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A COMPLEMENT TO THE 2005 FRAMEWORK FOR DEVELOPING SCIENCE ADVICE ON RECOVERY TARGETS IN THE CONTEXT OF THE *SPECIES AT RISK ACT*

Figure 1: Map of the Department of Fisheries and Oceans' (DFO) six administrative regions.

Context

The Species at Risk Act *(SARA article 41(1)(d)) requires that in a recovery strategy, a statement be made regarding the population and distribution objectives that will assist the recovery and survival of the species. Consequently, delineating potential population and distribution objectives is a key step within the DFO Recovery Potential Assessment (RPA) process (DFO, 2007). Such objectives directly influence the extent and kinds of actions required for the conservation and recovery of the species and protection of its critical habitat. Population and distribution objectives will therefore have an indirect impact on the authorization of activities that are likely to affect the listed species and/or its critical habitat (allowable harm) and the types and magnitude of the socio-economic impacts to be incurred following a decision to list a species under SARA, especially aquatic species and species whose critical habitat falls on federal lands. SARA confers latitude in setting recovery targets (or goals) as well as population and distribution objectives, and to date there has been considerable variation in the ambitiousness of targets and objectives in published RPAs and recovery strategies for aquatic species. This variability is also partly due to the absence of past consensus on what may constitute a minimum recovery target under SARA (DFO, 2005). Given that DFO has now accumulated six years of experience in implementing SARA and high level SARA Policies have been developed to establish guiding principles for implementation of the Act (Environment Canada, 2009), a review of the setting of population and distribution objectives within the context of RPAs and recovery strategies is timely in order to provide further guidance on the matter.*

SUMMARY

- The present advice aims to provide guidance for developing science advice through the RPA process, and more specifically science advice supporting the development of population and distribution objectives within SARA recovery strategies. It advances guidance that was provided five years ago based on limited experience in implementing SARA (DFO, 2005). Users of this 2010 advice are nevertheless encouraged to consult the 2005 advisory report as certain aspects dealt with in that report are not covered here.
- The RPA process may explore different management scenarios corresponding to a range of possible expected outcomes (i.e. goals) for species recovery strategies. Such outcomes shall include (1) improving the species' status to "special concern", but may also include (2) improving status to "not at risk", (3) ensuring species survival through on-going management, and (4) significantly reducing the probability of extinction or extirpation. Population (including abundance) and distribution objectives associated with such outcomes would be developed.
- Management scenarios should be evaluated even for species whose survival is not technically or biologically feasible. The capacity for lowering the probability of extirpation or extinction through specific management measures should be assessed.
- Key client sectors shall provide the required information and guidance for scenarios to be examined in the RPA.
- If a wildlife species has a range that extends outside Canadian jurisdiction, the rescue effect of populations outside Canada should be factored into the viability assessment of the Canadian population and in setting population and distribution objectives, while recognizing the purpose of SARA is to prevent extirpation from Canada.
- Even when data are limited, population and distribution objectives must be explored based on the best available information, including results of quantitative analyses, in light of the criteria and associated thresholds used by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to assign species' status.
- If available data and techniques are insufficient for enumeration/evaluation of population abundance, population objectives could be set using another metric - e.g. positive population trend over a given time period, productivity level required for a population increase, etc...
- Population and distribution objectives should be developed for each wildlife species (also referred to as Designatable Units by COSEWIC) and should be specific, measurable, achievable, relevant and results-focused, and time-bound (SMART). Focusing on results means that population and distribution objectives must be established within the context of the overall recovery goal for the species.
- If available, results of species-specific numerical analyses should be used to support the development of population and distribution objectives in preference to rules of thumb, provided that with associated uncertainty, analyses still yield useful results.
- For wildlife species for which there is credible scientific information suggesting the existence of demographically discrete populations, this population complexity shall be stated explicitly. Distinct objectives may be developed for each discrete population, but in any event this situation must be taken into account in setting population and distribution objectives.
- For species where limited range is one of the key criteria used in the determination of risk status, expansion beyond recent historical range may be a scenario explored in the RPA, if requested by the client.

