protection.
* Participants noted that there is a need for clarification on how to assess the effectiveness of rebuilding strategies.
* It was suggested that fisheries managers could investigate sources of data beyond traditional commercial fisheries sources, including data collected in the management of offshore energy zones and from ships of opportunity.
* It was noted that a key challenge in accounting for all sources of mortality is obtaining regular and consistently collected non-commercial catch data, reliable discard data and the sharing of data between jurisdictions for shared stocks.
* Some participants suggested that there should be recognition of equivalency with the Marine Stewardship Council certification scheme when assessing fishery sustainability.
* It was noted that the Harvest Strategy Policy should include a procedure for considering exceptional circumstances that arise that were not anticipated and tested as part of the MSE for a harvest strategy.
  + The policy should specify a timeframe for exceptional circumstances to be investigated and actions that may be taken before any changes are made to existing management arrangements including TACs.

#### Conclusions

This review recognises multiple factors are contributing to difficulties in striking an appropriate balance between risk, cost and catch. Factors contributing to increased risk include the emerging impact of climate change as discussed in section 3.3, loss of commercial catch data due to fishery closures and lack of robust data to inform estimates of non-commercial sources of mortality and discards. Catch is consequently impacted by the need to implement precautionary measures due to uncertainty, as well as access limitations and smaller fleet sizes brought about by the ‘spatial squeeze’. Capacity to reduce risk is influenced by the cost associated with improved monitoring and data collection to inform more reliable stock assessments.

Ideally, where a harvest strategy is supported by a stock assessment, that assessment should attempt to account for all known sources of mortality. This review heard this can be challenging where there is limited access to reliable catch (including from non-commercial sectors) and discard data. To address this issue, the Policy should require the use of an appropriate buffer commensurate with the level of stock assessment uncertainty when setting TACs to ensure stocks are maintained above the limit reference point at least 90% of the time.

There is also a clear need to undertake dedicated activities to improve the reliability of estimates for non-commercial take and discards, including recreational take of stocks shared with other jurisdictions. Commercial TACs are based on the recommended biological catch, less other sources of fishing mortality that must be accounted for. In the absence of reliable data on all sources of mortality, TACs may be set too low, unnecessarily constraining commercial take, or conversely, set too high, putting the stock at risk of overfishing.

This review also identified that there is no formal procedure outlined in the Policy for considering exceptional circumstances or conditions that could increase the risk that management arrangements implemented under harvest strategies will not effectively achieve the Policy’s objective. Exceptional circumstances that may be considered include:

* New information on the stock, fishing operations, population dynamics parameters, or biology that is outside the range considered during MSE testing
* Total catch is found to be greater than the recommended biological catch – for example, the catch of a shared stock in another jurisdiction is higher than anticipated.

In practice, AFMA’s Resource Assessment Groups and Management Advisory Committees already consider exceptional circumstances, however the Policy could provide a specific procedure and timeframe for taking actions such as gathering more information, triggering an earlier review of the harvest strategy, or considering changes to TACs if there is high risk to the stock.

#### Recommendations

1. **The Policy should recognise the spatial squeeze and consequent access restrictions on commercial fishers is impacting the collection of data to inform fisheries assessments and changing the risk posed by fisheries.**
2. **The Policy should specifically include a requirement to incorporate a buffer when setting TACs to achieve risk equivalency based on the level of uncertainty in stock assessments, including uncertainty associated with discard mortality.**
3. **The Policy should require that harvest strategies include a procedure for considering and responding to exceptional circumstances, including timeframes for specific actions.**
4. **While beyond the scope of the Harvest Strategy Policy, this review notes there are growing calls for a multi-sector ocean-wide monitoring and data collection framework to reduce reliance on commercial catch data**

## Review of key policy settings of the Commonwealth Fisheries Bycatch Policy

### Policy Purpose

Key points

The Policy is an important tool, and the objective of minimising bycatch remains current. EPBC-Listed Species should continue to be referenced in the policy.

The policy should continue to be outcomes focused allowing for flexibility in delivery while continuing to provide overarching guidance.

The Harvest Strategy Policy is being reviewed at the same time as the Bycatch Policy. There is a need to ensure alignment with the recommendations arising from both policies in relation to the categorisation of species managed under each policy.

#### Current policy settings

The Bycatch Policy was developed in recognition of the objectives of the *Fisheries Management Act 1991* (FMA), specifically:

…ensure 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 (ESD) (which include the exercise of the precautionary principle), 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 precautionary principle is defined by the FMA as:

where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

1. careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
2. an assessment of the risk weighted consequences of various options.

The development of the Bycatch Policy was driven by Australia’s obligations under the Food and Agriculture Organisation (FAO) Code of Conduct for Responsible Fisheries (1995) as well as responsibilities under the Law of the Sea for ’species associated with or dependent upon’ fished species within the exclusive economic zone. Since 2000 the policy has been used to assist Australia in meeting its international obligations for the protection of bycatch under many conventions and treaties.

In 2005, the Australian Government Fisheries Minister issued a formal direction requiring AFMA to take immediate action in all Commonwealth fisheries, including to:

* cease overfishing and recover overfished stocks to levels that will ensure long-term sustainability and productivity;
* avoid further species from becoming overfished in the short and long term; and
* manage the broader environmental impacts of fishing, including on threatened species or those otherwise protected under the EPBC Act.

Following the Ministerial Direction, the department developed the Harvest Strategy Policy. The Bycatch Policy works in concert with the Harvest Strategy Policy and was most recently updated in 2018.

##### Environment Protection and Biodiversity Conservation Act 1999 listed species

The Bycatch Policy considers bycatch in two ways; either as general bycatch or as EPBC Act-listed species. EPBC Act–listed species comprise those species protected under Part 13 of the EPBC Act (except for conservation-dependent species managed under the Harvest Strategy Policy in line with the requirements of the EPBC Act).

For EPBC Act-listed bycatch species, management arrangements must ensure fishing operations take all reasonable steps to avoid the mortality of, or injury to these species. All interactions with EPBC Act-listed species must be reported to the Department of Climate Change, Energy the Environment and Water. The management response to interactions with EPBC Act-listed species is generally determined on a fishery or species basis by AFMA (unless there are additional international obligations or joint management arrangements).

##### General Bycatch

General bycatch is managed by AFMA through Ecological Risk Assessments (ERAs) and Ecological Risk Management (ERM) with ERM actions to mitigate the unacceptable risk to species reflected in bycatch and discard workplans. The Bycatch Policy states ‘no general bycatch species should be exposed to any greater risk than that faced by a commercial species managed under the Harvest Strategy Policy’. Both the Bycatch and Harvest Strategy policies apply the same test that species should not be exposed to an unacceptable risk of recruitment impairment.

##### International fisheries

For fisheries managed jointly by an international organisation or arrangement, the Bycatch Policy does not prescribe management arrangements for those organisations but advises that the government will continue to pursue actions to reduce bycatch and fishing impacts consistent with the Bycatch Policy and domestic fisheries management arrangements.

The policy provides an anchor point which gives credibility to Australia in international fora. This contributes to Australia’s status as a global leader in fisheries management.

#### Implementation review

Bycatch strategies or workplans have been developed and published for most Australian Government-managed fisheries over the past two decades.

The Implementation Review noted the Bycatch Policy requires the development of Bycatch Strategies for general bycatch, and outlines a range of elements Bycatch Strategies should include. The Bycatch Guidelines recommended these strategies be included within broader Fisheries management Strategies (FMS). However, in part due to resourcing challenges associated with developing FMS, AFMA has made a decision in recent years to pursue the objectives and requirements of the Bycatch Policy and the Harvest Strategy Policy objectives via continuation of separate harvest strategies, bycatch and discard workplans, research and data strategies, rather than via integrated FMS.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The Commonwealth Fisheries Association (CFA) provided a submission that encouraged fisheries management policies that provide for efficient and cost-effective fisheries management while ensuring activities are conducted in a manner consistent with the principles of ecologically sustainable development.

The fishing industry (CFA & Tuna Australia) suggested the definition of bycatch could be amended to exclude encounters between bycatch and fishing operations under the definition of an interaction unless there is harm or stress caused.

The Australian Marine Conservation Society (AMCS) submission stated the Bycatch Policy objective must explicitly include robust monitoring of bycatch and noted the objective must also explicitly include ensuring strong rebuilding of Endangered, Threatened and Protected (ETP) species and overfished bycatch species.

##### Stakeholder workshop, September 2024

Participants noted support for the policy and its objective to minimise bycatch.

Some participants noted the need to consider animal welfare in the policy objectives in addition to mortality.

Participants discussed the importance of utilisation, where utilisation references the use of bycatch species rather than discarding them, essentially transitioning form bycatch to byproduct.

There was discussion on the importance of definitions and ensuring that terminology is used consistently throughout government and industry.

#### Conclusions

This review found the policy is important and necessary, and that the objective of the policy remains appropriate. Further, the policy should continue to be outcomes focused allowing for flexibility in delivery while continuing to provide overarching guidance. This also ensures risk assessment and performance reporting are featured strongly in the policy.

This review also found that the policy should continue to make reference to EPBC Act-listed species, noting the risk-based approach considers all bycatch species.

There are many animal welfare initiatives occurring through government such as the renewal of the Australian Animal Welfare Strategy and key initiative 6.6 of the National Fisheries Plan. Animal welfare issues should be pursued through these initiatives, and the Bycatch Policy should not hinder the implementation of any new proposals.

The Harvest Strategy Policy is being reviewed at the same time as the Bycatch Policy. There is a clear delineation between species covered under the Harvest Strategy Policy (key commercial and byproduct) and the Bycatch Policy (bycatch). Chapter 3 of the Harvest Strategy Guidelines and chapter 7 of the Bycatch Policy Guidelines give examples of how species may move between the two policies. For example, a byproduct species under the Harvest Strategy Policy could move to treatment as bycatch under the Bycatch Policy when less than 5% of the catch was retained, or when less than 10 fish were landed in a year.

#### Recommendations

1. **The policy should be retained, and objective should remain the same.**
2. **Ensure the policy remains outcomes focussed, that is, determining the outcomes sought to be achieved (consistent with the policy objectives) rather than prescribing the means to achieve them. This allows for flexibility in delivery while continuing to provide overarching guidance.**
3. **The policy should continue to make reference to EPBC Act-listed species within the policy, noting the risk-based approach considers all bycatch species.**
4. **The Policy should align with the recommendations arising from the review of the Harvest Strategy Policy in relation to the categorisation of species managed under each policy. This could include information provided in Chapter 7 of the Bycatch Policy Guidelines which gives examples of how species may move between the two policies.** **Any changes should also be consistent with the EPBC Act.**
5. **The definitions and terminology used in the policy should be reviewed to ensure consistency across policies, government and jurisdictions.** 
   * The definitions of Endangered, Threatened and Protected Species (ETP Species), Bycatch, Key commercial, and Byproduct should be reviewed to ensure consistency with international and industry standards.

### Data and Reporting

Key points

Performance reporting could be improved. There is an opportunity to explore options to make reporting more meaningful and transparent, potentially leading to increased confidence in the management of bycatch, public trust and social licence.

The review process considered the importance of data collection for the use in ERAs. It was determined that all available data sources should be utilised to ensure adequate information is used to inform the Ecological Risk Assessment (ERA) and Ecological Risk management

#### Current policy settings

The Bycatch Policy requires:

…Data collection should be sufficiently robust to support appropriate risk assessments, inform effective management options, monitor bycatch interactions and industry compliance and enable assessment of the efficacy of any management measures…

And

... Where bycatch species interact across more than one fishery covered by this policy, data collection, reporting and monitoring arrangements are encouraged to be consistent across fisheries to allow quantification of cumulative impacts and to support the effective implementation of the Bycatch Policy…

This would indicate, where possible, standardised data collection should occur to ensure effective sustainable fisheries management, safeguarding the long-term species and ecosystem viability as consistent with the ecosystem-based approach. The Bycatch Policy does not stipulate parameters for which data must be collected, how it is collected or by whom, however the Bycatch Policy Guidelines do suggest what data should be collected including species level data on bycatch, quantity, location, effort and gear used.

#### Implementation review

##### Data collection, including reporting to AFMA by fishers

The implementation review found AFMA has implemented a requirement for fishers to report catches in logbooks across all of its fisheries and has implemented logbook instructions for reporting of bycatch in many of its fisheries. It went on to note fisher reporting of bycatch and discards in logbooks is typically poor in fisheries where fisheries independent data collection (human observers or electronic monitoring) is low or absent. As such, ‘robust’ bycatch data collection systems typically require implementation of human observers or electronic monitoring (or scientific surveys) that have sufficient spatial, temporal, boat and method coverage that can provide bycatch data representative of the fishery as a whole, and/or which can incentivise accurate logbook reporting by fishers. Validation and verification are important aspects of ensuring data quality, which are enabled by observers and electronic monitoring.

The implementation review found independent monitoring of general bycatch varies across fisheries, spanning some fisheries having 100% observer or electronic monitoring coverage to other (generally smaller) fisheries having no independent monitoring.

##### Reporting

The 2022-23 AFMA Annual Report contains information on bycatch and bycatch management across Australian Government-managed fisheries. The coverage of that reporting is variable, with room for improvement in both performance reporting and quantification of general bycatch.

The implementation review noted there may be other AFMA reporting processes (outside the annual report) that are public and provide relevant information.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

The Australian Marine Conservation Society (AMCS) called for robust monitoring of bycatch to ensure populations of ETP and overfished bycatch species are rebuilt. They stated the current operating environment where up-to-date, robust stock assessments are unable to be undertaken, is one where overfishing, underinvestment in or incapacity to collect robust discard estimates, and poorly managed climate change impacts are turning former commercial and secondary species into ETP species.

AMCS argued greater consideration and implementation of the 2005 ministerial direction was required. Specifically, the requirement to ‘enhance the monitoring of fishing activity, for example through increased use of vessel monitoring systems with daily reporting, on-board cameras, and observers’. They suggested observer coverage has remained well below levels that could provide reliable estimates of ETP interactions, bycatch and discarding, and benthic interactions in many Commonwealth fisheries.

CFA and Tuna Australia noted the lack of regulated reporting for recreational fisheries increases the risk to both commercial and bycatch species as not accounting for this catch can have a direct impact on population assessments.

##### Stakeholder workshop, September 2024

Much of the data collection discussion at the workshop focused on climate change impacted species. Participants noted the importance of data collection and use in ERAs for species impacted by distribution shifts and declining stocks driven by climate impacts. Most participants agreed that the fishing industry should not be solely responsible for the collection of this data as the fish are not targeted, may be occurring in areas closed to fishing and changes are not driven by fishing activity.

Participants discussed the importance of ensuring that data is collected to achieve a purpose and not collecting more data at a cost to industry for the sake of collecting data. It was also noted that advancements in electronic monitoring would provide for more data collection that could be used in ERAs.

Some participants raised the importance of considering costs to the Australian community when fishing activities push species from a key commercial species to a byproduct species to a bycatch species and eventually an ETP species.

#### Conclusions

AFMA’s reporting obligations under the current policy are being met, however both stakeholders and the implementation review noted that performance reporting could be improved to evaluate progress and support stakeholder engagement.

While the Bycatch Policy requires sufficiently robust data collection and states the independent auditing should be used to provide transparency, there is an opportunity to explore options to make reporting more meaningful and transparent, potentially leading to increased confidence in the management of bycatch, public trust and social licence.

To that end Chapter 12 of the Bycatch Policy Guidelines suggests what data should be collected including specie, quantity, location, effort and gear used. In addition, Part 13 of the EPBC Act and the *Guidelines for the Ecologically Sustainable Management of Fisheries 2007* require bycatch reporting and the Guidelines further specify the need for reliable information collection to inform decisions and management responses.

Stakeholders and experts agree that changing ocean conditions due to climate change is influencing the abundance, distribution and resilience of fish stocks. Climate change and its impact on species distribution and population size should be a key consideration when undertaking ERAs. While fishing data is one way to measure these impacts, there are many initiatives that may provide additional insights into the impacts of climate change. All available data sources should be utilised to ensure adequate information is used to inform ERAs.

