DEPARTMENT OF
PRIMARY INDUSTRY AND FISHERIES

Guidelines for implementing the Northern Territory Fisheries Harvest Strategy Policy

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NORTHERN TERRITORY GOVERNMENT

Contents

1. Introduction

The Northern Territory Fisheries Harvest Strategy Policy (the Policy) provides an overarching framework for the development of consistent harvest strategies for Northern Territory fisheries, to provide clarity and certainty to all users regarding management decisions and further the objectives of the NT *Fisheries Act 1988*.

The Guidelines for implementing the Northern Territory Fisheries Harvest Strategy Policy (the Guidelines) have been developed to assist with the implementation of harvest strategies under the Policy and provide guidance on applying the Policy in various fishery circumstances. The Guidelines are intended to support harvest strategy development across the full range of Northern Territory fisheries and are consistent with, and utilities text and information contained within the National Guidelines to Develop Fishery Harvest Strategies (Sloan et al. 2014).

2. Key steps in developing a harvest strategy

The Policy provides the core principles of a harvest strategy. Using those principles, the Guidelines aim to provide an overview of the key steps that should be followed, as a guide to help fishery managers, fishers and other stakeholders during the process of developing a harvest strategy. These steps may vary depending on whether comprehensive management arrangements already exist at the individual fishery level.

2.1 Define the fishery

The initial step in developing a harvest strategy is to define the fishery. Having an agreed and clear definition of the fishery makes it easier to identify which objectives are of most relevance to the fishery. This is important because objectives will vary depending on the individual fishery and its characteristics. This step involves compiling and reviewing all available information on the fishery. Some of the information that should be considered includes:

- Identify the target species, geographical (management unit) and biological stock boundaries;
- Life history characteristics for each species;
- Determine 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 changers over time;
- User groups, including any information on catch shares;
- Identify any ecological impacts caused by fishing, including any TEPS interactions;
- Identify any environmental effects on the fishery; and
- Existing management arrangements currently in use (whether input or outputs controls are used, including any spatial management), the jurisdictions involved, any regulations, compliance arrangements and what management levers can be used to constrain fishing mortality.

2.2 Stakeholder engagement

An important step in the design of a harvest strategy is to establish or renew the relevant fishery management advisory committee or advisory group to engage stakeholders in the process. The roles of stakeholders need to be clearly stated in the harvest strategy design process because priorities often vary between different stakeholder groups. Unless there is a mutual understanding of the different stakeholders' priorities, there will be no clarity on how the fishery should be operated in terms of addressing ecological and where appropriate, economic, social and customary performance outcomes.

2.3 Identify relevant legislation and over-arching policy objectives

It is important at the beginning of the process to identify the high level over-arching legislative and policy objectives that will influence and shape the nature of the harvest strategy for each fishery. The high level objectives need to be taken into account when developing the conceptual management objectives for each fishery (see next section).

Some examples of overarching legislation, policy and codes of practice to consider here include international, Commonwealth and Territory legislation and overarching policies related to the ecologically sustainable development (ESD) of fisheries. International obligations are contained in treaties such as the United Nations (UN) Convention on the Law of the Sea (1982), the UN Straddling Fish Stocks Agreement (UNCLOS 1995) and the FAO Code of Conduct for Responsible Fisheries (FAO 1995). Relevant conservation-focused international obligations include the Convention on Biological Diversity, Convention on Conservation of Migratory Species of Wild Animals and Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora. Relevant Commonwealth legislation includes the *Environment Protection and Biodiversity Conservation Act 1999*, the *Fisheries Management Act 1991* and the *Aboriginal Land Rights (Northern Territory) Act 1976*. Within the Northern Territory the relevant legislation is the *Fisheries Act 1988*. Administration of this Act and related broad policy frameworks lies within the Department of Primary Industry and Fisheries.