- It may be possible to attempt recovery of an extirpated wildlife species (e.g. at the population level) with individuals from another wildlife species (i.e. another population of the same biological species). This scenario may be explored in the RPA, if requested by the client.
- When a given wildlife species at risk has hybridized with another wildlife species, a hybridized population could be included in population and distribution objectives; however, pure populations should be considered first in setting population and distribution objectives, and in the monitoring of progress towards the objectives.
- RPAs should qualify the ecological implications associated with different recovery scenarios and associated population and distribution objectives.
- If a multi-species or ecosystem recovery strategy is contemplated, population and distribution objectives may need to take into account ecological relationships between species at risk covered by the strategy and ecological functions that need to be preserved.

INTRODUCTION

The Species At Risk Act (SARA) has three purposes or goals:

- preventing wildlife species from becoming extinct or extirpated;
- to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activities; and
- to manage species of special concern to prevent them from becoming endangered or threatened.

The first two goals are key in the production of RPAs and recovery strategies, with the first purpose essentially focusing on species survival and the second purpose focusing on species recovery. While the term “recovery” is not defined in SARA’s definition section, population-based approaches (Sanderson, 2006) to goal or outcome setting would seem logical given SARA’s purposes, as opposed to using species conservation as a surrogate for some other desired end state (e.g. ecosystem integrity). COSEWIC uses specific criteria and associated rationale to assign risk status to wildlife species, and these criteria need to be considered in the development of the recovery strategy. These criteria provide further evidence that, in the context of a single-species approach, recovery goal and population and distribution objectives can be limited to the viability of the species in question.

While recovery is not defined as a term in SARA, examining what triggers the SARA recovery process may shed further light on the SARA concept of recovery. As SARA does not require that a recovery strategy be prepared for species of special concern, a status of special concern could constitute a minimum long-term SARA recovery goal for species listed as extirpated, endangered or threatened. Once a species’ status has improved such that it no longer qualifies for the threatened category and could be listed as of special concern, such species would require the development and implementation of a management plan. A goal of “not at risk” would be further up the conservation gradient. For aquatic species, a goal of rebuilding a population so that it can sustain sizeable harvesting activities or back to historical levels might be even further along this gradient. There may be situations in which neither the status of special concern nor not at risk can be achieved biologically or technically, but survival may be achieved through on-going active management measures. There can also be instances when species survival cannot be ensured and all that can be achieved is a significant reduction in the probability of extinction or extirpation. And there will occasionally be species for which nothing can be done, neither in Canada nor elsewhere, to reduce such probability.

Some of these outcomes would correspond to a declaration that recovery can be achieved, and others to a statement that recovery is unachievable. While the information required to make such statements should appear in the RPA, the determination of "recovery feasibility" required under SARA is to be made within the recovery strategy itself and not RPAs.

The context around recovery of a given species is often unique and is dependent on the biological characteristics of the species, the ecological system in which it resides and interacts, and the nature, diversity and severity of the threats operating. Such context has to be taken into consideration when developing recovery goals and population and distribution objectives. The scientific approach within the RPA process should however be consistent across species. The 2005 science advisory report on recovery target (DFO, 2005) and the current document are complementary and together aim to foster such consistency.

Finally, the obligation under section 46 of SARA to report on progress towards meeting recovery strategy objectives every five years requires that objectives be stated in a manner that is conducive to doing this.

ANALYSIS

The requirement for a recovery strategy to include population and distribution objectives will assist in the mandatory five year reporting on the implementation of the recovery strategy and review of progress towards meeting its objectives as well as the measurement of progress achieved through implementation of the management activities outlined in associated SARA action plans. Population and distribution objectives are therefore not just key elements of the recovery strategy, but are also the basis around which action plans must be designed.

Different management scenarios may correspond to different recovery goals or outcomes and related population and distribution objectives. To these different outcomes may correspond different assessments of recovery achievability, allowable harm, risk of extinction, time to recovery, and ecological impacts.