Data is critical to understand the changes and challenges impacting the marine environment. However, collection should not only be the responsibility of the fishing industry. The policy should allow for cross governmental work to access all available relevant data, including through the Sustainable Ocean Plan.

#### Recommendations

1. **Explore options to make reporting more effective.**
   * The review process found that reporting could be improved potentially leading to increased confidence in the management of bycatch, public trust and social licence.
   * This could extend to focussing on the effectiveness of mitigation measures for high-risk species.
2. **The ERA process should remain agile.** 
   * This would allow for all relevant available data to be utilised to ensure adequate information is used to inform ERAs. Other users of the marine estate should be encouraged to collect additional data which could then feed into the ERA process.

### Risk equivalency and assessment

Key points

There are continuing challenges associated with collection of the necessary data to implement bycatch plans and undertake ERAs, resulting in an increased level of risk and assessment challenges. The policy needs to remain strong on its approach to risk with a focus on outcomes to allow for adaptive management and adaptation as methodologies improve.

The precautionary principle plays a critical role in the policy’s objective, particularly where there is a lack of data or certainty. The lack of data should not be a reason for postponing a measure to prevent degradation.

The review found there is a need for greater direction within the policy in relation to risk equivalency and assessment, and that there is more work to done to address cumulative impact assessments.

#### Current policy settings

The Bycatch Policy applies a risk-based framework to support the minimisation of bycatch and decrease risk to species. It acknowledges information to inform the assessment and management of bycatch species is often limited, and decisions are made in the absence of a complete understanding of fishing impacts on bycatch.

When assessing risk, decisions made under the Bycatch Policy consider the risk-cost-catch concept. The current formulation of this principle in the Bycatch Policy is that that the risk of fishing interactions to bycatch species are to be balanced with the cost of fisheries management and economic returns from fishing. Fishing mortality will always be constrained such that the species interacted with in a fishery are not exposed to an unacceptable risk.

The Bycatch Policy Guidelines provide more context:

The risk–catch–cost trade-off seeks to balance the amount of resources invested in data collection, analysis and management of a fishery, the level of catch (or fishing mortality) taken from that fishery and the risk level. The higher the level of uncertainty about the state of a species, stock or fishery and how that species, stock or fishery is performing against its objectives, the more the fishery should mitigate or offset the risk of getting things wrong (for example, overfishing or overcapitalising) through being more precautionary (for example, reducing catch/fishing mortality and investing in additional monitoring).

Actions and strategies to reduce bycatch including bycatch reduction devices and onboard handling practices to enhance post release survival are key to ensuring bycatch species are not exposed to ‘unacceptable’ risks. Additionally, general bycatch populations must not be exposed to any greater risk than that accepted for commercial fish stocks managed under the Harvest Strategy Policy, which include key commercial and byproduct species.

The policy also requires that bycatch species are not exposed to unacceptable risk of recruitment impairment through cumulative impacts and states the assessment and management of bycatch species should account for all sources of mortality:

This means accounting for all known threats and causes, including regime shift, climate variability factors, mortalities from fishing and any other factors that a species may face across its range. This policy recognises that AFMA is only responsible for managing the risk of fishing-related mortalities in Commonwealth-managed fisheries.

#### Implementation review

The Implementation review found AFMA implements ERA and ERM approaches to assess and manage risk to general bycatch and most byproduct species in Australian Government-managed fisheries.

AFMAs ERA framework comprises a tiered or hierarchical framework for assessing the risk posed by fisheries to the ongoing sustainability of five ecosystem ‘components’, being key commercial species, byproduct/bycatch species, protected species, habitats and ecological communities. The assessment framework is designed to be both precautionary and cost efficient, with three potential levels of assessment.

Ecological Risk Assessment’s (ERAs) have been conducted for all fisheries that require them, with most major fisheries having updated ERAs since 2018.

More than 2000 bycatch and byproduct species are assessed using ERA. The vast majority of these species have been found to not be at high risk from fishing, and all but three fisheries have been assessed to not have any species at high risk from fishing. Most of the high-risk species are assessed to be ‘data deficient’ high risk, meaning there is uncertainty as to the actual risk to the species from fishing. The documented management responses for many of these species are focussed on additional data collection.

The implementation review further found the ERA methodologies currently used by AFMA are designed to be precautionary and default to high-risk scores for attributes where data is missing. Where this approach results in the final overall risk score being high, the species may be characterised as ‘high risk - data deficient’.

With respect to ERM responses, for species rated as high risk – data deficient, the response most consistent with the precautionary principle (from a sustainability perspective) would be to treat those species as high risk and implement actions to reduce risks posed by the fishery. However, the Bycatch Policy and its Guidelines recognise that due to risk-cost-catch considerations and the need to avoid impacts on fisheries resulting from potential false-positive ERA outcomes, the initial ERM response for these species may be data collection to address identified ERA data gaps. Where this approach is applied, data collected should specifically address the gaps from the ERA and should then lead to a re-assessment of risk. To date, additional data collection has been one of the main ERM responses for most high risk (data deficient) species. This should be followed by re-assessment (and further ERM if risk remains high) to ensure management remains precautionary.

The implementation review found implementation of cumulative risk assessments (across multiple fisheries or sectors) in Australian government managed fisheries is yet to occur. Methodological advancements in cumulative risk analysis have occurred but have not progressed to practical implementation.

#### Stakeholder feedback

##### Have Your Say, October to November 2023

In their submission, the Commonwealth Fisheries Association (CFA) raised the idea that risk-based assessments (including independent risk assessments) should be expanded, as they consider good fisheries management decisions do not require perfect and complete knowledge, which is very expensive to obtain even if available. They argue the ‘precautionary principle’ is often invoked by decision makers to offset risk and uncertainty, but widely varying approaches to caution can lead to undesirable consequences.

The CFA noted the need to define the right balance between risk, cost and catch. The cost of managing fisheries through increased uncertainty may see costs of management become disproportionate with respect to the value of some individual fisheries. They argued it is critical that management costs are balanced with an equitable allocation of fishing opportunities and more flexible attitude to risk that will allow for fisheries to operate whilst managing fisheries at sustainable levels.

On the subject of risk, AMCS noted without robust and up-to-date data, there is an unacceptable risk when applying the same stock assessment methods as applied to commercial species.

##### Stakeholder workshop, September 2024

As raised under section 4.1, participants at the workshops again discussed the importance of considering First Nations interests in the ERA and ERM processes and ensuring adequate information is available.

Discussion followed on from the ‘Data and Reporting’ chapter. It was recognised that data collection is key to ensuring that ERAs are effective and that risks are managed. Again, climate impacted stocks were a key point of discussion and having access to relevant data is necessary for effective ERAs. Some participants raised the risks and issues associated with obtaining data and the limitations of data sharing arrangements between jurisdictions

Participants also noted the impact of environmental factors should be considered when testing whether fisheries management responses (such as reduced Total Allowable Catches (TACs), gear changes, spatial closures) are likely to have positive impacts on risk levels.

#### Conclusions

As discussed in section 4.2 above there are continuing challenges associated with collection of the necessary data to implement bycatch plans and undertake ERAs, resulting in an increased level of risk and assessment challenges. The policy needs to remain strong on its approach to risk with a focus on outcomes to allow for adaptive management and adaptation as methodologies improve.

These solutions could address issues such as:

* giving further consideration to how mitigation measures can influence the level of risk
* considering if there are more efficient ways to address cumulative risk
* the impacts of a changing marine environment on our ability to undertake ERAs
* ensuring data collected for ‘high risk-data deficient’ stocks is targeted at key information gaps to allow reassessment
* the need to define ‘unacceptable’ risks which may include the consideration of injury, not just mortality

Given the importance of fisheries data to support decision making, the precautionary principle plays a critical role in the policy’s objective, particularly where there is a lack of data or certainty. The lack of data should not be a reason for postponing a measure to prevent degradation.

As noted in section 4.2, ERAs should not be reliant on just fishing data, but should also incorporate all available sources of data. This may also include the consideration of the impacts of areas closed to fishing activities such as Marine Protected Areas and offshore renewable energy zones.

#### Recommendations

1. **Where the Bycatch Policy Guidelines provide more clarity on the assessment of risk, these sections should be elevated to the policy proper.**
   * This should include assessment of mitigation measures, cumulative risk, a changing marine environment and data deficient stocks.
     + 5 (as pertaining to the assessment of mitigation measures)
     + 10 (as pertaining to cumulative risk)
     + 11 (as pertaining to the changing marine environment)
     + 12 (as pertaining to data deficient stocks)

## First Nations interests

The Department worked with AFMA and the Fisheries Research and Development Cooperation (FRDC) on a project to improve the way it engages with First Nations stakeholders in Commonwealth Fisheries (FRDC2021-024). The aim was to better understand and consider First Nations interests as part of the management of Commonwealth fisheries.

As part of this project a trial Indigenous Fisheries Technical Working Group was established as a case study for national-level engagement on fisheries related legislative and policy reforms. The group considered the Harvest Strategy Policy and Bycatch Policy and made a submission to inform this review. To address the interests of First Nations people, the submission recommended that both Policies be amended to include:

* Statements on Indigenous rights, interests and objectives including:
  + Legislative and government commitments that must be considered when developing a harvest strategy.
  + A broad definition of Indigenous fishing.
  + Social and Indigenous cultural objectives in definition of a harvest strategy
  + A schedule of species of importance to Indigenous people.
* A standard that the governments and/or proponents must meet with respect to engaging Indigenous groups in the development of fishery-specific harvest strategies and a clear process for demonstrating that a strategy meets this standard. This could include:
  + Pre-harvest strategy relationship and capacity development.
  + Engagement in strategy development including supporting Indigenous groups to make an informed decision about the preferred nature and extent of their involvement in strategy development.
  + Risk and impact assessment with respect to species of importance to Indigenous groups.
  + Development of harvest strategies that include objectives and outcomes of relevance to Indigenous groups.
  + Dissemination and implementation of harvest strategies with an associated statement on Indigenous interests.
* A set of default principlesconsidered most likely to produce outcomes that meet Indigenous rights, interests and objectives, with relevant precedents/examples noted. These principles should include:
  + Access and allocation. Maintaining/protecting Indigenous access to fisheries resources.
  + Species population levels including biomass targets. Ensuring sufficient abundance to meet Indigenous people’s needs.
  + Impacts on culturally sensitive species and areas. Reducing impacts of non-Indigenous fisheries on Indigenous values in specific species and places.

The Indigenous Fisheries Technical Working Group submission also recommended that biomass Limit Reference Points (LRPs) should be highly precautionary in order to maintain sufficient stock abundance for cultural fishing, citing as examples two Torres Strait harvest strategies with LRPs well above the default B20 proxy.

#### Current policy settings

The Harvest Strategy Policy articulates a requirement for the interests of First Nations sectors to be considered when developing harvest strategies for commercial fisheries. This is consistent with the requirements under the FMA that AFMA “in the performance of its functions, is to have regard to the objective of ensuring that the interests of commercial, recreational and Indigenous fishers are taken into account” (see FMA s 3(1)(e)).

Part 3.2 of the Harvest Strategy Policy sets out that harvest strategies for Commonwealth-managed fisheries must account for all known sources of fishing mortality on a stock, including recreational and Indigenous fishing. The interests of First Nations fishers are not explicitly defined within the Harvest Strategy Policy or Guidelines.

The Harvest Strategy Policy Guidelines provide information on approaches for taking into account all sources of mortality when establishing commercial TACs. This involves calculating the Recommend Biological Catch (RBC) that should be applied to a stock to achieve a pre-defined Target Reference Point (TRP) (currently BMEY) and subtracting the estimated catches of other sectors to derive a TAC for commercial fishers. A formal resource sharing arrangement may also be developed to apportion the RBC between sectors, though there is currently only one example where this has occurred – for recreational catch in the Southern Bluefin Tuna fishery.

The Commonwealth Fisheries Resource Sharing Framework 2020 outlines the government’s approach to sharing fisheries resources across commercial, recreational, and First Nations fishing sectors. It works alongside the Harvest Strategy Policy by providing a principles-based approach to creating resource sharing arrangements to manage access and allocation issues in Commonwealth fisheries.

The *Commonwealth Fisheries Resource Sharing Framework 2020* outlines the government’s approach to sharing fisheries resources across commercial, recreational, and First Nations fishing sectors. It works alongside the Harvest Strategy Policy by providing a principles-based approach to creating resource sharing arrangements to manage access and allocation issues in Commonwealth fisheries.

#### Technical Review findings

As described earlier in this paper, the Technical Review notes there is growing recognition that maximising net economic returns to the Australian community should include clearer consideration of the interests of non-commercial sectors, including First Nations. Ideally this could be achieved by directly considering the economic interests of First Nations and recreational fishers when calculating a biomass TRP, however the data required to support such assessments is limited. Alternatively, the Technical Review suggested the Harvest Strategy Policy provide for the adoption of higher TRPs in some fisheries which may benefit non-commercial users by seeking to maintain greater stock abundance.

#### Stakeholder feedback

##### Harvest Strategy Policy Stakeholder workshop, March 2024

* Participants broadly agreed the Policy should articulate principles and standards for engagement with First Nations people and communities with fisheries interests.
* It was noted First Nations people have multiple types of interests, including cultural interests, traditional commercial bartering practices, and commercial economic development interests.
* Participants discussed how First Nations interests might be addressed in the Policy, including through setting higher biomass targets and spatial access management. Participants noted:
  + First Nations stakeholders generally want more conservative (higher) biomass reference points in fisheries where they have significant interests.
  + Accounting for non-commercial interests in the setting of biomass TRPs is a matter for the Policy, however sharing of available catch should be managed under the *Commonwealth Fisheries Resource Sharing Framework 2020*.
  + While harvest strategies can account for First Nations interests, non-commercial interests are not explicitly managed by AFMA.
* Participants generally expressed in-principle support for the concept of a schedule of species of importance, noting:
  + Clear principles and priorities for the including species on the list need to be defined.
  + The Policy would need to clearly articulate how the schedule of species is to be considered in developing and implementing harvest strategies.

##### Bycatch Policy Stakeholder workshop, 18 September 2024

Participants discussed that First Nations wellbeing should be integrated into the Ecological Risk Assessment (ERA) and Ecological Risk Management (ERM) processes to ensure First Nations interests are adequately addressed. Participants noted this would align with discussions had during the Harvest Strategy Policy stakeholder workshop in relation to the trial Indigenous Fisheries Technical Working Group’s recommendation of a schedule of species of importance. This schedule could be used to feed information into the ERA and ERM process to ensure First Nations Interests are considered.

#### Conclusions

Stakeholders from all sectors were largely supportive of the inclusion of a set of principles and engagement standards within the Policies to guide consideration of First Nations interests when harvest strategies are developed or renewed for Commonwealth fisheries or when implementing the Bycatch Policy. This review considers it would be appropriate for the Policies to explicitly refer the provisions in the Fisheries Management Act that require AFMA to have regard to the objective of ensuring the interests of Indigenous fishers are taken into account.

As recommended in the section regarding setting of target reference points, the Harvest Strategy Policy should allow for the adoption of alternative TRPs in fisheries, diverging from the default of B48. This may involve setting higher biomass TRPs in fisheries where significant First Nations interests exist, and it can be demonstrated that a higher biomass target better achieves those interests. However, as noted in the risk, cost, catch section there are challenges associated with obtaining reliable information regarding non-commercial catch, including Indigenous harvest. To explicitly consider First Nations interests, investment is needed to support data collection to improve understanding of historic customary uses and enable accurate accounting of Indigenous harvest.

The review of the Harvest Strategy Policy notes that while for some fisheries it may be possible to consider non-commercial interests in the context of setting biomass TRPs and determining appropriate commercial catch limits, resource access and allocation is a matter for the *Commonwealth Fisheries Resource Sharing Framework 2020*. This Framework includes statements acknowledging Aboriginal and Torres Strait Islander peoples as the original fishers, traders, and managers of Australia’s fisheries resources and their rights to participate in customary and commercial fishing including under the *Native Title Act 1993* and the United Nations Declaration on the Rights of Indigenous Peoples. This review notes purchase of commercial quota by government for reallocation to First Nations organisations could be explored, but is outside the scope of the Harvest Strategy Policy.

