Pêches et Océans Canada | Fisheries and Oceans Canada

Guidance for the Development of Rebuilding Plans under the Precautionary Approach Framework: Growing Stocks out of the Critical Zone

Sustainable Fisheries Framework (SFF):
A Fishery Decision-Making Framework Incorporating the Precautionary Approach

Canada

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1.0 Introduction

Fisheries and Oceans Canada (DFO) has had a long history of management efforts to rebuild depleted stocks using tools available under the *Fisheries Act* and more recently under the *Species at Risk Act* (SARA), which requires recovery strategies for species or populations listed as endangered or threatened. However, the *Fisheries Act* does not specify rebuilding requirements and there is no national guidance for rebuilding stocks managed under the *Fisheries Act*.

In 2009, DFO published the Sustainable Fisheries Framework (SFF) and several associated policies. A key policy under the SFF is "*A Fisheries Decision-Making Framework Incorporating the Precautionary Approach*" (PA Framework), which outlines the departmental methodology for applying the precautionary approach (PA) when making decisions regarding harvest levels in Canadian fisheries. A key component of this PA Framework requires that:

- **"*when a stock has reached the Critical Zone, a rebuilding plan must be in place with the aim of having a high probability of the stock growing out of the Critical Zone within a reasonable timeframe*".**

As such, through the PA Framework, the requirement for rebuilding plans for depleted stocks has become departmental policy. At a minimum, the PA Framework and its rebuilding plan requirement applies to key harvested stocks managed by DFO; that is, those stocks that are the specific and intended targets of a fishery, whether commercial, recreational or subsistence. It may also be applied more broadly to other stocks where necessary and as circumstances warrant.

While the PA Framework specifically requires the development of rebuilding plans which aim to grow stocks out of the Critical Zone (i.e. above the Limit Reference Point (LRP)), it is acknowledged that this represents only part of the overall rebuilding process. As discussed further in Sections 2.0 and 3.1, the goal of any rebuilding process is to grow stocks up through the Cautious Zone and ultimately into the Healthy Zone (where possible), as defined by the PA Framework. Rebuilding plans, as described in this document, play a key role in the overall rebuilding process for those stocks which have declined at or below the LRP.

It is acknowledged that the overarching goal of the PA Framework is to prevent stocks from declining into the Critical Zone in the first place. However, for some stocks, particularly those which have been depleted in the past and currently exist in the Critical Zone, the development and implementation of rebuilding plans is an essential element in the implementation of the PA Framework and DFO's efforts to sustainably manage Canadian fisheries.

The purpose of this document is to provide guidance to DFO staff, particularly fisheries managers and others that are tasked with the development of rebuilding plans for stocks in the Critical Zone, and builds upon the guidance already provided through the PA

Framework. **This document should be viewed as an annex to the PA Framework, and thus subject to the terms and conditions set out in that policy.** It provides a general overview of the rebuilding process, including a review of objective development, rebuilding timelines and involvement of fishery participants, co-management bodies under land claims agreements and others with an interest[1] in the fishery. This guidance document also reviews key factors that may affect rebuilding success, as well as best management practices which have been demonstrated to be successful in promoting stock rebuilding. A Rebuilding Plan template, found in Appendix A, provides more specific information regarding the recommended contents of a rebuilding plan. This guidelines document is not intended to provide an operational framework for implementation of the PA Framework. As further experience is gained in rebuilding processes, revisions to this document may be required in the future.

While this guidance document has been developed specifically to address the rebuilding of stocks out of the Critical Zone (as opposed to additional rebuilding processes beyond the LRP), as outlined in the PA Framework, much of the information outlined in this document (particularly Sections 7.0 and 8.0) may also prove useful for those tasked with additional rebuilding processes through other management processes (e.g. rebuilding through the Cautious Zone and into the Healthy Zone, application of the Pacific Wild Salmon Policy[2], rebuilding COSEWIC assessed species at risk managed through the *Fisheries Act* or *SARA*).