Five different outcomes can be attached to the different scenarios considered: (1) improving status to not at risk, (2) improving status to special concern, (3) survival through on-going management, (4) significant reduction of the probability of extinction or extirpation, short of recovery or survival; and (5) no significant change to the likelihood of extinction or extirpation.

In keeping with SARA's preamble that "if there are threats of serious or irreversible damage to a wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty", management scenarios should be evaluated even for species whose survival is not technically or biologically achievable. The capacity of specific management measures in lowering the probability of extirpation or extinction should then be assessed. The information and guidance for scenarios to be examined in RPAS must be provided by the SARA program and the sectors responsible for management actions (Habitat Management and Resource Management) given their knowledge of key activities and constraints. Information must be provided early, as DFO Science needs to have sufficient time before the RPA meeting to develop models based on the different scenarios and management constraints.

Population and distribution objectives must be established within the context of the overall recovery goal for the species. While COSEWIC normally identifies designatable units (discrete wildlife species as per SARA) within a given biological species, further demographically independent units may exist within designatable units. Therefore, for wildlife species for which there is credible scientific information suggesting that the designatable unit may consist of *demographically discrete* populations, this shall be indicated in the RPA and distinct objectives may be developed for each one.

A variety of rules of thumb based on meta-analyses, genetics and/or other methods have resulted, especially for vertebrates, in the identification of generic minimum thresholds for abundance in viable populations that can be used to develop population and distribution objectives within the SARA context. However, given the inherent limitations of such rules of thumb and related studies, often including poor representation of some taxonomic groups, it follows that results of species-specific numerical analyses to support the development of population and distribution objectives should be used in preference to rules of thumb (consistent with DFO, 2005). However, high levels of uncertainty may render model output uninformative. Whenever numerical analyses are used, decisions concerning selection of parameter values and resulting magnitude and distribution of model output must be described explicitly. Whether data are limited or not, population and distribution objectives shall be explored based on the best available information, including results of quantitative analyses, in light of the criteria and associated thresholds used by COSEWIC to assign species' status.

To be useful in assisting species recovery, Population and distribution objectives need to be:

Specific - to clearly and concisely state what needs to be achieved in terms of population size/number, species distribution or threat reduction to reach the recovery goal;

Measurable - presented, either quantitatively or qualitatively, in a way that makes it possible to know when the outcome has been reached. There may be cases whereby available techniques do not allow for the enumeration/evaluation of population abundance. In such situations, population objectives could be set using another metric - e.g. positive population trend over a given time period, productivity level required for a population increase, etc...

Achievable - realistic given known limitations and threats;

Relevant and results-focused - objectives should be directly connected to the recovery goal; and

Time-bound - so that there is a clear indication of the time needed to achieve the recovery goal or outcome. In addition to identifying the timeline for achieving population and distribution objectives, it may often prove useful to project population abundance and distribution over five-year intervals to refine monitoring of progress against expected outcomes.

A rationale must be provided if some aspects of the SMART approach are not followed.

There are a number of special ecological circumstances that will affect setting recovery goals and population and distribution objectives. Although such circumstances cannot all be predicted, the following paragraphs cover some of these issues and how they should be addressed.

- Hybridized Population -

Hybridization between biological species or sub-species is a natural phenomenon which prevalence varies with species and can be influenced by human activities. SARA's definition of wildlife species stipulates that these can be recognized based on distinct geography or

genetics. Although the level of distinctiveness is not prescribed in SARA, an achievable recovery goal, as well as population and distribution objectives, would reflect current technical capacity to reduce introgression to an acceptable level. Identifying such level may be informed by how COSEWIC has tackled the issue for the species or for species at risk in general.

In the event that all populations of a given wildlife species are introgressed and it is not possible to reduce introgression to acceptable levels, then the species would be considered genetically distinct from the original population.

When a given wildlife species at risk has hybridized with another wildlife species, a hybridized population could be included in population and distribution objectives; however, pure populations should be considered first in the population and distribution objectives, and in the monitoring of progress towards these objectives.

