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NSW Fisheries Harvest Strategy Guidelines

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Contents

1. TITLE

NSW Fisheries Harvest Strategy Guidelines.

2. PURPOSE

The purpose of the NSW Fisheries Harvest Strategy Guidelines (the Guidelines) is to provide practical guidance to fishery managers, scientists, fishers and key stakeholders in the development of harvest strategies for NSW fisheries, consistent with the NSW Fisheries Harvest Strategy Policy (the Policy).

3. INTRODUCTION

The NSW Fisheries Harvest Strategy Policy provides an overarching framework for the development of consistent harvest strategies for NSW fisheries, to further the objectives of the *Fisheries Management Act 1994*. The adoption of a consistent and harmonised approach to harvest strategy development will lead to better managed fisheries across NSW, as decisions on ecologically sustainable harvest levels will be made in a more transparent, timely and predictable manner, with the support and understanding of fishers and key stakeholders.

These Guidelines have been prepared to assist with the development and implementation of harvest strategies under the Policy and provide guidance on applying the Policy in various circumstances. The Guidelines are intended to support harvest strategy development across the full range of NSW fisheries, including fisheries managed with input and output controls, single-species and multi-species fisheries, large and small-scale fisheries and data-rich to data-poor fisheries. The Policy provides for a risk management approach, whereby fishery exploitation levels should reduce as biological indicators of stock status decline to limit reference levels and/or uncertainty increases. Conversely, fishery exploitation levels can increase when biological indicators increase to target reference levels and/or uncertainty reduces. This will ensure fisheries are managed at an acceptable level of risk.

4. KEY STEPS TO DEVELOP A HARVEST STRATEGY

The Policy provides the core principles to be followed and core elements to be included in harvest strategies developed in NSW. Using the principles and core elements outlined in the Policy, the Guidelines provide an overview of the key steps that should be followed in the process to develop a harvest strategy, noting that some steps may not be necessary if comprehensive arrangements already exist at the individual fishery level. These key steps are consistent with the National Guidelines to Develop Fishery Harvest Strategies (Sloan et al. 2014).

4.1. Define the fishery to which the harvest strategy applies

An important step in determining the scope of the harvest strategy is defining the fishery and/or species to which it applies. Having an agreed and clear definition of the fishery ensures that objectives are relevant and all other components of the harvest strategy directly relate to the fishery of interest. This is important because objectives will vary depending on the individual fishery and its characteristics. Information that should be considered includes:

- Area of the fishery;
- Life history characteristics for each species;
- Environmental characteristics influencing fishery productivity;
- All sources of mortality;
- Method of fishing such as gear type, vessel numbers and vessel type;
- Location of fishing, taking note whether there have been spatial changes over time;
- User groups and participants, including any information on catch shares;
- Ecological impacts caused by fishing, including any threatened, endangered and protected species (TEPS) interactions;
- Impacts on Aboriginal cultural fishing practices;
- Environmental effects on the fishery; and
- Existing management arrangements.

4.2. Establish a mechanism to engage stakeholders in the process

Fishers and other key stakeholders provide local knowledge, valuable information on the structural and operational characteristics of each fishery, and much of the data required for assessment of fishery performance. Importantly, stakeholder engagement and ownership of a harvest strategy supports its implementation, adherence and evolution. For these reasons, it is important to determine an appropriate mechanism to engage key stakeholders.

How this is done will need to be assessed on a case-by-case basis and will be influenced by available resources. Expertise-based working groups established for a defined task and a set period of time, that include fishery managers, scientists, fishers and other key stakeholders can achieve the desired level of engagement and expert input. Incorporating independent expertise in the process is beneficial, to ensure an efficient, effective and transparent process (Sloan et al. 2014; Pascoe et al. 2019, Dowling 2016). Actively involving fishers and other key stakeholders is also more likely to result in management arrangements that are respected and complied with willingly (Matic-Skoko et al. 2011). It leads to improved trust among stakeholders and efficiency in decision making, as fishers and other key stakeholders 'buy in' to the decisions that result from application of the harvest strategy (Sloan et al. 2014).

All fishing sectors (commercial, recreational, charter and Aboriginal cultural fishing) the conservation sector, Aboriginal communities and the wider community have an interest in the sustainability of fisheries resources and how they are managed. The roles of fishers, other key stakeholders and government need to be clearly stated in the harvest strategy design process because priorities often vary between different stakeholder groups and the process to resolve inconsistent approaches needs to be respected and understood prior to any issues arising.