#### Recommendations

1. **The Harvest Strategy Policy should articulate principles to be considered and standards that must be met with respect to engaging First Nations groups in the development of harvest strategies.**
2. **The Bycatch Policy should articulate principles to be considered and standards to be met with respect to considering the interests of First Nations groups. This should include when undertaking ERAs.**
3. **The Harvest Strategy Policy should recognise a range of First Nations interests may exist in Commonwealth fisheries, and require these interests to be identified and considered in the development of fishery-specific harvest strategies.**
   * This may include more conservative TRPs for species of importance to Indigenous fishers where it can be demonstrated that a higher biomass target would better supports their interests.
   * Where a formal resource sharing arrangement is in place that allocates a share of the fisheries resource for First Nations interests, this should be used as the basis for considering whether it is appropriate to implement a higher TRP for the relevant fishery.
4. **There is in principle support for development of a schedule of species of importance to First Nations people that must be considered when developing and implementing harvest strategies and implementing the Bycatch Policy.** 
   * Further work is required to determine the practicalities of how the schedule would be developed and implemented, including how principles and priorities for the inclusion of species on the schedule would be determined.
   * Consideration of any additional management and/or data collection arrangements will be required as a pre-requisite for adopting TRPs higher than the default TRP to enhance abundance of species on the schedule.
   * Any formal allocation of the recommended biological catch of species identified as important to First Nations people should continue to be considered in accordance with the Commonwealth Fisheries Resource Sharing Framework 2020.

## Consideration of the Policy Guidelines

### Consideration of the Harvest Strategy Policy Guidelines

The *Guidelines for the Implementation of the Commonwealth Fisheries Harvest Strategy Policy* (the Harvest Strategy policy Guidelines) aim to provide practical assistance in the development of fishery-specific harvest strategies to meet the intent of the Harvest Strategy Policy. They provide contextual information to assist interpretation of the Harvest Strategy Policy and guidance to support development and implementation of fishery-specific harvest strategies.

Now harvest strategies are in place for all Commonwealth managed fisheries, this review considered the ongoing applicability of the Harvest Strategy Policy Guidelines.

#### Stakeholder feedback

This review heard information on useful modelling tools and assessment methods provided in the Harvest Strategy Policy Guidelines was considered useful at the commencement of the most recent version of the Harvest Strategy Policy in 2018. This review also heard best practice approaches are continually evolving and subject to available data and resources. AFMA noted it routinely refers to the most recent research to inform assessment approaches and decision making.

#### Conclusions

The review notes the Harvest Strategy Policy Guidelines are non-prescriptive by nature, and found interpretation of the Harvest Strategy Policy’s objective, principles and provisions should be included in the Policy to remove any doubt around the Policy’s intent. This includes interpretation of:

* Target setting in multi-species fisheries
* Risk, cost, catch trade-off provisions
* the 90% risk criterion for LRPs
* spatial management measures
* application of the Policy to jointly managed international stocks

Further, the review found some of the implementation requirements set out in the Harvest Strategy Policy Guidelines should be included within the Harvest Strategy Policy. While it is important for the Harvest Strategy Policy to maintain flexibility, the review considers it should include the following approaches for implementation:

* Requirements for addressing uncertainty and risk, including testing using Management Strategy Evaluation (or suitable alternative method).
* Requirements to consider applying a buffer or discount to the recommended biological catch or effort level to offset assessment uncertainty (noting this review recommends a buffer must be applied where needed to achieve risk equivalency).
* Circumstances under which dynamic references points may be implemented, including specific consideration of risk during extended periods of low productivity / recruitment.
* Requirements to test Harvest Control Rules for performance against LRPs.
* Aspects to consider in evaluating the impact of spatial management measures on the ability of a fishery to achieve the Harvest Strategy Policy objective.
* Approaches for accounting for all sources of mortality – including recreational and Indigenous catch, discards and catch taken in other jurisdictions for shared stocks.
* Requirements for consideration of the impact of choke stocks on the ability to maximise returns in multi-species fisheries.
* Circumstances where an alternative (higher)LRP should be considered to reduce risk to ecosystem function.
* Reporting requirements – including on implementation of the Harvest Strategy Policy and against rebuilding strategies.
* Circumstances which may trigger an early review or change to a harvest strategy, outside the regular five-year review cycle (consistent with recommendation in this review to include exceptional circumstances provisions within the Policy).

Where the Harvest Strategy Policy requires a unique management approach for Commonwealth fisheries, technical guidance to support implementation could be developed on a fishery-specific basis as required.

#### Recommendations

1. **Important elements of the Harvest Strategy Policy Guidelines, including interpretation of the Harvest Strategy Policy’s key provisions and minimum implementation requirements, should be brought into the Policy.**
   * Remaining elements of the Guidelines should be discontinued.
2. **The Harvest Strategy Policy should maintain flexibility in regard to the use of modelling tools and assessment methods, noting these are subject to evolving understanding of best practice, data availability and resources.**
   * Modelling tools and assessment methods should be tested to ensure they deliver on the policy objectives and requirements.

### Consideration of the Bycatch Policy Guidelines

The *Guidelines for the Implementation of the Commonwealth Fisheries Bycatch Policy* (Bycatch Policy Guidelines) aim to provide assistance to Australian Government entities (principally AFMA but also bodies (industry or otherwise) AFMA outsources to, including industry-based co-management arrangements) in interpreting and implementing the requirements of the Bycatch Policy. As with the policy, the Bycatch Policy Guidelines only provide guidance for general bycatch species and do not aim to influence or alter the management of EPBC Act-listed species. These species are principally managed under Australia’s environment legislation and guidance is provided by the Department of Climate Change, Energy, the Environment and Water.

The previous review of the Bycatch Policy highlighted the need for more detailed guidance and clearer explanation of bycatch requirements, which led to the development of the Bycatch Policy Guidelines. This document is quite detailed and lengthy, and feedback received from AFMA and other stakeholders as part of the current review process indicates the Bycatch Policy Guidelines are not effectively their intended purpose.

#### Stakeholder feedback

##### Stakeholder workshop, September 2024

Some participants noted the need for caution when considering retiring the Bycatch Policy Guidelines to ensure that valuable guidance material is not lost.

#### Conclusions

Given the Bycatch Policy is now well established, consideration should be given to retiring the Bycatch Policy Guidelines and moving relevant elements of the Guidelines into the policy itself. As the Bycatch Policy Guidelines are non-prescriptive by nature, moving some of the implementation requirements set out in the Guidelines to the policy will assist in ensuring the policy is implemented to achieve its objectives.

This has the potential to reduce duplication and increase understanding regarding implementation requirements of the Bycatch Policy. Consideration in particular should be given to areas of the Bycatch Policy Guidelines that detail how to address and manage risk and implement appropriate data collection, assessment and monitoring, including collection of data to demonstrate performance against the policy.

In considering retiring the Bycatch Policy Guidelines care should be taken to assess whether sufficient key guidance can be included in the policy without making the policy itself too long and complicated.

#### Recommendations

1. **Important elements of the Bycatch Policy Guidelines, including interpretation of the Bycatch Policy’s key provisions and minimum implementation requirements, should be brought into the policy.**
   * Remaining elements of the Guidelines should be discontinued, providing sufficient key guidance can be included in the policy without making the policy itself too long and complicated.
2. **The Bycatch Policy should maintain flexibility in regard to the use of modelling tools and assessment methods, to ensure maintenance of best practice approaches, given data availability and resources.**
   * Making amendments to ensure the policy is outcomes focussed (while maintaining consistency with the precautionary principle) would allow AFMA to better allocate resources to implement the requirements of the policy while remaining compliant.

## Glossary

| Term | Definition |
| --- | --- |
| B0 | See ‘unfished biomass’. |
| Biomass | The total weight or volume of a fish stock or of a component of a fish stock. |
| Bycatch policy | The Commonwealth Fisheries Bycatch Policy provides a framework for managing the risk of fishing related impacts on bycatch species in Commonwealth fisheries. |
| Bycatch species | Those marine species that are not targeted by a fishery, but are either incidentally taken and returned to the sea, or incidentally killed or injured as a result of interacting with fishing gear but not taken. Bycatch species can include EPBC Act-listed species. |
| Byproduct species | Species that make some contribution to the value of the catch in a given fishery but less than that of key commercial species. These species may be rarely encountered and usually retained, or frequently encountered and occasionally retained. |
| Catch | In relation to fishing, means capture, take or harvest. |
| Catch sharing arrangement | A formal arrangement between jurisdictions and/or sectors to apportion catch of a shared stock. |
| Cumulative impacts | The accumulation of all known impacts on a fish stock, population or species. |
| Cumulative risk | The accumulation of all known risks. |
| Discard | Any part of the catch which is returned to the sea, whether dead or alive. In Commonwealth fisheries, the term is predominantly used to refer to commercial species that are not retained. |
| Discarding | The practice of returning any part of the catch to the sea. |
| Dynamic reference points | Target reference points that are calculated relative to an estimate of unfished biomass in a specified period, taking into account the environmental conditions for that period. This estimate may be provided by assessment models and the expected outcomes in the absence of fishing or by reference to unfished sites, populations or stocks. |
| Ecological risk assessment (ERA) | An assessment process that evaluates the relative risk posed by fishing on species, habitats and communities within a fishery. |
| Ecological risk management (ERM) | The management framework for undertaking and responding to outcomes of ecological risk assessment. |
| Ecologically sustainable development (ESD) | Using, conserving and enhancing the community’s resources so that ecological processes are maintained, and the total quality of life, now and in the future, can be increased.  Principles of ecologically sustainable development (as per the Fisheries Management Act 1991):  decision‑making processes should effectively integrate both long‑term and short‑term economic, environmental, social and equity considerations  if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation  the principle of inter‑generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations  the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision‑making  improved valuation, pricing and incentive mechanisms should be promoted. |
| Ecosystem-based fisheries management | A management approach that considers the impact fishing has on all of the aspects of the marine ecosystem, including commercial species, non-commercial species, habitats and communities. |
| Effort | Also, called fishing effort. A measure of the resources (such as fishing hours or hook sets) used to harvest a fishery’s stocks. |
| Endangered, threatened, or protected species (ETP) | Species or stocks listed as either endangered, threatened or protected under the EPBC Act. |
| Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) | The central piece of Commonwealth environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places—defined in the EPBC Act as matters of national environmental significance. Parts 10, 13 and 13A relate specifically to aspects of fisheries. |
| EPBC Act–listed species  (also known as ETP) | EPBC Act–listed species comprises all those protected under Part 13 of the EPBC Act including whales and other cetaceans and listed threatened, marine and migratory species (except for conservation-dependent species which are managed through rebuilding strategies under the Harvest Strategy Policy). |
| Fisheries Management Act 1991 (FM Act) | Commonwealth Act that provides the legal framework for fisheries managed by the Australian Government. The Act sets out, among other things: fisheries management objectives and arrangements for regulating; permitting; and taking enforcement action with respect to fishing operations. |
| Fishery management strategy (FMS) | An all-encompassing document containing key fishery-level management measures including the harvest strategy and ERA/ERM objectives and requirements. |
| Fishing | Fishing includes:  searching for, or taking, fish  attempting to search for, or take, fish  engaging in any other activities that can reasonably be expected to result in the locating, or taking, of fish  placing, searching for or recovering fish aggregating devices or associated electronic equipment such as radio beacons  any operations at sea directly in support of, or in preparation for, any activity described in this definition  aircraft use relating to any activity described in this definition except flights in emergencies involving the health or safety of crew members or the safety of a boat  the processing, carrying or transhipping of fish that have been taken. |
| Fishing effort | A measure of the resources (such as fishing hours or hook sets) used to harvest a fishery’s stocks. |
| General bycatch | All bycatch that is not listed under the EPBC Act (see ‘EPBC Act–listed species’). |
| Harvest control rules | Pre-determined rules that control fishing activity according to the biological and economic conditions of the fishery (as defined by monitoring or assessment). Also called ‘decision rules’. Harvest control rules are a key element of a harvest strategy. |
| Harvest strategy | A decision framework designed to pursue defined biological and economic objectives for commercial fish stocks in a given fishery (also known as a management procedure). Key elements include: operational objectives, performance indicators, reference points, acceptable levels of risk, a monitoring strategy, an assessment and harvest control rules. |
| Harvest Strategy Policy | The policy that establishes the requirement for the development of harvest strategies in Commonwealth-managed fisheries. |
| Input controls | Management measures that place restraints on fishing, e.g. who fishes (licence limitations), where they fish (closed areas), when they fish (closed seasons) or how they fish (gear restrictions). |
| Interaction | Includes any physical contact between a species and a fishing operation and includes all catch, and any discards or releases. Collisions (that is, an animal that makes contact with the fishing operation but is not caught) are also considered to be interactions. |
| Key commercial species | Stocks that are most relevant to the objective of maximising net economic returns to the Australian community from the management of a given fishery. |
| Key commercial stock | Stocks that are most relevant to the objective of maximising net economic returns to the Australian community from the management of the fishery. |
| Limit reference point (LRP) | The level of an indicator (such as biomass or fishing mortality) beyond which the risk to the stock is regarded as unacceptably high. |
| Major harvester | In the context of internationally shared stocks, a nation state that is takes a substantial proportion of total catch. The Harvest Strategy Policy does not precisely define this term, but the Harvest Strategy Policy Guidelines suggest that a domestic harvest strategy is unlikely to be appropriate where Australia’s catch share is less than 30% of the total in the fishery. |
| Management Strategy Evaluation (MSE) | A computer simulation to compare the relative ability of different Management Strategies. |
| Maximum economic yield (MEY) | The sustainable catch or effort level for a commercial fishery that allows net economic returns to be maximised. In this context, ‘maximised’ equates to the largest positive difference between total revenue and total cost of fishing. |
| Maximum sustainable yield (MSY) | The maximum average annual catch that can be removed from a stock over an indefinite period under prevailing environmental conditions. |
| Mortality | The death of fish, whether from fishing or other causes. |
| Net economic return (NER) | Defined in the Harvest Strategy Policy as fishing revenue less fishing costs over a particular period. Fishing costs include the usual accounting costs of fuel, labour, repairs and maintenance, as well as various economic costs such as the opportunity cost of owner labour and capital. |
| Non-targeted catch | The portion of the catch that was not the intended target of a fishing operation. |
| Overfished | A fish stock with a biomass below its biomass limit reference point or below its specified indicator limit reference point. |
| Overfishing | When a fish stock is subject to too much fishing. The rate of removals from a stock is likely to result in the stock becoming overfished. For a stock that is overfished, overfishing is a rate of removals that will prevent the stock recovering in accordance with its rebuilding strategy. |
| Population | All the organisms of the same species, which live in a particular geographical area, and have the capability of interbreeding. |
| Precautionary principle | Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:  careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and  an assessment of the risk-weighted consequences of various options. |
| Productivity (of a fish) | The rate of generation of biomass in an ecosystem. |
| Proxy | A more easily estimated figure used to represent the value of a reference point where the actual value is unknown. For example, a target biomass of 0.48 times unfished biomass (expressed as 0.48B0) is a proxy for biomass at maximum economic yield where the actual value of biomass at maximum economic yield may be unknown. |
| Rebuilding | The increase of an overfished stock’s biomass to above its limit reference point and towards its target reference point. |
| Rebuilding strategy | A strategy designed to rebuild an overfished stock to above its limit reference point and towards its target reference point. |
| Recommended biological catch (RBC) | An estimate of the total fishing mortality (catch from all sectors plus discards) recommended to achieve a pre-defined target. Distinct from total allowable catch. |
| Recruitment | The amount of fish added to the exploitable stock each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to the fishing gear in one year would be the recruitment to the fishable population that year. This term is also used in referring to the number of fish from a year class reaching a certain age. |
| Recruitment impairment | A sustained and significant reduction in recruits to below average levels. Typically associated with recruitment overfishing. |
| Reference point | Specified level of an indicator used as a benchmark within a harvest strategy. |
| Regime shift | Sudden, dramatic and long-lasting changes in ecosystem structure and function. Regime shifts can occur as responses to natural or anthropogenic causes. |
| Regional fisheries management organisation (RFMO) | An international organisation that establishes binding measures for conservation and sustainable management of fisheries in which multiple nation states in a given geographical area have an interest. |
| Risk equivalency | An equivalent level of risk between two comparable stocks or species. |
| Risk-based approach | An approach to fisheries management that recognises that decisions are made in the absence of perfect information. The approach requires that risks of action and inaction are known and appropriately managed. |
| Risk–catch–cost (RCC) | The RCC trade-off is a concept that seeks to balance the amount of resources invested in data collection, analysis and management of a fishery, with the level of catch (or fishing mortality) taken from that fishery. |
| Species | A group of animals in which members can breed with one another and produce fertile offspring |
| Stock (stock structure) | A unit of management (subpopulation) of a particular fish species with common intrinsic population parameters (growth, recruitment, mortality and fishing mortality) and for which extrinsic factors (immigration and emigration) may be ignored. A stock may encompass the whole distribution of a species, in which case the stock and species are in effect the same thing. Or it may be some subset of the distribution of a species, in which case a species would have stock structure and comprise multiple stocks. |
| Stock assessment | A scientific analysis of a fish stock to estimate quantities of management or scientific interest such as fishing mortality and biomass, particularly in the context of reference levels. |
| Take (taken) | See ‘catch’. |
| Target reference point (TRP) | The desired state of the stock or fishery. |
| Total allowable catch (TAC) | The annual catch limit set for a stock, species or species group. Used to control fishing mortality within a fishery. |
| Total allowable effort (TAE) | The maximum amount of fishing effort that can be used by commercial fishers during a fishing period. |
| Unfished biomass | The value for the biomass of a stock in the absence of fishing (expressed as B0). Typically an estimate of a fixed, equilibrium biomass level. |