It is important to note that rebuilding plans developed under the auspices of the PA Framework are not legally binding instruments and cannot form the basis of a legal challenge. The rebuilding plan can be modified at any time. Its development does not fetter the Minister's discretionary powers set out in the *Fisheries Act*. The Minister can, for the proper management and control of fisheries, and the conservation and protection of fish, modify any provision of the plan in accordance with the powers granted pursuant

[1] Includes Provinces, Territories, Aboriginal peoples, processors, academia, environmental and community non-governmental organizations, and others.

[2] The PA Framework states that Canada's *Policy for Conservation of Wild Pacific Salmon* (Wild Salmon Policy) applies as the guiding document for adopting the Precautionary Approach to decisions on the management of Pacific salmon stocks. The Wild Salmon Policy provides distinctive guidance on salmon planning and management in that it considers units of biological diversity (salmon conservation unit) defining salmon stocks at finer scales compared with many other fisheries. The Wild Salmon Policy also provides guidance on the development of integrated strategic plans that are intended to set out long-term conservation objectives for groups of salmon conservation units (CU) and recommended measures for fisheries, habitat and enhancement to address salmon conservation issues. As stated in the Wild Salmon Policy, integrated strategic plans, as a minimum, must be capable of maintaining and restoring all CUs above their established lower benchmarks with an acceptable degree of certainty within a defined time frame. At the same time, the Wild Salmon Policy recognizes that there may be circumstances where it is not feasible to fully address all risks faced by a CU, and a decision may be made to limit the range of measures taken. The required components of an integrated strategic plan for conserving and restoring salmon are similar to those outlined in the rebuilding plan guidelines for the PA Framework. While the Wild Salmon Policy will continue to be the primary directive for the maintenance and restoration of Pacific Salmon CUs, where it is determined that conservation units require rebuilding, DFO will consider additional guidance from the PA Framework rebuilding plan guidelines for inclusion in an integrated strategic plan.

to the *Fisheries Act*. A statement of these provisos must be included at the beginning of each rebuilding plan, and communicated to all who are participating in the development of the plan.

Management decisions resulting from the application of these guidelines will be subject to fisheries legislation in general. Additionally, they will take into account relevant land claims agreements, the duty to consult where decisions may adversely affect established or potential Aboriginal or treaty rights, the constitutional protection provided to Aboriginal and treaty rights by Section 35 of the *Constitution Act* (1982), other departmental policies and other relevant considerations.

2.0 Rebuilding Plans vs. Integrated Fisheries Management Plans

Integrated Fisheries Management Plans (IFMP) provide a planning framework for the conservation and sustainable use of fisheries resources and the process by which a given fishery will be managed for a period of time. They are an important reporting tool and valuable source of information on a given fishery for fisheries managers, other DFO sectors (i.e. those having input into the fisheries management process), co-management bodies under land claims agreements, fishery participants, and others with an interest in the fishery. IFMPs provide a clear and concise summary of the characteristics of a fishery, scientific aspects, management objectives, management measures used to achieve those objectives and criteria by which attainment of objectives will be measured. The provisions of the plan will determine how the fishery will be managed and, where applicable, what will appear in licence conditions. In 2010, DFO completed a revised IFMP guidelines document (DFO, 2010*b*) to reflect the changing fisheries management regime as presented by the SFF.

A rebuilding plan developed under the auspices of the PA Framework should be approached as an extension of the IFMP process and document. The standard IFMP should been seen as the primary tool to be used for those stocks whose population status is within the Cautious or Healthy Zones (this includes the rebuilding of a stock from the Cautious Zone to the Healthy Zone). However, for those stocks which are in the Critical Zone, the standard IFMP would be supplemented with a rebuilding plan which outlines the objectives, timelines and management measures that are specific to growing the stock above the LRP. In incidences where a current IFMP exists, a rebuilding plan may be presented as an annex to the IFMP and draw upon the content of the IFMP where appropriate. Where a current IFMP does not exist, a rebuilding plan may be developed as a standalone document. Such a plan would tend to be more substantial in content compared to a rebuilding plan developed as an annex to an IFMP. Given the "nested" relationship of a rebuilding plan within the greater IFMP process, every effort has been made to ensure consistency between the IFMP and the rebuilding plan guidelines, where possible. However, differences do exist between a standard IFMP and a rebuilding plan,

reflecting the unique requirements for rebuilding a stock from the Critical Zone to above the LRP.