The harvest strategy development process is designed to provide clarity on how the fishery should be operated in terms of addressing biological/ecological, economic and/or social, cultural and environmental objectives, during periods of stability, decline and recovery. Lack of clarity can result in ad hoc decisions and sub-optimal use of resources, which increases the probability of serious conflicts, as different interest groups jostle for greater shares of the benefits (Cochrane 2002). Understanding these differences helps in the identification of 'best compromise' outcomes and requires participants to agree on a full range of objectives and to participate in a transparent process of decision-making towards meeting them.

4.3. Identify relevant legislation and overarching policy objectives

Commonwealth and State legislation and various overarching policies are related to the Ecologically Sustainable Development (ESD) of fisheries. Relevant Commonwealth legislation includes the *Native Title Act 1984*, the *Environment Protection and Biodiversity Conservation Act 1999* and the *Fisheries Management Act 1991*. Within NSW the primary legislation for fisheries is the *Fisheries Management Act 1994*. Other relevant legislation in NSW includes the *Environmental Planning and Assessment Act 1979* and the *Marine Estate Management Act 2014*. Key NSW fisheries policies include the *Policy on Fisheries Resource Sharing in NSW* (2015) and the *Policy and Guidelines for Fish Habitat Conservation and Management* (2013). Other policies under development relate to Aboriginal cultural fishing and co-management.

Administration of NSW legislation and related policy frameworks rests with the NSW Department of Primary Industries. The objectives in this legislation and policy are 'high- level' and expressed in broad terms, such as 'maximise benefit for the community.' This provides guidance but is not adequate as operational targets or limits for a harvest strategy.

4.4. Develop conceptual and operational management objectives

In NSW, high level objectives are outlined as the objects of the *Fisheries Management Act 1994*. These have been translated into 'conceptual' objectives within Fishery Management Strategies, which are made under Part 1A of the Act. Conceptual objectives are designed to be relevant to management of individual fisheries, consistent with legislation and overarching policies (Sainsbury and Sumalia 2003) but sit above the operational objectives needed for the purposes of harvest strategy development. They should still reflect the interests and input of fishers and other key stakeholders early on in the development of a harvest strategy, because they directly influence the management options suitable for the fishery (Dowling et al. 2008, 2011).

Conceptual objectives should relate to the species, fish stock or fisheries management unit that they apply to and be developed in the context of existing fisheries legislation and policy. When developing conceptual management objectives, trade-offs between expected ecological, economic and social outcomes should also be identified. Such trade-offs should be evaluated and agreement reached on how to prioritise issues across the three types of objectives (Pascoe et al. 2019). A harvest strategy should try to balance all its objectives, but under the NSW Fisheries Harvest Strategy Policy the biological objective to protect aquatic resources from over-exploitation takes precedence over other objectives.

Following the establishment of agreed conceptual objectives for a particular fishery, a set of operational objectives should be clearly defined for individual species in the fishery. These operational objectives should be explicit, measurable, and linked to the indicators, reference points, and decision rules of a harvest strategy.

As an example, Box 1 below demonstrates the links between the three levels of objectives for the NSW Lobster Fishery:

1) High-level legislative objectives;
2) Conceptual fishery management objectives; and
3) Operational management objectives established for the defined species.

Box 1: Example of the linkage between 'high level' legislative objectives, 'conceptual' fishery management objectives and 'operational' management objectives for the NSW Lobster Fishery

High level legislative objective (*Fisheries Management Act 1994*)

- To conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

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Conceptual fishery management objective (Fisheries Management (Lobster Share Management Plan) Regulation 2000).

- Increase the biomass of eastern rock lobster stock

↘

Operational management objective (*draft* Lobster Fishery Harvest Strategy)

- To ensure spawning biomass (Bsp) remains above 20% of the unfished (virgin) level, this being the level below which recruitment to the stock may be severely compromised

4.5. Establish the ESD context for the fishery

Determining the biological status of the stock or fishery management unit is an important step in harvest strategy development, because the operational objectives for a fishery are often linked to biological status. For example, a stock or fishery management unit classified as 'depleting', 'depleted' or 'recovering' may require additional resources for assessment and have more restrictive decision rules than a stock classified as 'sustainable'. To ensure consistency, the National Fish Stock Status Reporting Framework (Stewardson et al. 2018) is used to assess biological status of fisheries.

To enable a harvest strategy to incorporate all aspects of ESD and not just focus on the biological and ecological aspects, the economic, social, cultural and environmental performance of each fishery should also be considered.

As a requirement of the NSW Fisheries Harvest Strategy Policy, an Ecologically Sustainable Development (ESD) risk assessment will be conducted as part of each fishery harvest strategy. This will ensure that all major risks posed by – and to – the fishery are taken into account, thus promoting an ecosystem approach to fisheries management. The ESD risk assessment can be completed concurrently with the harvest strategy, where required and existing Environmental Impact Statements can be used as a starting point.