## Appendix A: Technical Review final report



FINAL REPORT: FRDC 2021-135

Technical review to inform revision of the “National Guidelines to Develop Fisheries Harvest Strategies” and “Commonwealth Fisheries Harvest Strategy Policy”

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## Executive Summary

This technical review considers recent research and experience (national and international) in the design and implementation of harvest strategies and offers recommendations for revisions to the current (2018) Commonwealth Harvest Strategy Policy and Guidelines. The review examines major challenges to harvest strategies – shifting baselines, economic targets, increasing spatial restrictions on fishing, and the complexities and costs of managing multispecies fisheries.

Detailed recommendations may be found in the body of the report, but key points for Policy consideration include:

1. Whether it is time to shift away from an economic target focused on commercial fishing operators, to consider a more stable “default” biomass target, suggested to be around 50% of unfished biomass. This simplifies target setting and recognises that management of Commonwealth fisheries embraces a range of objectives and interacts increasingly with other users of the marine environment, including the need to harmonise harvest strategies for resources shared with fisheries managed by the States and Territory.
2. Increasing evidence of shifting baselines for marine populations including many fished species calls into question a fundamental premise of harvest strategy policy (the concept of a value for unfished biomass) and requires a considered policy response, including the prospect of altering biomass targets and limits in harvest control rules, in some circumstances at least. This also has implications for stock status classification and the issue of non-recovering stocks.
3. Various problems leading to deterioration in the quality and quantity of data available for status determination, including shifting baselines, changes in spatial access, and cost pressures, lead to the need for a reconsideration of the evidence required for assessing stock status. Where robust methods such as management strategy evaluation show that particular stocks should be maintained well above limit reference levels under application of a given harvest strategy, should that be sufficient to classify the status of such stocks as “sustainable”, at least for some period of time?

Key points for consideration of changes to Guidelines include:

1. The need for standards of evidence to determine changes to reference points under changing environmental conditions, with an interim approach requiring assessments to report status both with and without environmental factors considered.
2. The need for ongoing monitoring and reporting of economic performance, even if economic targets are no longer the sole consideration.
3. Specification of the data requirements and analytical tools available to assess the impact of changing spatial access to fishing grounds.
4. Additional guidance on approaches to multispecies harvest strategies.
5. The Guidelines need to achieve the right balance between clarification of policy, general guidance, and more specific information regarding tools and methods.
6. The Guidelines must confirm to the objectives of relevant fisheries legislation, especially the Fisheries Management Act 1991.

Additional policy considerations, outside the strict remit of Harvest Strategy Policy, but affecting its successful implementation, include:

1. The need to harmonise any changes to status reporting arising from consideration of climate and other environmental (non-fishing) effects with standards and definitions in the EPBC Act, including definitions of conservation status and application to species recovery strategies.
2. The benefits of a more consistent national approach to harvest strategy policy and guidance, including the issue of consistent biomass targets.
3. The need for collective responsibility across sectors and users of the marine environment to support and enable ongoing monitoring, including a whole of government approach to cost sharing.

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## Background

The Commonwealth Fisheries Harvest Strategy Policy and Guidelines were first released in 2007 with a second edition released in 2018 (hereafter referred to as the 2018 Policy and Guidelines). The 2018 edition noted that the policy would be reviewed after five years.

This report provides a technical review of recent and developing research relevant to harvest strategies (both in Australia and overseas) to inform the 2023 review. It identifies information, methods and approaches that could inform potential improvements to the 2018 Policy and Guidelines and identifies specific recommendations for improvement.

As a first stage in this review, a discussion paper was provided in June 2023 that focused on new and relevant research, primarily in the published scientific literature. This Discussion Paper is included as Appendix 2 in this report. In the current report, this information from the scientific literature has been supplemented by information from recent workshops and webinars, discussion papers on relevant topics, and direct discussions with a range of experts, including experience arising from practical implementation of the 2018 Policy and Guidelines. This additional source material is listed at the end of this report.

This review has also been informed by the identification of some important emerging challenges to fishery management more generally, and to harvest strategy implementation in particular. Key challenges include:

* The impact of shifting baselines, due to climate change and other drivers, on fundamental aspects of harvest strategy implementation,
* A variety of concerns about interpretation and implementation of the Policy’s maximum economic yield target,
* The impacts of increasing spatial restrictions, from various sources, on commercial fishing, with flow on effects to monitoring, stock assessment and harvest strategy design and implementation, and
* Ongoing difficulties in managing multi-species fisheries including the issue of non-recovering species.

The report is structured around these four key issues, where there seem to be clear implications for policy and/or guidelines. Information on additional (minor) topics is in Appendix 3.

The report concludes with comments on some broader issues that lie outside the scope of harvest strategy policy but nonetheless impinge on it and limit its effective delivery.

## Key Issues

### Shifting baselines

The most significant challenge and barrier to implementation of the Policy are the rapid changes occurring in Australia’s ocean environments and ecosystems. These are currently being driven by ocean warming and other manifestations of climate change, but other factors, such as recovery of many marine mammal populations, are also driving change.

These changes matter because the implementation of the Commonwealth Harvest Strategy Policy is premised on a stable value of unfished biomass, often equated with pre-fishing biomass, and referred to as *B0*. This quantity enters the harvest strategy in numerous ways:

* The proxy for the limit reference point is set at 20% of *B0* which also defines the depletion level corresponding to the category of overfished.
* The proxy for the biomass to achieve maximum sustainable yield, *BMSY* is set at 40% of *B0*
* The proxy for the target reference point, *BMEY*, is set at 48% of *B0*
* The standard “hockey stick” harvest control rule is defined in relation to current depletion which is expressed as *Bcurrent* / *B0*
* Rebuilding of overfished stocks requires plans to recover stocks to levels defined in relation to *B0*

Even where biomass cannot be estimated directly, data limited assessment methods still attempt to estimate stock status relative to an unfished reference level. Current depletion is also used to determine when an exploited species can be considered for conservation-dependent listing under the EPBC Act.

The 2018 Policy acknowledges that climate change and other factors can affect the productivity of stocks and suggests that fisheries should “seek to account for that variability when developing and implementing harvest strategies” (Section 3.3). The 2018 Guidelines include a chapter (Chapter 7) on variability, regime shift and climate change, including application to harvest strategy design.

As the Discussion Paper (Appendix 2) notes, how to both measure and accommodate shifting baselines in harvest strategies is one of the most active areas of recent research on harvest strategies. Key recent papers include Bessell-Browne et al. (2022) and Szuwalski et al. (2023), both of which document clear instances of shifting baselines while also warning about too readily adopting redefined limits and targets in harvest strategy implementation. This is mainly because of the risk that stock declines caused by fishing may be misinterpreted as environmentally driven changes.

A current major Australian research project on the topic (Penney et al. in prep.) describes, develops and implements a range of methods and tools to detect and explore the relative impacts of fishing and changing environmental conditions on stock abundance and trajectories, mostly applicable only to Tier 1 assessments requiring annual age-composition data to estimate annual recruitment. Evidence points to a wide range in fishing and non-fishing (environmental) effects across different stocks. Some stocks have clearly been driven by the latter, with important implications for recovery strategies, and indeed for classification of overfished resources. The study also used management strategy evaluation (MSE) to test a range of approaches for incorporating shifting baselines (dynamic *B0*) in harvest strategies. Results show that application of dynamic reference points and harvest control rules can increase catches slightly and reduce the likelihood of fishery closures. The study concludes that whether to adopt static or dynamic harvest strategies in the face of shifting baselines is a management and policy choice. Results from the study can help inform that choice.

A recent workshop (Smith et al. 2023) brought together experience from around the world on approaches to dealing with climate change for harvest strategies. There is plenty of evidence accumulating for effects of climate on fish stocks (both positive and negative) but management systems and protocols have generally been slow to respond. The workshop could not identify any internationally agreed approach or best practice for taking direct account of climate change impacts in harvest strategies. Emerging best practice for science and reporting involves presenting stock assessment advice for two scenarios – with and without dynamic *B0* and reference points.

An even more recent workshop presented and discussed a draft framework for integrating climate impacts and risk into harvest strategies (AFMA 2023). The draft framework discussed at the workshop proposes a three-step process involving 1) assessing the climate risk to a species based on best available evidence; 2) considering whether the stock assessment or harvest strategy already accounts for climate change effects, or if the TAC/E or management arrangements are already sufficiently precautionary; and if not 3) considering additional precautionary mechanisms. This framework is currently under consideration by the AFMA Commission.

#### Implications for the Policy and Guidelines

The issue of shifting baselines is currently the biggest challenge facing harvest strategy policy and implementation because it directly affects the whole current basis for stock status representation and classification, including the definition of overfished. There is increasing and very clear evidence that the productivity and abundance of many key commercial species, and indeed whole marine ecosystems, are in a process of rapid change. While an international consensus on the correct management response to this challenge has yet to emerge, the issue cannot be ignored and requires policy direction.

The Policy needs to recognise explicitly that baselines are changing for many species and that harvest strategies should adapt accordingly, with certain provisos in place. On the vexed issue of limit reference points (LRPs), and in cases where it is clear that declines are largely driven by non-fishing factors, reductions in LRPs are appropriate in some circumstances, though a floor should be set on the changes allowed to the LRP in the harvest control rule. These considerations should be guided by the MSE results available soon in the final report of the Penney et al. study. The Guidelines should spell out the standard of evidence required to support changes to reference points, noting the methods that are now available to distinguish between impacts from fishing and impacts from environmental factors (refer to Penney et al. 2023). This distinction is more challenging when fishery impacts are indirect, for example where fishing gear affects recruitment by interacting with habitat.

The Guidelines should also recognise and accommodate the AFMA framework for integrating climate impacts into harvest strategies, assuming that framework is endorsed by the AFMA Commission. This framework is important because it also covers data limited stocks that are not amenable to the methods for estimating dynamic *B0* that can be applied to many data rich stocks.

These considerations also apply to non-recovering stocks. Particularly in cases where stock recovery plans have been in place and properly implemented for many years with no evidence of recovery, reviews should be undertaken to determine if environmental factors may be contributing partly or largely to the failure to recover. Consideration should be given to adding an additional category of “environmentally determined” to stock status classification.

### MEY and biomass targets

A target of maximising economic returns has been built into Commonwealth fisheries legislation since 1991 and into harvest strategy policy since 2007. Chapter 2 in the 2018 Policy defines the objective of the policy as the ecologically sustainable and profitable use of fishery resources, where the latter is interpreted in the Strategy (section 2.1) as implementing harvest strategies that “maximise net economic returns to the Australian community from management of Australian fisheries”. This wording comes directly from the objectives of the Fisheries Management Act 1991 and has been interpreted in the harvest strategy policy to mean a target of maximum economic yield (MEY) for commercial fishers. The interpretation in the 2018 policy has a different focus than the wording of the Act because:

1. The Act refers to economic returns to the community, which implies benefits to both consumers and producers, whereas the MEY targets in the policy are limited to fishers only.
2. The Act specifies returns to the Australian community whereas the policy is silent on where economic returns flow.
3. Economic yield is a formal economic concept and may not necessarily capture what the legislators intended by “economic returns”[[1]](#footnote-2).

The 2018 Harvest Strategy Policy has attempted to operationalise maximising economic returns by maintaining key commercial fish stocks “on average, at the required target biomass to produce maximum economic yield from the fishery”. In section 3.6 of the Policy, this involves setting the target reference point at *BMEY*, the proxy for which is 48% of unfished biomass (*B48*) or 1.2 times *BMSY*, in cases where the latter can be estimated directly.

Several theoretical and practical problems have arisen that require reconsideration of this target as interpreted in the 2018 policy. These problems include:

1. *BMEY* is difficult to estimate.
2. *BMEY* can be highly variable.
3. Proxies for *BMEY* do not appear to be robust.
4. *BMEY* depends on other factors affecting economic performance.
5. Other Australian jurisdictions do not use *BMEY* as a target in policy (although it’s applied for several individual fisheries).
6. *BMEY* for commercial fishers ignores other objectives, sectors, and aspects of the public interest.

Expanding on these points:

Calculation of *BMEY* for an individual fishery requires a bioeconomic model of the fishery that includes both the stock dynamics and the economic factors driving profitability, including the price of fish, fixed and variable costs of fishing, and implicit costs such as the unpaid labour of owner-operators. For multi-species fisheries, this also involves a model describing the technical interactions across stocks. Methods to model such situations are described in the 2018 Guidelines, but in practice only one Commonwealth-managed fishery uses a fully dynamic bioeconomic model to determine *BMEY* and to set harvest controls within the harvest strategy – for tiger prawn stocks in the Northern Prawn Fishery.

Recent attempts to develop a bioeconomic model of parts of the multi-species SESSF (Pascoe et al. 2023) have produced results that are both surprising and yet to be implemented. Virtually all fisheries managed by AFMA default to the proxy for *BMEY* in the Policy.

Fluctuations in prices and costs of production can significantly alter the value for *BMEY*. Such fluctuations have been evident in recent years arising from disruptions due to Covid, trade disputes and regional wars, affecting prices and costs of fishing (particularly fuel costs). Although individual fishing firms will respond to fluctuations in business conditions as they must, having an inherently fluctuating target in a harvest control rule is likely to exacerbate problems.

The proxy value for *BMEY* in the Policy is 48% of *B0* (denoted *B48*) and, as noted above, has been widely adopted. This rather precise value derives from an assumption that *BMSY* is approximately *B40*, and that *BMEY* is 1.2 times *BMSY*. The basis for the “1.2 times” is not clear. Punt et al. (2013) investigated default ranges for both *BMSY* and *BMEY* across a variety of situations and found that *BMSY* was generally in the range of 35-40% of unfished levels, while *BMEY* was in the range of 50-60%. Investigating values for *BMEY* in a multi-species fishery, Pascoe et al. (2023) found values much higher than the *B48* default used in the Policy.