- Disappearance of All Individuals of a Wildlife Species -

There may be a situation where all individuals from a given wildlife species (Designatable Unit (DU) as per COSEWIC) have disappeared from the wild in Canada. Achieving the recovery goal and population and distribution objectives in such a circumstance would be dependent on the availability of individuals of the same wildlife species in captivity or in other countries and the ability to successfully reintroduce the species in the wild, given habitat and threat constraints.

In addition, following extirpation of a given wildlife species (DU) identified as a distinct population, it may be possible to attempt recovery using individuals drawn from another wildlife species (DU). This would be more appropriate if the extirpated species and other source population are not genetically different. This scenario may be explored in the RPA, if requested by the client.

- Range expansion -

A key issue in setting the recovery goal is whether it is acceptable, appropriate and desirable to establish a wildlife species in areas where it did not formerly occur. This may have major implications in terms of assessing the achievability of a recovery goal. Although no departmental or federal policy exists concerning introduction of species at risk, the National Code on Introductions and Transfers of Aquatic organisms (DFO, 2003), developed essentially for aquaculture, requires that “proposals to introduce aquatic organisms that are exotic or that may result in a range extension require biological assessments of the impacts on indigenous fisheries resources, habitat and aquaculture, as well as a plan for monitoring any negative impacts arising from the introduction.”

For species whose small area of occupancy, extent of occurrence or number of locations were key criteria used in the determination their risk status, expansion beyond recent historical range may be a scenario explored in the RPA, if requested by the client. If such scenarios are to be explored, it would be informative to undertake: (1) an examination of COSEWIC’s guidelines on manipulated populations; (2) an assessment of whether habitat within recent historical range can be restored or created so that recovery targets can be met; and (3) an assessment of the risk that expanding the species’ range will aggravate the situation of other species at risk.

- Range Outside Canada –

The IUCN and COSEWIC criteria consider the possibility of rescue of a given population by a neighbouring population by lowering the category of risk of the former when such possibility is significant. Therefore if individuals of a wildlife species occur outside Canadian jurisdiction, those individuals should be taken into account in their ability to affect the outcomes of management scenarios considered, and setting associated population and distribution objectives, recognizing the purpose of SARA to prevent extirpation from Canada.

- Multi-Species and Ecosystem Approaches -

SARA allows the adoption of a multi-species or an ecosystem approach when preparing the recovery strategy (article 41(3)). The nature of such approaches requires consideration of the needs of other components of the ecosystem, and not just the specific needs of the listed species. If a multi-species or ecosystem approach is used, population and distribution objectives may need to be adjusted to account for ecological relationships among these species at risk and ecological functions and relationships that will need to be preserved or restored (e.g. increase population abundance objective for a listed forage species to a level at which it can sustain a level of predation by its specific predator, also listed as at risk, so that the later can also achieve viability objectives). However, irrespective of the recovery planning approach chosen, RPAs should qualify the potential ecological impacts associated with different recovery scenarios. This information would prove invaluable in the listing and recovery processes. It would also provide early direction for monitoring ecological impacts of action plan implementation, which has to be reported on every five years (SARA s. 55).

CONCLUSION AND ADVICE

Advice contained in this report with regards to population and distribution objectives corresponds to the current state of understanding flowing from the suite of species at risk and associated context and issues that have been the object of the SARA listing and recovery process to date.

This knowledge is not static, but rather continuously evolves as a result of new experience associated with new species assessed by COSEWIC, and also as new policies and guidelines pertaining to SARA implementation are developed.

It may often be a challenge to follow this and other existing guidance related to SARA recovery planning, due to constraints associated to data quality and quantity, time, expertise and other resources available.

However, providing a common basis for addressing SARA requirements related to population and distribution objectives should lead to an increased level of consistency across species' recovery strategies and DFO regions, thereby leading to an increased level of credibility for this key aspect of the species at risk program.

SOURCES OF INFORMATION

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