The management objectives of the legislation and overarching policies described above are 'high-level' and frequently expressed in broad terms, such as 'maximise benefit for the community' and are not designed to be used as actual operational targets for a harvest strategy.

2.4 Develop defined conceptual management objectives

The formation of an effective harvest strategy depends heavily on having well defined conceptual management objectives that determine the overall outcomes that the harvest strategy will work to achieve. Conceptual objectives are needed to translate the high-level objectives into specific individual fishery management objectives and should be contained within a fishery management framework. They form the link between the high level objectives and the operational objectives needed for the purposes of harvest strategy development (see Box 1 for an example taken from the South Australian Pipi Fishery).

Conceptual objectives should relate to the species, fish stock or fisheries management unit that they apply to and need to be developed in the context of the high level overarching legislation and policy objectives and any relevant ministerial directives. These conceptual objectives should be defined and agreed upon by 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. 2011).

When developing the conceptual management objectives, the trade-offs between the ecological, economic, social and customary outcomes being sought should be considered at the beginning of the harvest strategy design process, preferably in consultation with all key stakeholders. These trade-offs should be identified and understood so that the agreed management objectives can be achieved.

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

TIER 1-High level legislative objective (*Fisheries Management Act 2007*)
-To protect, manage, use and develop the aquatic resources of the State in a manner that is consistent with ecologically sustainable development

TIER 2-Conceptual fishery management objective (Lakes and Coorong Fishery Management Plan)
-Ensure the Lakes and Coorong Fishery resources are harvested within ecologically sustainable limits

TIER 3-Operational management objective for Pipi Fishery (Lakes Coorong Fishery Management Plan)
-Maintain a target Pipi relative biomass above 10 kg/ 4.5 m^2 and not less than 8 kg/ 4.5 m^2
-Ensure the Pipi relative biomass does not drop below 4 kg/ 4.5 m^2
-Maximise Fishery Gross Margin

2.5 Determine the stock status and other ESD considerations for the fishery

Determining the status of the fishery being managed is an important step in the harvest strategy design process because the operational objectives used could vary based on fishery or stock status. For example, an overfished stock may require additional resources for assessment and have more restrictive decision rules than a stock that is considered sustainable. To ensure consistency, the guidelines in the National Fish Stock Status Reporting Framework (Flood et al. 2012; 2014) will be used to assess fishery biological status and the reference points defined in this framework will be linked to the harvest strategy, to assist with reporting of biological status.

To enable a harvest strategy to incorporate all aspects of ESD (and not just focus on the ecological aspects), the economic, social and customary performance of each fishery should also be considered, where appropriate. An 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 conduct an assessment of the ecological, economic, social and customary risks to the fishery. Conducting an ESD risk assessment will assist to identify and prioritise the full suite of ecological, economic, social and customary issues in the fishery and help inform harvest strategy development in the context of achieving ESD outcomes for the fishery. While conducting an ESD risk assessment is not considered to be critical to developing a harvest strategy, it is recommended that this occurs because it will facilitate a holistic approach to ensure the full set of ESD characteristics of a fishery are incorporated in the harvest strategy.

Conducting an ESD risk assessment will also ensure issues such as by-catch, by-product and broader ecosystem impacts including TEPS interactions are taken into account and, where necessary or relevant, built into the harvest strategy. It is important to note that while issues like TEPS interactions may influence harvest strategy design, they should not be considered a determining factor, as there are many ways in which such issues can be managed within the overall fisheries management system.

2.6 Building the harvest strategy

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

2.6.1 Develop operational management objectives

Because the conceptual fishery management objectives are frequently expressed in broad terms, the desired outcomes for a harvest strategy need to be translated into operational management objectives that are relevant for defined species within a fishery. Operational management objectives are more precise and formulated in such a way that they can be easily measured and achieved within a specified period. To be effective, operational objectives should be consistent with higher level legislative and conceptual fishery management objectives articulated in the management framework and linked to performance indicators and reference points. Often, a particular reference level of a performance indicator can be translated directly into an operational objective. Establishing linkages between the operational objective, performance indicator and reference point in this way, helps to ensure that the performance of the fishery can be measured and audited against the operational objectives. Examples that show how a defined conceptual management objective is translated into an operational and measurable objective for many types of fisheries are presented in the National ESD Reporting Framework for Australian Fisheries: The How to Guide for Wild Capture Fisheries (Fletcher et al. 2002; 2003).