One effective way to establish the overall ESD status and context of a fishery is to use the national ESD reporting framework tool developed by Fletcher et al. (2002) to assess the ecological, economic, social and cultural risks to the fishery and of the fishery. Conducting an ESD risk assessment helps to identify and prioritise the full suite of ecological, economic and social issues in the fishery. However, this is not the only risk assessment tool available to conduct this work and some flexibility will be maintained to ensure the most suitable tool for the specific fishery circumstances is adopted.

Conducting an ESD risk assessment will also ensure issues such as by-catch, by-product and broader ecosystem impacts including TEPS interactions and any impacts on Aboriginal cultural fishing are taken into account, noting there are many ways to manage such issues within the overall fisheries management system.

4.6. Build the technical elements of the harvest strategy

The key technical elements of a harvest strategy form an integrated package and should be developed together in a formal structured decision-making framework (Sloan et al. 2014).

4.6.1. Develop operational management objectives

Harvest strategies will be designed to maintain stocks, on average, at a target biological reference level that maximises long-term, sustainable yield from each fishery. Natural variability, recreational fishing and other economic, social and cultural interests should also be considered when choosing target biological reference levels and may be given different weighting in specific circumstances. For example, in some fisheries economic outcomes may have more importance while in others, a desire for high catch rates or high strike rates may drive a need to create a higher stock abundance. Similarly, for Aboriginal fisheries higher abundance may be important to support ongoing access for culturally important species.

Operational management objectives are more precise statements than the conceptual objectives and should be formulated so that the extent to which they have been achieved during a specified period can be measured (Cochrane 2002; Fletcher et al. 2002; Sloan et al. 2014). To be effective, operational objectives should be consistent with higher level objectives in the relevant legislation or management plans for the fishery and should be linked to indicators, reference points and decision rules. Often, a reference point for a performance indicator can be translated directly into an operational objective with a specified timeframe. Establishing links between the operational objective, indicator, reference point and decision rule ensures that the performance of the fishery can be measured, audited and transparently reported against the operational objectives.

4.6.2. Develop indicators, reference points and acceptable levels of risk

Indicators and reference points will be largely determined by the availability of information. This will depend on both availability of past data, but also on decisions made about future monitoring and assessment methods to be used in the fishery, noting the 'catch-cost-risk' trade-off inherent to such choices (Fletcher et al. 2002; Sainsbury 2005; Dichmont et al. 2011, Dowling et al. 2013). The 'catch-cost-risk' trade-off refers to a trade-off between the level of fishing mortality (catch) and the cost of managing the fishery in pursuit of its objectives. More caution should be used if there is greater uncertainty about stock status.

The indicators chosen should be able to measure the extent to which objectives are being achieved. Importantly, the development of indicators and reference points is an iterative process. There is often a range of available indicators and potential reference points: the choice of which to use will be influenced by the objectives and by the relative costs of each in terms of data collection and assessment to measure the indicators, i.e. catch-cost-risk.

Harvest strategies will be designed to maintain fish stocks above a limit reference point where the risk to the stock is regarded as unacceptable. Where information to support selection of a suitable stock specific limit reference point is not available, 20% of the unfished biomass level will be used as the default. In cases where biomass levels are not currently estimated, or not estimated reliably for a specific fishery, a suitable proxy may be used.

Harvest strategies should meet the probability and risk thresholds specified for the fishery, in accordance with the policy, and regardless of the level of uncertainty of assessments. This is an explicit recognition of the need for precaution in the face of uncertainty. In general terms, it requires that increasing assessment or management uncertainty will be mitigated by reducing exploitation rates. This should result in acceptable levels of risk of breaching a limit reference point (defined in the Policy) being achieved no matter the level of uncertainty. In general, harvest strategies that adopt higher levels of exploitation should be supported by assessments with higher certainty, typically requiring higher levels of monitoring and more frequent assessment, which involves more resources and higher costs. Therefore, in a cost-limited context, a more cautious strategy should be adopted in data-poor fisheries (Dowling et al. 2014).

A tiered approach is a useful way to deal with different levels of information and uncertainty in assessments of stocks (e.g. Smith et al. 2008). Each tier corresponds to a given availability of data and a method to assess biological status. The decision rules may also vary across tiers and should be selected at each tier to achieve the same acceptable level of biological, economic, social, cultural and environmental risk. This inevitably means that tiers based on less certain information will need to be more precautionary in nature.