Where appropriate, the IFMP engagement and development process can be utilized for the development of PA compliant rebuilding plans. However, additional and/or alternative processes may be developed where the stock condition, ecological factors, characteristics of the harvesting sectors and other fishery interests, or the overall planning environment warrants a different approach. This would be determined on a case-specific basis.

3.0 Defining Rebuilding Objectives

Clearly stated objectives are an essential element of any rebuilding plan, and direct the development of specific rebuilding measures. Well developed objectives help ensure requests for scientific advice are clear and that fisheries managers have the information needed to inform decision making. Clear objectives also ensure that the expectations of external partners and other fishery interests in the rebuilding process are accurate and well founded. In the absence of clear objectives, the probability of success is reduced, as it becomes difficult to know when desired goals have been reached.

Those tasked with the development of rebuilding plans should always strive to ensure objectives are **SMART** (Specific, Measurable, Attainable, Relevant and Timely) and take into account the overall feasibility of rebuilding (Section 7.4).

3.1 Short-term vs. Long-term Objectives

Rebuilding plans should include both short-term and long-term objectives. Short-term objectives are those which are expected to be accomplished within the lifespan of the rebuilding plan, and drive the development of the specific management measures of the plan itself. As outlined in the PA Framework, the primary objective of any rebuilding plan is to:

- **promote stock growth out of the Critical Zone (i.e. grow the stock beyond the LRP) by ensuring removals from all fishing sources are kept to the lowest possible level until the stock has cleared this zone. There should be no tolerance for preventable decline. This objective remains the same whether the stock is declining, stable or increasing.**

As noted in Section 2.0, once a stock has grown beyond the LRP, the standard IFMP process will be utilized to continue stock growth. Hence the lifespan of a rebuilding plan is based upon the timelines required to reach this objective.

Given that LRP-oriented objectives are often based upon biomass (or equivalent metrics), it may also be desirable to develop additional short-term objectives which are non-LRP

oriented yet achievable within the lifespan of the rebuilding plan. Such short-term objectives may be directed by the need for overall restoration of stock (i.e. beyond biomass goals) and/or ecological characteristics required to ensure healthy stock status. Non-biomass considerations in defining rebuilding success are discussed further in Section 3.2.

While the short-term objectives of a rebuilding plan may be well defined, the steps required to reach them may not always be clear. Indeed, the objective of growing a stock beyond the LRP may initially appear to be an insurmountable goal to fisheries managers, scientists and fishery participants alike, particularly for severely depleted stocks. **Milestones** may provide a valuable tool in achieving the short-term rebuilding objective. These are specific and measureable targets that represent interim "steps" that can be achieved as the stock grows through and out of the Critical Zone. Milestones may be based on such characteristics as positive stock trajectory, biomass targets, restoration (or progress towards restoration) of desirable stock and/or ecological characteristics, and fishing mortality reductions. Milestones may be achievable over relatively short timeframes (e.g. 3-5 years) when compared to the overall period required to grow the stock above the LRP, and can provide a valuable and measurable indicator to ensure rebuilding is on track as determined through performance reviews (Section 11.0). Indeed, the development of milestones plays a dual role; the process will also assist in determining what indicators can be tracked to measure plan performance.

Short-term objectives, as well as the milestones established to reach them, should be defined to explicitly consider three components:

- a target, which is preferably quantifiable where possible (e.g. specified biomass goal);
- a desired time to reach the target (e.g. specified number of years/generations); and
- an acceptable probability level for reaching the target within the specified timeframe.

Reducing ambiguity in objectives and milestones by defining such components will improve accountability and transparency around achieving them.