The economic performance of a fishery is determined by factors other than just the target biomass of the stock. For example, the Pascoe et al. (2023) study also found that the fleet structure for the SESSF is very far from optimal technical efficiency (economically). This should not be the case given that ITQs have been in place for over 30 years and economic theory says that autonomous adjustment to an optimal fleet structure should have occurred. This is not uncommon in Australian fisheries and can occur from a variety of reasons, including stock issues (e.g. TACs have not been binding) or quota market dynamics being driven by factors other than technical efficiency (e.g. access to capital or the desire to control processing market share; Rust et al. 2017). The non-optimal fleet structure may partly account for the results for *BMEY* found in the Pascoe et al. study. Economically optimal biomass will also be affected by many other factors, including some of the issues associated with spatial restrictions discussed in the next section of this report.

Although not a primary consideration, it is interesting to note that Commonwealth-managed fisheries in Australia seem to be the only jurisdiction that has adopted *BMEY* for commercial fishers as a general target in their policy. This is perhaps understandable because almost all Commonwealth-managed fisheries are effectively single sector fisheries, involving primarily commercial fishing, though that is starting to change as outlined further below. All the State and Territory jurisdictions in Australia manage multi-sector fisheries, and most international jurisdictions still have MSY as a target. As noted further below, having a different target to other jurisdictions poses issues for managing shared resources.

The most compelling reason for considering a change to the policy on biomass targets in harvest strategies for Commonwealth-managed fisheries arises from consideration of multiple objectives. The Commonwealth Policy is premised on an economic target (interpreted and applied as commercial economic performance) and an ecological limit. However, these are not the only objectives that need consideration, as discussed in more detail in the section of the Discussion Paper headed “Selecting targets and limits” (Appendix 2). Other factors to consider include:

1. Consumer surplus.
2. Employment.
3. Recreational and cultural fishing benefits and interests.
4. Various environmental benefits, including greenhouse gas emissions and reduced ecosystem impacts.
5. Governance and risk benefits.

Of these factors, only consumer and employment benefits are likely to improve with a biomass target below commercial *BMEY*. These both benefit from higher catch and effort levels resulting in likely lower prices, associated with a target closer to *BMSY* (see a more detailed explanation of consumer surplus in Appendix 1). For the reasons outlined in the Discussion Paper, the other factors are likely to be associated with biomass targets above *BMEY*, or at least above the current default value for *BMEY* of *B48*.

#### Implications for the Policy and Guidelines

The choice of a biomass target is fundamental to harvest strategy policy. The current target *BMEY* takes the legislative objective of “maximising economic returns to the Australian community” and has a commercial producer focus in policy objectives for Commonwealth-managed fisheries. Some aspects of this primary commercial fishing focus are starting to change, with strategies by AFMA to engage more with recreational and particularly indigenous cultural fishing interests. In addition, the more recent development of harvest strategy policies in Australian States and Territories and their steady implementation has brought into prominence the issue of harvest strategy coordination for shared stocks and resources. Having different biomass targets for the same stock in different jurisdictions results in de facto re-allocation of resources between jurisdictions, so an agreed target is vital. Biomass targets vary across jurisdictions, with, for example, Queensland adopting a default 60% target (*B60*), which was driven in part by recognising that recreational fishing utility is maximised at higher biomass levels than for commercial fishers. Other jurisdictions do not specify particular targets in policy, but recent approaches in South Australia and New South Wales seem to favour a *B50* target for some fisheries, reflecting interests across diverse sectors.

In considering multiple objectives, sectors and interests (including public interest), trade-offs are inevitable in selecting a biomass target for a particular stock, but it is important to emphasise that for any given stock a single target should be defined for the purposes of harvest strategy implementation. Having said that, a sole focus on MEY for commercial fishers as a target may not serve the interests of Commonwealth fisheries management going forward, and it may be more useful to refer to *BTARG* as the generic target, rather than *BMEY*.

While the trade-offs involved in selecting a *BTARG* will vary from fishery to fishery, it may also be advantageous to define a default biomass target level within the Policy, with *B50* as a suggested starting point for discussion. The Guidelines should make clear that variations to the default can be considered in individual cases, reflecting the particular objectives and interests of the fishery in question. The Guidelines can also outline approaches to evaluating the trade-offs involved in selecting a suitable target, such as the use of MSE. Expanding the scope of the *BTARG* to include more than commercial fisher economic yield would be a change in policy but does not create a conflict with the legislation, because “economic returns to the Australian community” includes benefits to other users.

The approach of referring to *BTARG* as the generic target, rather than commercial fisher *BMEY*, would be particularly valuable if a national consensus could be reached on common standards for targets in harvest strategy policy (with additional benefits for national reporting through mechanisms such as SAFS). Even without such consensus, there would be benefits to having a clearly defined default target biomass in the Commonwealth Harvest Strategy Policy which avoids the vagaries and uncertainties associated with *BMEY*, as outlined above. AFMA and ABARES could and should continue to report on the economic performance of Commonwealth-managed commercial fisheries through measures like NER (net economic returns), as is already the case. This was supported by the Economic Working Group who have also noted the need for expanding this reporting to economic outcomes to the Australian community given this explicit objective in the legislation.

### Spatial squeeze

Spatial restrictions on fishing and changing access to fishing grounds remain important considerations for commercial fishing, with flow-on effects to harvest strategies. Not least of these flow-on effects are disruptions to stock assessments (Field et al. 2006). Changing the spatial distribution of fishing can affect almost all aspects of stock assessments, including catch rates (CPUE) and the size and age structure of the catch, and can even cause problems for fishery independent surveys if the area closed to fishing is also closed to surveys.

Fishing grounds can be closed or restricted for several reasons. These include the declaration of marine reserves (particularly IUCN category 1 and 2 reserves), areas closed by fishery managers to protect habitat or bycatch species including protected and endangered species, and areas closed due to competing uses such as marine cables, oil and mineral extraction, and, increasingly, offshore wind farms. A key issue with most of these competing uses is that the only sector with a long-term commitment to monitoring marine living resources is the fishery sector, where much of the cost of monitoring is born by the commercial fishing industry. Especially where historical fishing grounds are closed for reasons other than fishery management, there needs to be shared accountability across sectors and users and shared costs for ongoing monitoring and assessment.

The assessment of stock status, fundamental to harvest strategies as well as conservation management, is made more complex by having parts of the population that are unfished. The costs and benefits of such closures have been explored to some extent for marine reserves (Hilborn et al. 2006, Ovando et al. 2021) but the data and tools to undertake such analyses are limited and generally not available in Australia. Such analyses require spatially resolved models which are rare for Tier 1 assessments, and generally non-existent for more data-limited situations. Some uses of the marine environment, such as windfarms, create new structures which can act as substrate and habitat for marine communities and benefit some fish, but the devil can be in the detail (Werner et al. 2024) and in general, uncertainty is high about the impacts of most closures on stock status. Tools to assist in marine spatial planning for multiple uses exist (Rassweiler et al. 2014, Hammar et al. 2020) but have seen limited application in Australia.

One area of tool development where Australia is well-served is in ecosystem models of the marine environment. Models such as Atlantis, which are spatially resolved and can deal with multiple pressures and uses, have been used to assess the impacts of spatial closures, and spatial management more generally, for some Australian fisheries. Marine reserves are often proposed as valuable to provide baseline information on stocks in the absence of fishing. For this to be true, adequate data collection must occur and be available for fishery assessments. There is currently very little usage of marine reserve monitoring data for informing fisheries management but there is sampling in some commonwealth MPAs that may contribute (Hayes et al., 2019).

#### Implications for the Policy and Guidelines

The current policy and guidelines already deal with issues around spatial management and highlight the need to assess the impacts of (changing) spatial restrictions on the performance of harvest strategies. A significant new issue that has emerged since 2018 has been the development of wind farms in offshore areas and the spatial exclusion zones that apply to them.

The Guidelines could be improved in two ways. The first is to better document the complexities in assessing the impacts of spatial restrictions on both stock abundance and the performance of harvest strategies, as discussed above. The second is to point to some of the tools that are available to assess the impacts, including ecosystem models such as Atlantis, GIS tools (to the extent they exist), and spatial models and analyses for fishery resources. Further development and application of such tools is essential and FRDC can play an ongoing role in this area.

This area of policy interacts strongly with other areas of government responsibility, including marine conservation (through the EPBC Act and the implementation of marine reserves), marine offshore energy production, and other areas of marine use. Australia lacks a comprehensive framework for marine spatial planning, but agreements and arrangements between sectors and branches of government can improve coordination. Ongoing monitoring of fishery resources in areas closed to fishing is of vital interest to fisheries and the implementation of harvest strategy policy, and equitable cost-sharing arrangements are required.

## Multi-species fisheries

The challenges of multispecies fisheries for harvest strategy design and implementation are not directly addressed in the existing Policy or Guidelines, although there is mention of multispecies maximum economic yield (MMEY) and two of the harvest strategy examples in the Guidelines deal with multispecies fisheries.

The harvest strategy for the multispecies Southern and Eastern Scalefish and Shark Fishery (SESSF) has been amended several times since its inception in 2005 but is still proving to be problematic. Apart from the multispecies challenge of implementing harvest strategies for each of 30 quota-managed stocks, this fishery is also dealing with most of the other issues raised in this review, including shifting baselines, problems with economic performance, and frequent changes to spatial access, particularly for the trawl fishery. This has made it the focus of a good deal of recent research, with a current FRDC supported project developing and testing a specifically multispecies harvest strategy for the fishery (Little et al. 2023). This project has formally investigated a suite of possible multispecies harvest strategies, including a “pretty good multispecies yield” (PGMSY) approach, multispecies MEY, a trigger species approach, and an indicator species approach previously developed by Newman et al. (2018) in Western Australia. The performance of these approaches is being tested using two different types of operating model – a multispecies metier model, and the Atlantis ecosystem model.

AFMA has implemented a process to consider and build on the results of this research, with a first stakeholder workshop held in October 2023 (Corrie et al. 2024). A significant challenge and driver for the research and for implementation of a new harvest strategy for the SESSF is to manage the costs of monitoring, assessment and management commensurate with the value of the fishery. The harvest strategy finally adopted may well involve elements of several of the approaches tested.

The multispecies section in Appendix 2 of this report contains further information on recent research on multispecies harvest strategies.

#### Implications for the Policy and Guidelines

Multispecies and multi-stock fisheries pose particular issues for harvest strategy implementation and deserve further attention, particularly in the revised Guidelines. The focus should be on providing options and advice about alternative tools and approaches. Recent research and harvest strategy evaluation in the SESSF could be used as a case study. The current Guidelines only mention multispecies MEY, which may not be the best option for many multispecies fisheries.

A further consideration involves multispecies harvest strategies actively monitoring and assessing fewer species and stocks. For fisheries such as the SESSF, this would only be implemented if the robustness of such a strategy had been clearly demonstrated by methods such as management strategy evaluation (MSE). A policy question arising is what status classification to adopt for stocks that are not routinely assessed, but for which (MSE) evidence exists that the harvest strategy adopted would maintain such stocks well above limit reference levels. For such stocks, how often should some level of empirical verification be demonstrated and what form should that take?

## Summary of Recommendations

### Harvest Strategy Policy

This review has identified several topics and issues for Policy consideration.

Regarding shifting baselines:

* The Policy should recognise explicitly that baselines such as unfished biomass are changing for many species and that harvest strategies should adapt accordingly, with certain provisos.
* Where it is clear that baselines have shifted due to changed environmental conditions, biomass target and limit reference points should be adjusted, with a floor set on changes to LRPs in harvest control rules.
* Consideration should be given to an additional category of “environmentally determined” for stock status classification, with flow-on implications for stock recovery strategies.

Regarding biomass targets:

Regarding standards of evidence for stock status determination:

* The Policy could recommend additional evidence to support stock status determination, over and above various conventional stock assessment methods. In particular, where MSE has determined that a stock should be maintained at levels well above limit reference points under application of the harvest strategy, this could be sufficient to determine a “sustainable” stock classification, for some period of time to be determined, even in the absence of more conventional stock assessment information.

### Harvest Strategy Guidelines

The review has also identified several topics and issues for revisions to the Guidelines:

Regarding shifting baselines:

* The Guidelines should spell out the standards of evidence required to consider changes to target and limit reference points attributable to changed environmental conditions, noting the methods that are now available for such attribution.
* The Guidelines should be modified to accommodate the emerging AFMA framework for integrating climate impacts into harvest strategies.
* The Guidelines should specify that an interim standard for stock assessment reporting could consist of status assessment with and without considering climate and environmental effects.

Regarding biomass targets:

* The Guidelines should make clear that variations to the default value for BTARG can be considered in individual cases and should reflect the particular objectives and interests of the fishery in question, including harmonizing targets for shared stocks.
* The Guidelines should outline approaches to evaluating trade-offs in selecting a suitable target, such as the use of MSE, and indicate the tools available for such analyses.
* The Guidelines should emphasise that, notwithstanding a move away from BMEY as the explicit and sole target, the economic performance of the fishery is a key performance measure of the success of a harvest strategy and should continue to be monitored and reported. Consideration should be given to making this reporting cover “economic returns to the Australian community” broader than commercial producer surplus.

Regarding spatial management:

* The Guidelines should emphasise the complexities in assessing the impacts of changes to spatial management and spatial access to fishing grounds.
* The Guidelines should indicate the types of analytical tools available and suitable to assess spatial impacts and the data requirements for their use.

Regarding multispecies fisheries:

* Additional guidance is required for multispecies fisheries, including current and emerging options for multispecies harvest strategies and the tools available to assess their performance.

Regarding additional topics (see Appendix 3):

* Guidance is required on the application of exceptional circumstances that would involve stepping outside the strict application of the harvest control rules in a particular year.
* The Guidelines should provide further clarification on the appropriate use of buffers for risk mitigation.
* The default value for BMSY (B40) should be used in almost all circumstances unless there is clear evidence about stock recruitment “steepness” from a Tier 1 stock assessment model.

More generally, there should be a greater focus in the Guidelines on identifying tools and methods for analysis, together with their data needs and the appropriate circumstances for their application and use. In redrafting the Guidelines, consideration should be given to their purpose - clarification of policy, general guidance, or a more specific how to guide (or a combination of these).

## Other Considerations

Three issues arose in the course of this review that, strictly speaking, sit outside the remit of harvest strategy policy and guidelines, but nonetheless affect their implementation and success. These are listed here and discussed briefly:

EPBC harmonization for conservation dependent status

* The approach adopted for stock status determination in the Commonwealth Harvest Strategy Policy and that adopted in the EPBC Act to determine conservation status of fished stocks need to be in alignment and follow agreed approaches. A challenge is to maintain the agreement when considering the implications of shifting baselines, particularly due to climate impacts. Mounting evidence of environmental factors determining failure of some stocks to recover to above “static” biomass limit reference levels (Fulton et al. 2023) need to be considered and agreed across Commonwealth government departments. The kinds of evidence (standards of proof) required to establish such findings and their use in recovery plans also need to be agreed.

National approaches and standards for harvest strategies

* There are currently nationally agreed guidelines for harvest strategies and nationally agreed standards for stock status reporting, but no national agreement on harvest strategy policy or on targets for stocks. Lack of agreement on stock biomass targets, in particular, has important implications for harvest strategies where stocks are shared across jurisdictions. As discussed above, failure to agree management objectives and targets for shared stocks leads to de facto reallocation of resources between jurisdictions and fleets. The importance of agreement on targets needs to be emphasised in the national harvest strategy guidelines and, ideally, common standards for stock status reporting with respect to targets also agreed in the Status of Australian Fish Stocks (SAFS) process.

Harmonizing policy and sharing costs across sectors and users of the marine environment

* As noted above in the section on spatial management, other users and uses of the marine environment are increasingly impinging on historical fishing grounds, resulting in changed patterns of fishing and in many cases, a degradation of the data used to assess stock status, with important flow-on effects on harvest strategies. The loss of fishery-relevant data and information from areas closed to fishing is of particular importance and the fisheries department needs to secure agreements with other (Commonwealth) departments and agencies about monitoring and sharing the costs of monitoring, so that the fishing industry does not alone bear the costs of the degradation of information.

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See also references in the Discussion Paper at Appendix 2.