Regardless of the level of uncertainty in assessments, all harvest strategies must ensure that there is a 'high likelihood' of achieving biological objectives, especially to avoid a stock depleting or becoming depleted and/or breaching a biological limit reference point. The correct interpretation of the risk criterion is that the stock should stay above the limit at least 90% of the time (i.e. a 1 in 10 year risk that stocks will fall below the limit). However, there may be highly variable species (e.g. some small pelagic species such as Sardines) where this criterion could be violated even in the absence of fishing. The harvest strategy for such species will need to reflect this and the risk criterion be suitably adjusted.

4.6.3. Develop the monitoring and assessment system and decision rules

There will often be a range of available data collection, monitoring and assessment methods to consider when developing the harvest strategy. The right option will require judgement on a case by case basis to suit the individual fishery, considering the cost-catch-risk trade-off.

Decision rules can take many forms. For example, they can include requirements for fishing effort or catch to be set at pre-determined levels, or for increased data collection and monitoring to inform future assessment and decision making. More generally, decision rules are linked directly to indicators and reference points and are dependent on the monitoring and assessment system. These choices need to be pragmatic and take account of the design principles listed in the NSW Fisheries Harvest Strategy Policy prior to implementation.

5. TEST THE ROBUSTNESS OF HARVEST STRATEGIES

There is inherent uncertainty in knowledge of the past and current biological status of fish stocks, their response to different levels of harvest, and their current and future productivity. Recognising this, evaluation/testing of the likelihood of a harvest strategy achieving its objectives should be undertaken prior to implementation (Davies et al. 2007). Such testing is particularly important when information is incomplete and imprecise, and the relationship between the harvest decision rule and management actions is complex (Davies et al. 2007).

One approach is to use a simulation model to represent the underlying dynamics of the fishery. This permits evaluation of how different operational objectives in a harvest strategy will impact on future fishery performance, through comparing the relative performance of possible alternatives. While this process allows for the explicit calculation of the probability of breaching reference points, it has a requirement for stock specific data to be applied through a population dynamic model.

An evaluation of a harvest strategy need not necessarily be simulation-based. Qualitative methods can also be applied, and 'empirical' tests undertaken to evaluate scenarios such as 'what if' the harvest strategy had been applied in the past, given the history of stock status observed (Smith et al. 2004; Prince et al. 2011), or how well the approach worked in the past, in the fishery being assessed, or in similar fisheries. The focus of the evaluation is to identify whether the proposed harvest strategy is likely to be suitably 'robust' based on known and plausible sources of uncertainty in the biological stock status and dynamics of the fishery.

6. REVIEW AND IMPROVEMENT OF HARVEST STRATEGIES

A key function of harvest strategies is to provide for increased certainty, transparency, and predictability in decision making and overall management of fisheries. However, this must also be balanced with the need for flexibility to adapt to changing circumstances and for new information to be considered (Hilborn and Walters 1992). Experience world-wide has demonstrated that irrespective of the amount of prior testing of a harvest strategy, periodic adjustments are necessary to ensure that sensible management decisions are being made (Smith et al. 2008). It may be necessary to include new information relevant to stock status, or to address problems identified in application of the harvest strategy, or to reduce uncertainties that were not previously understood.

Once a harvest strategy is operational, if circumstances change significantly or there are substantiated reasons to doubt the accuracy of data inputs, then 'break-out rules' may be used. These may identify certain exceptional and specific circumstances that may trigger a variation from the harvest strategy. This allows for flexibility in a structured way, but not so much flexibility that it undermines the harvest strategy. The harvest strategy itself should define the specific exceptional circumstances where this would apply, to avoid harvest strategies being changed for minor or erroneous reasons and any actions taken should explicitly address any data deficiencies. In this sense, documenting the boundaries of flexibility in the harvest strategy is part of the process of developing a shared understanding among managers, fishers, and key stakeholders. Having flexibility to vary from the harvest strategy under certain clearly specified circumstances should not be seen as broad flexibility in interpreting the results of assessments and applying the harvest decision rules, which would undermine the harvest strategy (Smith et al. 2008).

7. CONSIDERATIONS OF FISHERY-SPECIFIC SCENARIOS

The National Guidelines to Develop Fishery Harvest Strategies (Sloan et al. 2014) outline a set of considerations when designing a tailored harvest strategy for particular types of fisheries. It is proposed that the fishery specific scenarios outlined in the National Guidelines are used where necessary to provide additional guidance to harvest strategy development for fishery specific scenarios under the NSW Fisheries Harvest Strategy Policy.

8. REVIEW AND IMPROVEMENT OF THESE GUIDELINES

These guidelines will be maintained as a living document, so that feedback received and lessons learned during implementation of the NSW Fisheries Harvest Strategy Policy may be incorporated, along with any other relevant information. Any substantial revisions will be communicated to stakeholders.

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