Long-term objectives are those which are expected to be achieved over timeframes longer than the lifespan of the rebuilding plan itself. Long-term objectives include growing the stock through the Cautious Zone and into the Healthy Zone, based on the established Upper Stock Reference (USR) and/or to the Target Reference Point (TRP). Long-term objectives should also look beyond biomass targets (or equivalent metrics) toward broader stock and ecological goals (Section 3.2). While long-term objectives will not be accomplished within the lifespan of a rebuilding plan (instead relying on long-term fisheries management planning processes such as IFMPs), it may be beneficial for such objectives to be presented in the rebuilding plan and supported by short-term objectives and associated milestones. Like the short-term objectives, defining explicit targets, timeframes and probabilities for long-term objectives, to the extent possible, will reduce ambiguity and assist in performance reviews.

3.2 Defining Rebuilding

In setting objectives, it is important that fisheries managers, scientists, fishery participants, co-management bodies under land claims agreements, and others with an interest in the fishery are clear on what is meant by stock rebuilding. In the simplest terms, rebuilding often is in reference to growth of the stock biomass (or equivalent metrics, such as escapement for salmon or yield for effort controlled fisheries) to reach a target level. Indeed, this would frequently be the primary focus of rebuilding plans completed under the auspices of the PA Framework.

However, rebuilding a stock to a healthier and more robust state is often far more complex than simply reaching a target biomass. For example, increases in biomass without concurrent recovery of size and age structure, or expansion of spatial distribution to the historical range, may result in subsequent depletion of the stock when harvest pressure resumes/increases above the LRP. As such, overall rebuilding success should be defined in a broader ecological context and entail restoring a stock to its "normal" or "near normal" life history characteristics (e.g. restoring age structure, size and age-at-maturity, genetic diversity, behavioural traits, distribution) and ecological function (e.g. restoring predator/prey relationships), to the extent possible. Defining "normal" is a rather subjective process and should consider a stock's long-term characteristics prior to its depletion, as well as what is possible given any long-term shifts in overall ecosystem conditions. It is not meant to reference a non-fished state.

Rebuilding a stock in the broader ecological sense may require much longer timeframes than simply rebuilding biomass. It is often a more complex and challenging goal, and may take many generations to achieve (if it can be done at all). Despite the challenges, it is beneficial to the overall long-term health of the stock and the ecosystem as a whole if such goals are incorporated into the long-term objectives for the stock, and supported through short-term objectives.

3.3 Multispecies Objectives

As various species do not live in isolation of each other, factors such as predator-prey relationships and competition within and between species (Section 7.5) should be considered in developing rebuilding objectives for any particular stock. Rebuilding activities for one stock may have positive, negative or neutral ramifications for other stocks. In incidences where rebuilding activities will benefit more than one species, opportunities to pursue a more ecosystem-based approach to objective building would be encouraged. However, in cases where rebuilding one stock has the potential to negatively impact the status of another (e.g. rebuilding a predator species which would result in a decline in a prey species), objectives should be carefully developed through a balanced approach to ensure neither is depleted to a point of serious harm.

In mixed-stock and multispecies fisheries, management actions to rebuild a depleted stock ***may*** require restrictions on fishing opportunities for other stocks and species whose

populations are healthy. In such cases, objectives should strive to balance the rebuilding needs of the depleted stock with the socioeconomic ramifications (Section 6.0) for those harvesters that primarily target healthy stocks and may be required to forgo catches of those healthy stocks in order to allow the depleted stock to recover.

3.4 Socioeconomic Objectives

In addition to conservation-based considerations, rebuilding plan objectives should also take into account socioeconomic impacts and requirements, including the potential impacts on current and future business opportunities for harvesters, the impacts on ongoing opportunities for the recreational sector, and the importance of continued access for Aboriginal communities to support both economic opportunities and food, social and ceremonial fisheries. Balancing both conservation and socioeconomic objectives for a stock requires careful consideration of how they will each affect progress towards rebuilding, and necessitate an open and transparent relationship with fishery participants, co-management bodies under land claims agreements and others with an interest in the fishery. Further information on socioeconomic considerations in rebuilding is presented in Section 6.0.