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## Acknowledgements

This review has benefited from discussions with many colleagues as well as the involvement of the authors in the recent workshops and meetings listed in the source material. Special mention should be made of the benefit derived from discussions on key topics with David Smith, Beth Fulton, Rich Little, Pia Bessell-Browne, Alice McDonald, Dan Corrie, Andrew Penney and Keith Sainsbury. Helpful advice and guidance were provided by George Day and his team at DAFF. Kate Ollerhead provided assistance with literature searches and helped draft sections of the discussion paper at Appendix 2.

## Appendix 1 Consumer surplus

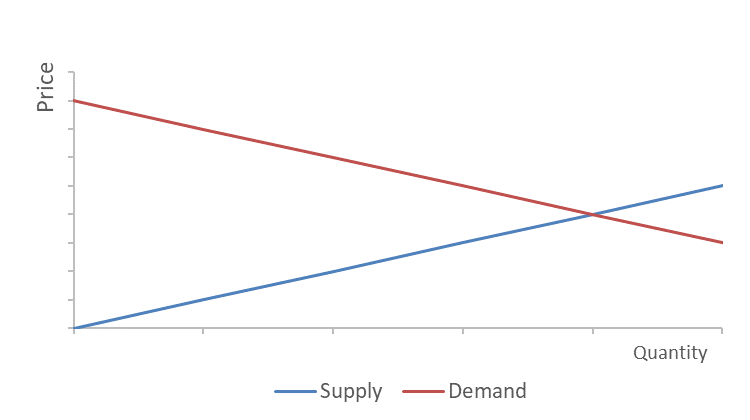
*Producer surplus, consumer surplus….and how these are controlled by government decisions with fisheries management objectives and catch settings.*

This appendix explains the concept of “producer surplus” which is used in the report in the discussion of the MEY biomass target. The 2018 policy interprets the legislative objective of “maximising economic returns” to mean that a BMEY target should be pursued. This interpretation of BMEY was limited to producers only and this appendix explains that there are other ways to interpret that objective.

The supply-demand relationship is well known for goods like fish that are traded in markets. If price is higher, then producers will increase production. If price is lower, then more will be consumed. If the good is traded in an open, competitive market then the amount produced / consumed will be at the intersection of these two competing curves representing a market equilibrium. So, in the example below, X fish will be supplied/consumed at price Y.

Australian commercial fisheries with non-binding TACs are close to being competitive open markets with supply driven by markets rather than regulations.

Figure 1 Supply and demand in an open market



X

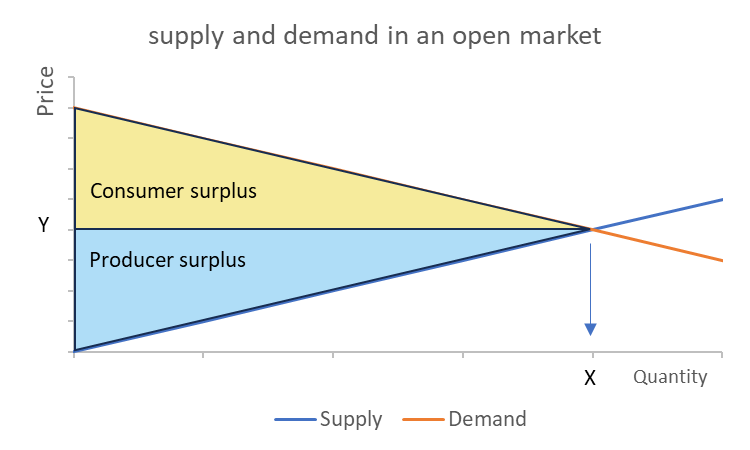
Y

People have a consumer surplus when the price they pay for a product or service is less than the price they're willing to pay. It's a measure of the additional benefit that consumers receive because they're paying less for something than what they were willing to pay. For example, if someone heads to the market to buy a fish and are willing to pay $20, but then find the market price is $15, they have a consumer surplus of $5.

An open competitive market has many different buyers and sellers with different willingness to pay/receive. Some people buying fish in an open market will have a high consumer surplus while others receive little. Some people would have a negative consumer surplus at the equilibrium price, so they don’t make a purchase.

In the figure below, the yellow triangle represents the combined consumer surplus of all the people willing to buy fish at the equilibrium market price (Y). The blue triangle is the combined producer surplus of all the fishers who would be willing to supply fish at the equilibrium price “Y”.

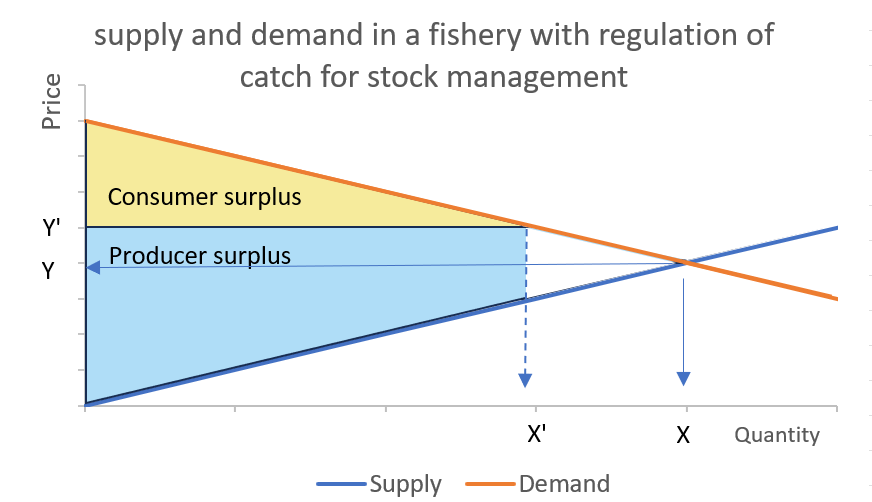
Figure 2 Supply and demand in an open market



A consumer surplus means that goods are priced lower than what many consumers would be willing to pay. This is often the result of competition, technological progress, and producer efficiency. In general, all of these things are considered to be "good" for promoting economic growth and prosperity. Governments usually try to increase consumer surplus with regulations around competition and trade. Consumer surplus from commercial fishing is an “economic return to the community”.

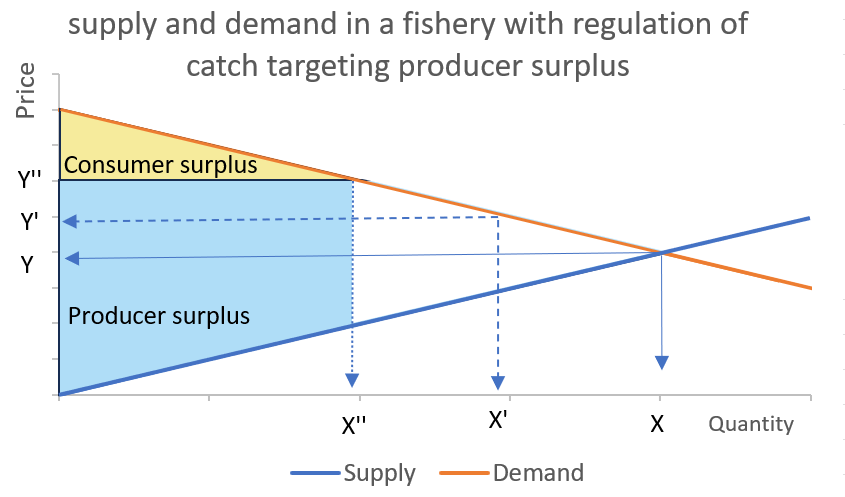
Many Australian fisheries have their catch regulated by the government, not markets, because of the need to manage stocks. For example, to keep stocks above a limit reference point to protect recruitment sustainability, or to prevent undesirable ecological impact. TACs are an obvious example of regulation that reduces supply, but limited entry and input controls are also relevant. Reducing supply with regulation (from X to X’) increases price (from Y to Y’). This reduces consumer surplus and increases producer surplus. Although governments usually aim to increase consumer surplus, reducing supply is considered acceptable in fisheries where there’s an obligation to protect the stock or environment.

Figure 3 Supply and demand in a fishery with regulation of catch for stock management



Fisheries management often goes beyond simply targeting sustainable stocks and adjusts supply because of economic objectives. When managers apply targets of maximum economic yield focused on producer profits, they reduce catch to target higher biomass than would be needed for sustainability objectives alone (from X’ to X’’). Price for fish increases (from Y’ to Y’’), which leads to more economic yield (producer surplus) for commercial fishing operations, but less economic yield (consumer surplus) for buyers of seafood.

Figure 4 Supply and demand in a fishery with regulation of catch targeting producer surplus



These diagrams are obviously highly generalised but illustrate that: (i) economic benefit for the community from fisheries includes both consumer and producer surplus; and (ii) management choices that increase producer surplus usually do this at the expense of consumer surplus. Managers that aim to increase economic benefit to the community need to consider both consumer and producer surplus and the way they interact will vary from fishery to fishery. Important factors are whether the seafood is exported and how the producer surplus flows into the economy,

These concepts were explored in Australia’s most important fishery for Australian consumers, the Australian Southern and Eastern Scalefish and Shark Fishery (SESSF). Briton et al. (2023) noted that the current management system is designed to maximise producer surplus but that this comes at a social cost for crew members and fish consumers. If managers preferred to target economic benefit to the community rather than producers, then systems such as the eco-viability (also known as “co-viability”) are available and are used elsewhere, especially France. These include consideration of the trade-off between producer and consumer surplus.

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## Appendix 2 Discussion paper – June 2023

Review of Commonwealth harvest strategy policy and guidelines 2023: discussion paper

Tony Smith, Caleb Gardner, Kate Ollerhead

June 2023

##### Introduction

A harvest strategy is a fishery management tool that provides a clear and agreed decision framework to achieve defined objectives for fish stocks that are harvested in a given fishery. Key elements of a harvest strategy include processes for monitoring and assessing the biological and economic conditions of the stock, measured against fishery-specific reference levels, coupled with pre-agreed rules (harvest control rules or decision rules) for controlling fishing levels according to the current status of the stock.

Harvest strategies are regarded internationally as the gold standard for effective stock management, with international agencies such as the Food and Agriculture Organisation of the UN and the Marine Stewardship Council deeming them best practice, and their use has been formally adopted in the European Union and by many countries such as the US, Canada, New Zealand and South Africa.

In Australia, harvest strategies were first adopted for Commonwealth-managed fisheries in 2007 with the release of the *Commonwealth Fisheries Harvest Strategy Policy and Guidelines*. National guidelines for developing harvest strategies were developed in 2014 and subsequently most Australian State and Territory governments have also adopted formal harvest strategy policies. The Commonwealth policy and guidelines were updated in 2018 and are now the subject of a review in 2023. This discussion paper provides input to the 2023 review.

Since 2007, formal harvest strategies have been adopted for all Commonwealth-managed fisheries, with many fisheries having been through more than one iteration of harvest strategy development and implementation. Collectively, these fisheries vary greatly in scale, value and complexity, so that the Commonwealth has developed considerable experience and expertise in designing and implementing harvest strategies for a diverse range of fisheries. Much of this experience has already been captured in the 2018 update to the policy and guidelines, with the guidelines in particular providing advice on a wide range of topics relevant to harvest strategy implementation. Nevertheless, the policy landscape and external drivers continue to evolve and change, so that the context for this review includes some emerging key challenges:

* Shocks to both the biological systems (such as marine heatwaves) and to markets (trade disputes, disruptions due to Covid)
* Longer term changes to marine ecosystems and species through global warming
* Changing social expectations about resource management
* Increasing competition for resource access and sharing marine spaces
* Increasing demands on fisheries management despite fixed or reducing budgets
* Decreasing data quality for key inputs to stock assessment and management.

This discussion paper considers the impacts of these and other challenges on a set of topics of relevance to harvest strategies. Most of the issues covered here are already mentioned in the 2018 policy and guidelines, but new research and ongoing management experience (including where harvest strategies are not working) need to be considered. Not all topics covered in the existing guidelines are discussed here.

##### Selecting targets and limits

Target and limit reference points are fundamental to the design and implementation of harvest strategies and feature very prominently in the current policy and guidelines. Reference points serve two related but separate functions in a harvest strategy. First, they help define the operational objectives of a harvest strategy by specifying the values of an indicator that correspond to the achievement of a management objective. Second, they serve to define aspects of a harvest control rule, such as target exploitation rates or biomass depletion limits beyond which targeted fishing must cease.

In general, limit reference points correspond to conservation or sustainability objectives (biological objectives) for a harvest strategy, while target reference points correspond to economic (or sometime social) objectives. Across management jurisdictions in Australia, there is widespread agreement about limit reference points. These correspond to the definitions of overfishing in the national Status of Australian Fish Stocks classification scheme and also to definitions in international fishery certification schemes such as the Marine Stewardship Council (MSC). There is also a considerable body of science underpinning the selection of limit reference points. A widely used default for a biomass limit reference point BLIM is 20% of unfished biomass (Smith and Smart, 2022). This is the proxy value recommended in the current Commonwealth harvest strategy policy. Stocks below this level are considered to have unacceptable risk of recruitment overfishing.

The objectives for fisheries and the suitable values for target reference points (TRPs) are much more complex and disputed across management jurisdictions in Australia. The current Commonwealth policy objective is quite clear – the objective is to achieve maximum economic returns to the Australian community from fishing a resource. This has been operationalised to maximum economic yield (MEY) for producers with the biomass that achieves producer MEY (BMEY) being the default target reference point. In practice, few fisheries have developed the bioeconomic models and analyses to estimate BMEY precisely (and in any case it can fluctuate widely under variations in prices and costs), so a proxy value is recommended in the policy, with BMEY set at 20% above BMSY (the biomass that achieves maximum sustainable yield). Again, there are few fisheries that can estimate BMSY precisely, so default values are set at 40% B0 for BMSY and 48% B0 for BMEY. The target fishing mortality rate FTARG is set at the value FMEY that achieves BMEY.

The current harvest strategy guidelines provide a lot of advice on how to operationalise and achieve MEY for producers, including for multispecies fisheries (see also later section on multispecies fisheries). Most Commonwealth-managed fisheries are largely commercial fisheries, so having a well-defined economic target makes sense. However, societal expectations about fishery management are changing, and there is growing recognition that maximising economic benefit to the Australian community requires consideration broader than producer profit. Among these are the following considerations:

* Consumer surplus: Economic Yield to the community from a fishery includes both producer surplus and consumer surplus although usually only the producer surplus is measured and considered in Australian fisheries management. When fisheries management sets catch to maximise economic yield to producers only, it means that catch (supply of seafood) is reduced relative to the level that would maximise community benefit (both consumer and producer surplus). The shift in benefit from consumers to producers is greatest when there is a strong price effect from lower supply. So, a target reference point that includes both consumer and producer surplus will be closer to BMSY and below the BMEY levels typically adopted in Australia (Pascoe et al., 2018).
* Greenhouse benefits: With global and national focus on mitigating global warming and its consequences, reducing greenhouse emissions for key industries is in the spotlight. These considerations have a bearing, not only on the types of fishing gear and vessels used, but also on the overall amount of fishing effort expended in catching fish. A recent paper discusses the greenhouse gas emission consequences of selecting different reference points and provides a measure of the fuel use per unit of catch (Hornborg and Smith, 2020). The message is clear – higher biomass reference points (achieved with less fishing effort) have greenhouse benefits (Farmery et al., 2013).
* Ecosystem benefits: Fishing has ecological impacts beyond the catch of target species. These impacts are diverse, affecting populations, communities, habitats and sometimes the structure of ecosystems. While there are trade-offs involved, the impacts are often related directly to the amount of effort applied. Higher biomass targets correspond to less effort and lower ecological impacts. Pascoe et al (2018) explored including the non-market value of bycatch in calculation of community MEY from a fishery. Unsurprisingly, this led to an estimate of lower MEY catch / higher BMEY than if only producer surplus was considered. The main point was that limiting MEY calculations to producer benefits only does not maximise economic benefit for the community.
* Recreational and cultural benefits: This is another situation where the traditional limited approach to focusing on commercial producer benefit only in calculating MEY may reduce economic benefits to the wider community. Both recreational and indigenous cultural fishers receive non-market economic benefits from harvesting fish and their target biomass level is likely higher than for commercial producers. For recreational fishers, the probability of catching a “trophy” fish is higher at higher biomass, while indigenous fishers will generally benefit from higher biomass targets because fish will be more accessible to shore-based fishing. Both cultural and recreational fishers tend to be less efficient than commercial fishers which means they tend to benefit more from lower catch/higher biomass than a commercial fisher. See also the section on multi-sector fisheries below.
* Governance benefits: Ask any fishery manager whether they would rather be managing a depleted or a healthy resource! Fish stocks at higher biomass levels require less management intervention, often less intensive monitoring, less frequent assessment, and overall, less contention and lower management costs.
* Dynamic operating environments and tolerance of risk: The productivity of fisheries changes through time both because of climate change and also due to normal interannual fluctuations in recruitment and other drivers of population dynamics. The economic environment of fisheries is also dynamics due to changing costs and prices. These contribute to an uncertain operating environment for management and a buffer of a larger stock level can assist in reducing the risk of current catches impacting future production.