2.6.2 Develop performance indicators, reference points and acceptable levels of risk

The indicators and reference points developed for a particular fishery and/or stock 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 in such choices (Fletcher et al. 2002; Sainsbury 2005; Dowling et al. 2013). The performance indicators that are chosen should be able to measure the extent to which the objectives are being achieved.

Importantly, the development of indicators and reference points is an iterative process and there will often be a range of indicators and reference points available. The choice of which to use will be influenced by the objectives chosen and the relative costs of data collection and stock assessment required to determine the performance indicators.

Harvest strategies should be designed to meet the probability and risk thresholds specified for the management of the fishery, in accordance with the Policy, 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. Harvest strategies that adopt higher levels of exploitation should adopt higher levels of monitoring and more regular assessment, which inherently involves higher costs. Therefore, in a cost-limited context, a more cautious strategy should be adopted in data-poor fisheries.

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 and social risk. This inevitably means that tiers based on less certain information will need to be more precautionary in nature.

2.6.3 Developing the monitoring and assessment system and the 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 needs and will be influenced by the available data, future needs and the relative costs associated with the different methods. As noted in Sloan et al. (2014), decision rules can take many forms and

need to be part of the overall package. The decision rules are linked directly to the reference points and performance indicators and are dependent on the monitoring and assessment strategy that is chosen. These choices need to be pragmatic and take account of the core policy principles contained within the Policy prior to implementation.

2.7 Testing the robustness of a harvest strategy

In recognition of the inherent uncertainty in knowledge of the past and current biological stock status of fish stocks or fisheries management units, and their response to different levels of harvest as well as their current and future productivity, an evaluation of the likely performance of any proposed harvest strategy to achieve operational objectives should be undertaken prior to implementation (Davies et al. 2007). Such testing is particularly important when information is incomplete and imprecise, and when the relationship between the harvest decision rule and management actions is complex (Davies et al. 2007).

There are various quantitative, qualitative, empirical and experiential methods available to undertake an assessment of whether the harvest strategy is likely to be appropriate. Such assessments are often called management strategy evaluation (MSE). The most complex method is to use a simulation model to represent the assumed underlying dynamics of the fishery and generate future data to evaluate how different operational objectives in a harvest strategy will impact on future fishery performance (e.g. Punt et al. 2002; Punt et al. 2012) by comparing the relative performance of possible alternatives. This allows for the explicit calculation of the probability of breaching reference points, even for stocks where current biomass cannot be calculated (Australian Government 2007).

An evaluation of a harvest strategy need not just be simulation based. More qualitative methods can also be applied, and 'empirical' tests can also be undertaken to evaluate scenarios such as 'what if' the harvest strategy had been applied in the past, given the history of biological stock status observed (see 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. In other words, it provides a basis to identify the strategies that are most likely to meet objectives in spite of the uncertainty in the stock status and dynamics of the fishery and its response to different levels of harvest and management (Davies et al. 2007; Prince et al. 2011).

2.8 Periodic review and update of the harvest strategy

Experience world-wide has demonstrated that irrespective of the amount of prior testing of a harvest strategy periodic amendments (to ensure optimal management decisions) are likely and indeed necessary (Smith et al. 2008). For example, when there is new information that substantially changes understanding of the biological stock status of a fishery, when problems are identified in application of the harvest strategy or when uncertainties that were not previously understood arise (Australian Government 2007).