A graph with black circles and arrows

Description automatically generated

**Figure 1.** BTARG for commercial producers is higher than BMSY in practice for Australian fisheries and equates approximately to BMEY. BTARG for recreational and cultural fishers will be higher again, in general, because they typically gain greater benefit from stocks with lower exploitation rates and higher biomass, improving catch rates and access. BTARG will vary if it includes benefits and externalities to the community rather than commercial producers only. Consideration of the economic benefit of “consumer surplus” would typically lead to strategies of higher catch and BTARG below BMEY. Inclusion of environmental externalities such as bycatch would also lead to higher BTARG. Risk of unexpected stock impacts from catch settings in harvest strategies is reduced where the target is greater than BMEY for commercial producers.

With the exception of consumer benefits, all these considerations point in the direction of higher biomass targets. Even for consumers, there is no benefit in fishing the stock below BMSY. For the other considerations, a suitable target biomass or proxy will be higher than estimated for commercial BMEY. It is likely to vary case by case and there will be trade-offs. The point is to consider these wider objectives and to weigh up the trade-offs explicitly.

A further consideration in selecting targets is what to do about stocks that are shared across jurisdictions (nationally or internationally). For stocks whose management is shared with States or Territories, the ideal is to have a common harvest strategy. This would require common reference points and identical harvest control rules. For most shared resources, allocation agreements have been reached between jurisdictions (and usually between sectors within jurisdictions). However, differences in harvest strategies between jurisdictions, such as different targets or different harvest control rules, would result in different management responses in response to the same stock status, leading to changes in relative allocations over time. Most states have adopted their own harvest strategy policies and guidelines, and there are some notable differences between them (e.g., Queensland has adopted a default biomass target of 60% B0). In general, jurisdictions that, for whatever reason, have adopted more conservative targets (higher biomass targets) will be at a disadvantage relative to those with less conservative targets. This situation is becoming more problematic as more jurisdictions implement harvest strategies. Discussion and resolution of the issue seems warranted at a national level.

*Questions to consider / information request:*

* Should the harvest strategy policy be modified to include objectives broader than commercial MEY?
* Is there a need for common standards and approaches to harvest strategy limits and targets across jurisdictions, particularly for shared resources?

##### Shifting baselines

Stock assessments typically measure the status (abundance or biomass) of a stock relative to its unfished or pre-fishing level. This is often expressed as a depletion level – the current level of the stock relative to its unfished level, expressed as a percentage. As discussed in the previous section, this is used to define reference levels such as a target (e.g., 48% B0 as a proxy for commercial BMEY) where B0 is unfished biomass. Similarly, limit reference points for biomass are expressed as a depletion level (20% of B0). These are simple concepts and widely used in fisheries assessment and management, including in harvest strategies.

A difficulty arises when B0 itself varies over time. The productivity and abundance of a species is influenced by the properties of the ecosystem in which it exists, and ecosystems change. For example, the marine ecosystems of southern Australia were already highly modified by sealing and whaling in the 19th century, well before most present-day fisheries developed. The recovery of these species is now changing these ecosystems again, not necessarily back to how they were. Changes in ecosystems cause fluctuations in the abundance of a species even in the absence of fishing. If these changes are merely random in nature, and equally up and down, then B0 can be thought of as an average unfished level. However, larger, longer term, and/or unidirectional changes in system productivity can cause larger impacts on B0 (and hence perceptions of depletion) and need to be accounted for.

There is mounting evidence that global warming is having dramatic impacts on ocean ecosystems, including in Australia (Barange et al., 2018). These changes are impacting harvested species in several ways:

* Shifting spatial distributions
* Changes in B0
* Changes in productivity (impacting FTARG)

These impacts and their consequences have been the focus of scientific research over the past decade or more, with a lot of new evidence and analysis emerging since the last update of the harvest strategy policy and guidelines in 2018.

There is mounting evidence of shifts in spatial distribution of populations and species, particularly along the eastern and western coasts of Australia (Gervais et al., 2020). A common trend is a southward shift in distributions, associated with warmer ocean temperatures shifting further south. These changes have implications for both resource access and jurisdictional arrangements. As populations shift south, access to the resource can be diminished or lost entirely for fishers in more northerly areas, while fishers in the south may gain access to resources not previously available. These changes can also affect assessments of resource status, due to contrasting trends in abundance in different parts of the range. Similarly, resources that are mainly managed by one jurisdiction may increase in importance for another jurisdiction. All these changes have important implications for harvest strategies, particularly for shared resources.

Ocean warming is not only affecting the spatial distribution of species, but also their abundance. Some of these impacts can be rapid and dramatic, such as the effects of marine heatwaves. Harvest strategies need to be flexible enough to respond appropriately to such changes. Other changes due to ocean warming may be more gradual but also more long-lasting. The effects of such changes on population abundance may be direct (physiological) or mediated through broader changes in ocean ecosystems, including impacts on ocean currents (dispersal and settlement), food supply and habitat. These changes can result in large changes in both abundance (unfished B0) as well as population productivity (through changes in growth, natural mortality and/or recruitment), sometimes positive but often negative.

Considerable scientific research has been directed at this issue of shifting baselines, particularly in the past five years (Bryndum-Buchholz et al., 2021; Holsman et al., 2019; Link et al., 2021). Mostly it has considered changes in B0 rather than changes in productivity, because this is easier to detect and measure. One way to detect such changes is to allow for “dynamic B0”, where B0 is estimated each year as the biomass which would occur in that year in the absence of fishing, given current conditions. This contrasts with the more usual approach of estimating a “static B0” corresponding to the biomass which existed prior to the commencement of fishing (so at a fixed point back in time, which will vary from stock to stock depending on the history of fishing). There is mounting evidence for a number of Australian fish stocks that dynamic B0 has changed considerably over time, and for some stocks has shown a declining trend, possibly associated with ocean warming or other changes to the ecosystem.

The implications of dynamic B0 for harvest strategies can be profound and require careful consideration. The current Commonwealth harvest strategy policy and guidelines define proxies for both target and limit reference points relative to B0. If B0 is static or fixed, these limits (BLIM) or targets (BTARG or BMEY) are also fixed, and the response of the harvest control rule to changes in abundance will not change over time. However, if a dynamic B0 is used to define these reference points, the biomass targets and limits will themselves change over time, and in the case of declining B0, the reference points will also be shifted to lower levels of biomass. If the harvest control rules also change with the changes in reference point, the result would be to continue to fish the stock as it declines, with higher catches than would occur if a static B0 approach was used.

Several scientific papers have pointed out the potential risks of adopting such a dynamic approach to reference points and harvest control rules (Szuwalski et al., 2023; Thompson et al., 2021; Travers-Trolet et al., 2020). Some have advocated sticking to the static approach, but this is based only on consideration of changes to B0. If productivity is also declining, the other important part of a harvest control rule, the target fishing mortality rate or FTARG (proxy FMEY for Commonwealth fisheries) may also change, and sticking with a fixed rule may lead to overfishing due to an inappropriately high fishing mortality rate. A major research project is considering these issues (Penney et al, in prep) and is due to report quite soon, so more information and guidance on these issues should be available shortly. One possibility being explored in this work is to limit the reduction in the limit biomass reference point to half the static equivalent, with corresponding limits on changes in the form of the harvest control rule (Bessel-Brown et al., 2022). The consequences of changes in productivity are also being investigated.

*Questions to consider / information request:*

* Should reference points be changed in response to changes in productivity or unfished biomass?
* What evidence should be required to consider making such changes?

##### Multi-species fisheries and EBFM

Fisheries that target or catch many species pose particular issues and challenges for harvest strategy design and implementation. The 2018 guidelines already deal with some of these issues, including providing advice on how to achieve multispecies MEY. The current policy recognises that not all stocks in a multispecies fishery can be harvested simultaneously at “optimal” levels, and that some (less productive or more catchable) stocks may be maintained at biomass levels lower than either (single species) MEY or MSY, provided that all stocks are maintained above limit reference point levels of biomass. The existing harvest strategy policy applies to all retained species, while a complementary bycatch policy applies to species that are caught and discarded.

Harvest strategies were originally developed as a single species management tool and continue to be applied in that way in most instances. The status of an individual stock is assessed, stock-specific reference points are developed, stock-specific harvest control rules are applied, and stock-specific management actions determined (catch controls such as quotas or various forms of input controls). Some variation in targets is allowed, based on the notion of ‘pretty good yield” which recognises that the peak in yield curves as a function of biomass tend to be fairly flat, so that similar yields can be obtained over a range of stock sizes (ref). This concept has been extended to “pretty good multispecies yield” (Rindorf et al., 2017).

A multiple single-species approach to harvest strategies, while widely applied, has several drawbacks. Not least of these is that very species-diverse fisheries require a lot of stock assessments as each stock is, in a sense, managed separately. Issues also arise with “choke” species, where catches from stocks that are not overfished are constrained by the status of stocks that are overfished. Another issue is that changes over time in the primary species targeted can confound interpretation of catch rates and greatly increase the uncertainty about stock status.

Such issues have led to a search for alternatives to the standard approach. One approach, using MICE (models of intermediate complexity for ecosystems) has been applied in several fisheries (Plaganyi et al., 2014). Another approach considers a “balanced” approach to harvesting species across an ecosystem (Zhou et al., 2019). A third approach, adopted for several fisheries in Western Australia, is referred to as the “indicator species” approach (Newman et al., 2018). This has been applied to the assessment and management of multi-species, multi-gear and multi-sector fisheries and uses a risk assessment and prioritisation approach to select indicator species that are then the focus of more targeted assessment and management. By selecting indicator species that are most vulnerable to the fishery (due to low productivity and/or high catchability), the assumption is that the status of other less vulnerable species will be assured if the indicator species is maintained at appropriate stock levels. The selection of indicator species is determined not only by inherent vulnerability, but also by management importance, including commercial value as well as social and cultural significance. The possibility of applying this approach is currently under investigation for the Commonwealth Southern and Eastern Scalefish and Shark Fishery (Sainsbury and Fulton, 2023).

Recent scientific literature also points to ways in which ecosystem considerations can start to be incorporated into harvest strategy design. This would help support the Commonwealth commitment to ecosystem-based fisheries management (EBFM) which is addressed separately to harvest strategy policy. EBFM is currently addressed through the Australian Government’s ecological risk assessment and ecological risk management framework, with bycatch managed under the Bycatch Policy.

There are several ways in which harvest strategy policy could link operationally to these broader ecosystem considerations. One way is to extend the indicator species approach outlined above to include a selection of “ecologically important” species. These might include keystone species, low trophic level species, habitat-defining species, or TEPS (threatened, endangered and protected species). For example, low trophic level or “forage” species are already considered and treated separately in the Marine Stewardship Council standard, with higher target biomass levels required for key low trophic level stocks, in recognition of their importance as food for other species in marine ecosystems (MSC, 2022). The EU is starting to adopt ecosystem considerations in some single species harvest strategies (Howell et al., 2021), while the North Pacific Fishery Management Council in the US, is trialling ways to incorporate ecosystem considerations into harvest strategy advice (Dorn and Zador, 2020). Several jurisdictions overseas have also adopted “ecosystem caps” where total removals from an ecosystem are limited, even if single species assessments and harvest strategies indicate that more could be taken (Holsman et al., 2020). An important consideration concerns the sorts of ecosystems and ecological communities that decision makers wish to maintain, in relation to overall harvest rates and the economic and other benefits of fishing (Fulton et al., 2022).

*Questions to consider / information request:*

* Should the guidelines be expanded to include new approaches to harvest strategies for multispecies fisheries, such as the indicator species approach or the balanced harvest approach?
* To what extent can considerations arising from ecosystem-based fisheries management be incorporated directly into harvest strategies? Or should harvest strategies remain principally a strategy for stock management?

##### Multi-sector fisheries

Multi-sector fisheries are those where part of the catch is taken by non-commercial fishers, in particular recreational fishers, charter fishers, and/or indigenous fishers following cultural fishing practices. (Indigenous fishers may also be commercial or recreational fishers). The term is not meant to refer to multi-gear fisheries, although these are sometimes referred to as sectors (e.g., the trawl sector, the line sector).

Most Commonwealth-managed fisheries do not have a large recreational or cultural component, but these sectors do constitute a component of the catch for some stocks. Take from sport fishing can be a significant factor for some fisheries targeting large pelagic species, and the Commonwealth has already adopted specific arrangements for quantifying and managing the recreational take of Southern Bluefin Tuna. A question that arises where there is a significant non-commercial take is how to account for the catch from these sectors in harvest strategies. If the level of catch is high enough (as a proportion of the total catch), these sectors may even have their own harvest strategies including harvest control rules. As with multi-jurisdiction fisheries, the challenge of managing for different users goes beyond just apportioning catch. There is also the question of compatibility of reference points and harvest control rules, including the challenge of reconciling how to manage if BMEY is different for the different sectors.

Considering recreational fishing first, a challenge in almost all cases is how to estimate the catch taken. This problem is being addressed through initiatives like the national recreational fishing surveys, and several State jurisdictions are also developing their own surveys and protocols. A second problem is in regulating recreational fishing mortality. Fishery managers have developed a range of tools to try to regulate recreational catch, including bag limits, boat limits and size limits, as well as closed areas and seasons. Recent research suggests that some of these measures may not be very effective, including “output” controls such as bag limits (Ochwada-Doyle et al., 2023). The basic problem is that in most cases there are no effective controls on overall fishing effort. To date, most recreational fishing controls have been applied in a reactive manner, and the development of harvest strategies for recreational fishing is still in its infancy. Where harvest strategies have been developed for multi-sector fisheries, in most instances these have only applied to the commercial component, with estimates of recreational catch “taken off the top” of annual estimates of sustainable catch. This can lead over time to large changes in the allocation of catch between sectors, often to the detriment of commercial fishers, so that equity issues can arise. The Western Australian government has tried to address this issue in developing harvest strategies for mixed sector and multi-species fisheries (Fletcher et al., 2016).

Estimating economic yield from the recreational sector is another challenge but needs to be considered if the objective for management is to maximise benefit broader than the commercial sector. Recreational economic yield is analogous to commercial economic yield in that it is benefit minus costs – it is not measured by recreational expenditure. Benefit in the case of non-commercial fishery harvests is the non-market utility of recreational fishing which can include factors such as consumption benefit and enjoyment of the activity. Recreational economic yield from fishing behaves differently from commercial fishing in two important ways. The first is that there is far greater variation between individual recreational fishers. We can see that some individual recreational fishers get far greater utility than others by the way that participation responds to catch rate. Managers need to consider the fishers on the margin who don’t gain utility and won’t participate if catch rates are low. This is a loss of community economic benefit. Another difference from commercial fishers is the diminishing marginal utility from higher daily catch of recreational fishers. Put simply, a commercial fisher typically receives the same market price from the last fish they catch as the first. However, a recreational fisher gains most utility (think “excitement”) from the first fish caught and this utility diminishes with each additional fish they land on the trip. It’s possible to make general observations on recreational fisheries without doing surveys to estimate recreational economic yield. The factors described above mean that recreational BMEY can be assumed to be higher than commercial BMEY (and target F lower) because higher biomass means more fishers participating, higher strike rate, and reduced risk of a no-catch-day for the less experienced fishers on the margin.

Trying to estimate indigenous cultural fishing catch and economic values for use in harvest strategies is even more difficult than recreational fishing. Several States are developing policies and strategies in this area, and a current FRDC-funded project is attempting to develop a harvest strategy framework for cultural fishing in New South Wales. Generally, the way in which non-commercial sectors are considered and managed in harvest strategy policies has important implications for allocation and equity between sectors (Barclay et al., 2023). As with recreational fishing, in the absence of empirical estimates, it can be assumed that BMEY for cultural fishing will be higher than for commercial fishing. This is because of lower efficiency of cultural fishing effort and the non-use value from stocks that are closer to their natural state.

Approaches exist to estimate the economic and social benefits of non-commercial fishing and incorporate them into harvest strategy development for multi-sector fisheries (Dowling et al., 2020; Pascoe et al., 2019). However, most fisheries lack the data and models to undertake such analyses.

*Questions to consider / information request:*

* Should harvest control rules for recreational and/or indigenous cultural fishing be incorporated in Commonwealth fisheries harvest strategies? If so, how?
* Should target reference points be altered (increased for the biomass TRP) to reflect the objectives and interests of non-commercial sectors?

##### Uncertainty and risk

Uncertainty and risk are ubiquitous in fisheries assessment and management. Proper harvest strategy design involves clear recognition of the uncertainties and strategies to manage the resulting risks. The risks in this case are failure to meet management objectives and targets. Explicit levels of acceptable risk are defined in the policy in relation to probabilities of falling below (biomass) limit reference points.

Sources of uncertainty are many. Formal approaches to stock assessment involve fitting population models to data. Data are often “noisy” (variable), and, of more concern, frequently biased. Sometimes entire categories of data are missing or extremely limited (for example, catches from recreational fisheries, although this situation is starting to improve). Models involve assumptions and the assumptions may not hold. (See for example the section on shifting baselines above). Fishery-dependent data such as catch per unit effort from logbooks may not reflect changes in the population being assessed, while fishery-independent data (from scientific surveys), though likely less biased, are expensive to collect. Of current concern is the general reduction in the quality, quantity and types of data available to assess stock status, often due to budgetary constraints. Fisheries management in Australia has also moved from applying harvest strategies to only their data-rich fisheries towards also including more data-poor fisheries. This has resulted in many assessments becoming increasingly uncertain over time.

Not all stocks have the data (or sometimes the resources) to assess stock status using quantitative models statistically fitted to time series of data. There has been growth over the past decade or more in methods for so-called data-limited assessments, and these methods are now used to assess a number of stocks in Commonwealth managed fisheries. While this has enabled the application of harvest strategy policy to fisheries that could not otherwise have done so, a particular problem with these methods is that the uncertainty in the assessment (the uncertainty about stock status) is very hard to determine and quantify. Even for the statistical quantitative models used where the data allow, experience has shown that uncertainty is often underestimated.

Uncertainty about stock status is perhaps the most important source of uncertainty in applying harvest strategies, but other sources of uncertainty are also important. Economic data and models are required to address and meet the MEY objective but both data and models are similarly afflicted by uncertainty. For example, the past five years have seen a series of shocks to both costs and prices, associated with external events such as trade disputes with China, impacts from Covid restrictions, and the war in Ukraine affecting energy costs. The proxy for commercial BMEY (1.2 times BMSY) is highly uncertain, and a recent study suggests may be well off the mark (Pascoe et al., 2023). Non-market values of non-commercial sectors may be more stable through time but have the challenge of the need for dedicated surveys to estimate costs and benefits.

The performance of a harvest strategy in meeting its objectives is related to the way in which all three key elements of a harvest strategy work together – monitoring, assessment and the harvest control rule. The policy is explicit that harvest strategies should be formally tested to assess whether they are highly likely to meet the objectives of the policy and suggests using methods such as management strategy evaluation (MSE) to undertake such testing. MSE is a simulation-based approach that in principle can be used to assess the robustness of a harvest strategy to uncertainty in each of the elements discussed. MSE is indeed a useful tool for this purpose and can help identify and eliminate combinations that will not meet the objectives.

As with any method, there are some constraints to consider in using MSE. The first is that it is resource intensive and requires analysts with high level quantitative skills as well as very good communication skills. These are often the same analysts and scientists undertaking (quantitative) stock assessments to implement the harvest strategies, so that a resource/time constrain often comes into play. A second constraint is in the choice of “operating model” (the simulation model used to evaluate the performance of the harvest strategy). While a relatively simple operating model may be sufficient for a simple single species fishery, more complicated models are required for multispecies fisheries, and also to consider the broader ecological implications of harvest. The broader the focus, the more uncertainties need to be considered. Fortunately, Australia is quite advanced in development and application of prospective operating models, including multispecies models, ecosystem models, bioeconomic models, as well as coupled social-ecological models for fishery and marine systems (Little et al., 2023; Fulton et al., 2011; Pascoe et al., 2020; Plaganyi et al., 2014). More use could be made of this capacity and capability.

As already noted, the current Commonwealth harvest strategy policy has adopted an explicitly risk based approach to harvest strategy design and implementation. This has given rise to the risk-catch-cost framework which is well described in the current guidelines. This concept outlines a trade-off where higher catches can be achieved at a given level of risk by investing in data, assessment and management to get the most out of harvesting a resource. However, the same level of risk could also be achieved by a much lower investment that would require a correspondingly lower level of catch. This approach to risk equivalence has been applied in various ways to harvest strategy design, including the development of tier-based harvest strategy frameworks. MSE has been used extensively to calibrate risk equivalence between tiers, spanning data rich to data poor situations and resources (Fulton et al., 2016; Fischer et al., 2023).

In practice, maintaining risk equivalence across tiers corresponding to a range of levels of data quality and quantity requires explicit methods to address uncertainty and implement precaution. One method in common use is to apply precautionary buffers to the “advice” arising from application of a harvest control rule (e.g., a quota recommendation), depending on the tier being used. Another approach (not currently used) could be to adjust the limit and target reference points used in the harvest control rule, depending on the tier. A third approach, used in some US fisheries, is to discount the catch recommendation according to the uncertainty about either current biomass or the target fishing mortality rate arising from the stock assessment (Privitera-Johnson and Punt, 2020). This approach has not been adopted in Australia to date. It can be shown to work quite well where statistically based quantitative stock assessments are in use. However, as noted earlier, a problem arises where less quantitative or even qualitative (weight of evidence) assessments are used, where it is generally impossible to quantify the uncertainties involved.

Concerns have been expressed that the principles of risk equivalence and application of the risk-catch-cost trade-off are not always consistently or correctly applied in current applications of tier-based harvest strategies in (some) Commonwealth fisheries. This seems to be an area where further guidance and attention is required.

*Questions to consider / information request:*

* Is stronger guidance or direction required on how to take account of uncertainty and apply the precautionary approach more consistently in the Commonwealth harvest strategy policy and/or guidelines?
* What is the right balance in deployment of scarce resources between (tactical) stock assessment versus (strategic) management strategy evaluation?

##### Special topics

*Close kin mark recapture*

CKMR is a recently developed tool that can provide a direct (absolute) estimate of stock abundance (Bravington et al., 2016; Trenkel et al., 2022). It has already been applied to several Commonwealth-managed stocks (southern bluefin tuna, school shark) and shows promise for other stocks that are otherwise difficult to assess. It offers promise as the quality of other sources of data on trends in abundance, particularly fishery-dependent data such as CPUE, deteriorate over time (see earlier section on uncertainty and risk).

CKMR is not without its drawbacks, however. The initial costs to develop the genetic basis of the method for each species can be high, though once developed, the costs for ongoing application have decreased considerably. Of possibly greater concern is the ability to collect the samples needed to apply the method, particularly for depleted stocks where targeting is avoided, or for stocks that reside mostly in areas closed to fishing.

A specific concern that has been raised is the problem of estimating B0 where CKMR estimates form the main basis for assessing current abundance. This issue arose in the school shark example, where the stock estimates from CKMR were inconsistent with those obtained from previous analyses (Thomson et al., 2020). A suggested resolution of the inconsistency was that whole sub-populations of the stock had been eliminated, fundamentally changing the measure of unfished biomass. The issue for the harvest strategy is that, in its current form, it relies on an estimate of depletion relative to B0 to feed into the harvest control rule.

It is not yet clear how commonly this issue may arise. Moreover, as discussed in the earlier section on shifting baselines, the issue of non-stationarity in B0 is a more general one that needs to be addressed. A new research project is examining this issue, specifically regarding CKMR. In the meantime, estimates from CKMR can be used as an additional input into quantitative stock assessments, and may gradually replace other indicators such as CPUE over time. If there really is major uncertainty about B0, a suitably precautionary fixed fishing mortality rate can be applied to the most recent estimate of abundance from CKMR.

*Non-recovering stocks*

The current harvest strategy policy seeks to maintain stocks at or around target levels and actively avoid the stock falling below the (biomass) limit reference point. Where stocks do fall below BLIM, fishing mortality is set to zero in the harvest control rule, and other management arrangements constituting a formal recovery strategy are set in place.

Harvest strategies have now been implemented in most Commonwealth-managed fisheries since 2007. In most instances they have succeeded in preventing overfishing, and in enabling the recovery of previously overfished stocks, but there have been some exceptions. Several examples are to be found in the Southern and Eastern Scalefish and Shark Fishery (SESSF). The problem with school shark has already been mentioned. Another example is eastern gemfish, the stock of which collapsed in the late 1980s (well prior to the implementation of formal harvest strategies, though strict measures were brought in at the time to limit catches and try to recover the stock). Given the low level of the stock and the avoidance of targeting, there is considerable uncertainty about the ongoing status of eastern gemfish, but it seems clear that it has failed to recover in the past thirty or more years. The reasons for this are not clear – possibly a combination of changes in the ecosystem, more recent changes in ocean temperatures, and possibly ongoing low levels of incidental fishing mortality that are sufficient to prevent recovery. It is quite possible that the stock would not recover to a level above its previous limit reference level, even if all fishing mortality ceased. On the positive side, the eastern stock of orange roughy has recovered to well above its limit reference level under application of the harvest strategy and a specific recovery plan.

The eastern gemfish example raises the question of how the harvest strategy policy should deal with non-recovering stocks. The EPBC Act requires that efforts at recovery should continue until recovery occurs, but in some instances, recovery may not be possible.

*Questions to consider / information request:*

* Should there be a “statute of limitations” for non-recovering species?

*Spatial management*

Spatial structuring of fisheries occurs in the biology of the fish, in fishing effort (e.g. factors affecting accessibility), and in management controls both related to the fishery (e.g. spatial closures) or external (e.g. marine parks and other exclusions).

Harvest strategies often account for spatial issues by dividing the fishery into regions with the fishery performance tracked separately for each region. There is a trade-off in managing spatial issues with smaller spatial division suffering from less data and confidence in assessments, plus greater difficulty in implementing management of catch.

Commonwealth fisheries interact with large spatial closures for some gear types, especially bottom trawl, plus marine parks including no-take areas. These introduce problems in the harvest strategy, including how the stock in closed areas is included in the assessment of the stock, and also in the choice of appropriate reference points (Field et al., 2006; Pincin and Wilberg, 2012). Stock in areas closed to fishing is generally more relevant to limit reference points because LRPs are associated with management objectives of avoiding recruitment overfishing. In contrast, stock in no-fish areas is less relevant to TRPs where these are explicitly linked to objectives of maximising economic benefit as per the Commonwealth. This is because economic yield is maximised by balancing the revenue (catch) against the cost of fishing (driven by catch rate), and the stock in closed areas provides no catch rate benefit.

Closed areas have been proposed as useful reference sites where empirical information can be obtained on density at B0, and comparisons made with fished areas to provide simple estimates of depletion in data poor fisheries (Wilson et al., 2010). However, Edgar et al (2014) noted that many marine parks have limited value for informing fisheries management because the stocks inside don’t represent density at B0 due to fish movement, illegal fishing, and different habitat types.

Spatial structuring in populations can lead to localised depletion and, effectively, to loss of access to the resource for some fishers (commercial, recreational, Indigenous) because of place-based fishing. Mobile species can exhibit the "basin theory" of populations, whereby a depleting resource first disappears at the margins of the distribution, which is another argument for higher biomass targets.

*Questions to consider / information request:*

* Does the policy need any specific components on treatment of stock in unfished areas, especially closed areas and marine parks?
* Does the use of reference points drawn from the whole spatial area of the fishery misrepresent the status and performance relative to targets in the places where it matters most for users of the resource?

##### Key points and questions for consultation

* What is the right balance between flexibility and prescription in the harvest strategy policy and guidelines?
* What is the resolution to apparently “irresolvable” issues such as non-recovering species (noting the constraints imposed by the necessity to meet EPBC requirements and standards)?
* Is there a need for stronger guidance on precaution?
* Is there need for a broader approach to defining targets under changing social expectations?
* Should the harvest strategy policy be kept simple and single stock focused, or should it embrace elements (or all) of EBFM?
* Note that some fisheries tick all the (difficult) boxes? (multi-species, multi-sector, multi-gear, multi-jurisdiction, ocean warming hotspot). Is there a better/simpler way to manage these fisheries?
* Is there a need for common standards and approaches for shared resources? Does Australia need national standards for harvest strategies, at least for shared resources?
* How can the policy and practice be more realistic about the cost constraints in the risk-cost-catch trade-off?

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## Appendix 3 Additional topics

Several more specific points were noted in the course of this review, particularly concerning the current guidelines:

Exceptional circumstances

* Disruptions to markets and supply chains due to Covid and international trade disputes have required consideration of exceptional circumstances for several harvest strategies over the past five years. Guidance on the appropriate use of exceptional circumstances is required.

Buffers and risk mitigation

* The use of buffers for risk mitigation is mentioned in several parts of the guidance but care needs to be taken about multiple use of buffers. Buffers can be used in different ways, including by setting more precautionary reference points, by discounting RBCs depending on levels of uncertainty in stock status, or by increasing buffers as the time since the last stock assessment increases (time buffers). Further clarification on the appropriate use of buffers for risk mitigation would be a useful addition to the guidelines.

Calculating BMSY (request from DAFF)

* The proxy for BMSY is 40% of unfished biomass, to be used where “BMSY is unknown or poorly estimated”. In practice, the default value is used in most instances and the department has asked for guidance on the circumstances under which BMSY should be estimated directly. BMSY is only well estimated where information is available on the “steepness” parameter in the stock recruitment relationship used in the stock assessment. High levels of steepness, approaching 1, correspond to lower levels of BMSY, with levels as low as B20 (the default limit reference level) possible for very high levels of steepness. Steepness itself is only well estimated if the stock has been severely overfished in the past, and when reliable data from such periods of overfishing has been available. Such circumstances are rare. In practice, it is best to use the default value for BMSY in almost all instances, and values of BMSY below B30 should not be used.

Tier level for catch only stock assessment methods

* Table B2 in the 2018 Guidelines (p64) recommends the use of catch only methods at Tier 3. This is an inappropriate method to recommend at this Tier level as these methods are highly uncertain about depletion and are not responsive to recent changes in catch levels. At best, such methods might be considered at about Tiers 7 or 8 in this scheme.

1. MEY of commercial fishers has been interpreted in the 2018 policy to mean the surplus of commercial fishing operations (see Appendix 1) after deducting explicit costs (e.g. labour, fuel, etc.) and implicit costs (lost time, opportunities, etc.) from the gross value of landed product. This may be a more narrow, academic interpretation than intended by the phrase “economic return” used in legislation. For example, MEY in the 2018 policy treats employment (labour) as a cost that should be minimised, whereas employment is often considered an economic benefit in popular discussion of economic return to communities. [↑](#footnote-ref-2)