One way to build flexibility into a harvest strategy is to identify 'exceptional circumstances' that may trigger a departure from, or even suspension of, the harvest strategy. This allows for flexibility in a structured way, but not so much flexibility that it undermines the intent of having a harvest strategy. In this sense, understanding the boundaries of flexibility in a harvest strategy is part of the iterative process to develop mutual understanding among managers, fishers and stakeholders about expectations from adopting a formal harvest strategy. Specifically, this could include defining the exceptional circumstances that may trigger such a change.

A formal review of a harvest strategy, involving all stakeholders, should be planned and undertaken on an agreed time frame (for example, every three to five years). Harvest strategies need to be adaptive enough to address deficiencies, unforeseen circumstances and to allow for improvements (Walters and Hilborn 1978), but should not be changed to relax or vary the harvest strategy when the decisions are not suitable to some, or all, stakeholders.

2.9 Considerations for specific fishery scenarios

While the principles of a harvest strategy are the same for any fishery, it is important to identify specific issues that need to be considered when applying the Policy to a given fishery, and to tailor the harvest strategy appropriately. The *National Guidelines to Develop Fishery Harvest Strategies* (Sloan et al. 2014) contains a set of considerations to assist fishery managers, fishers and other stakeholders in the development of harvest strategies for particular fishery scenarios and should be consulted where necessary.

3. Glossary

Biomass (B): The total weight of a stock or a component of a stock; for example, the weight of spawning stock biomass is the combined weight of sexually mature animals.

Decision rule: Pre-determined actions, linked directly to performance indicators and information about current status, and designed to maintain fishery performance in line with operational objectives. These management actions may also be linked to reference points.

Ecologically sustainable development (ESD): Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased. ESD principles require that:

- 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 and
- improved valuation, pricing and incentive mechanisms should be promoted.

Ecosystem: A dynamic complex of plant, animal, fungal, and micro-organism communities and the associated non-living environment interacting as an ecological unit.

Fishery: A term used to describe the collective enterprise of taking fish. A fishery is usually defined by a combination of the species caught (one or several), the gear and/or fishing methods used, and the area of operation.

Fish stock: A discrete population of a fish species, usually in a given geographical area and with negligible interbreeding with other biological stocks of the same species.

Fishery management unit: Defined in terms of the area of water or seabed that is fished, the jurisdictional boundaries that exist, the people involved in the fishery, the species caught, the fishing methods and the types of boats used.

Harvest strategy: A framework that specifies pre-determined actions in a fishery for defined species (at the stock or management unit level) necessary to achieve the agreed ecological, economic and social management objectives (see Sloan et al. 2014).

Management framework: The broad set of controls needed to manage a fishery usually described in fisheries regulations, a fishery management plan or a fishery management policy.

Management strategy evaluation: A qualitative or quantitative procedure where alternative management strategies are evaluated and compared before implementation.

Operational objective: An objective that has a direct and practical interpretation in the context of a fishery and against which performance can be evaluated (in terms of achievement) (Fletcher et al. 2002).

Overfished stock: A state where the stock is recruitment overfished and current management is not adequate to recover the stock, or where appropriate management measures have been implemented but have not yet resulted in measurable improvements.

Performance indicator: A quantity that can be measured and used to track changes in an operational objective.

Precautionary principle: A concept that asserts that 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.

Recreational fishing: Fishing other than commercial fishing or traditional fishing, where the catch is either released or retained.

Recruitment overfished: A state where the spawning stock biomass for a stock or management unit has been reduced through catch, so that average recruitment levels are significantly reduced.

Stock assessment: An assessment that produces information on the biological status of a stock.

Stakeholder: An individual or a group with an interest in, or connection with, the conservation, management and use of a resource.

Traditional fishing: Fishing for the purposes of satisfying personal, domestic or non-commercial communal needs, including ceremonial, spiritual and educational needs and utilising fish and other natural marine and freshwater products according to relevant Aboriginal custom.

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