4.0 Rebuilding Timeframes

As outlined in the PA Framework, rebuilding plans must be in place with the aim of having a high probability of the stock growing out of the Critical Zone within a reasonable timeframe. Ideally, a reasonable timeframe would normally represent the time for a cohort to recruit to the spawning biomass and then contribute to rebuilding the productive capacity of the stock. This period will vary among species. For many species it will correspond to a period of 1.5 – 2 generations.

In some cases, however, the rebuilding of a stock above the LRP may only be possible over a longer timeframe (i.e. greater than 1.5-2 generations). This would include situations where life history characteristics of the stock in question reduce potential growth rates, when current productivity regimes are not favourable for stock growth, or for stocks that are so severely depleted that growth above the LRP would only be possible over many generations. Recent experience suggests that often there are numerous factors leading to the decline of stocks and the specific causes may not be fully understood. Such uncertainty (see Section 7.7) may influence rebuilding timelines.

Flexibility in setting rebuilding timeframes may also be desirable from a socioeconomic perspective (Section 6.0), as it may be desirable to trade-off the pace of rebuilding in favour of a management approach that results in slower yet positive stock growth with fewer socioeconomic impacts. However, in such circumstances, conservation considerations (e.g. positive stock trajectory) must still remain the primary goal in setting timelines.

Specified timelines to meet rebuilding objectives (and associated milestone) are required to ensure management measures are on-track, as evaluated through performance reviews (Section 11.0). They are also needed to ensure that the expectations of fisheries managers and fishery interests are well founded. As such, timelines should be clearly outlined in the rebuilding plan and regularly reviewed (and revised where applicable) to ensure they are still feasible and relevant.

The development of the rebuilding plan itself should be initiated well in advance to ensure the plan is ready to come into effect at the boundary of the Critical and Cautious Zones. Developing a rebuilding plan may take considerable time, and this should be taken into account in deciding when to initiate the process. In some cases, a plan could be initiated when the stock has declined past the mid-point of the Cautious Zone. If a stock is already in the Critical Zone, a rebuilding plan must be developed and implemented on a priority basis.

5.0 Engagement of Fishery Participants and Co-Management Bodies Under Land Claims Agreements

To increase the probability of success and ensure all legal commitments are fulfilled, it is imperative that fishery participants and co-management bodies under land claims agreements be fully engaged from the onset of the rebuilding process, and throughout the entire development and implementation of a rebuilding plan. Other fisheries interests may also be engaged where warranted, as determined by the responsible fisheries managers and scientists. Information held by these parties, including Aboriginal Traditional Knowledge (ATK) and Traditional Ecological Knowledge (TEK), can enhance both biological and socioeconomic analyses, and their knowledge would complement the information obtained from scientific surveys. Harvesters in particular may be able to contribute data from fishing logbooks and records, and to provide additional information regarding costs and earnings (OECD, 2010).

Engagement by fishery participants and co-management bodies under land claims agreements is essential in setting realistic and achievable rebuilding objectives (Section 3.0). In any rebuilding approach, there are risks and uncertainties associated with those management measures put in place to reach the plan objectives. For example, a rebuilding plan may project that, with the introduction of specific conservation measures, a species will rebuild to a specified level after a specified number of years. However, there is often some level of uncertainty associated with these projections, particularly in cases where ecosystem shifts may be a factor. As such, it would be crucial to articulate these risks and uncertainties to all to reduce future conflicts or misunderstandings should the projections outlined in rebuilding plans not hold true (OECD, 2010).

Thorough engagement with fishery participants and co-management bodies under land claims agreements also allows for a meaningful assessment of the various potential

rebuilding measures and scenarios, including harvest decision rules (Section 8.4), that will drive the rebuilding process. Through the cooperative development of harvest decision rules with fishery participants and co-management bodies under land claims agreements, there is a common understanding prior to the implementation of rebuilding measures as to the next suite of actions to be taken should objectives and milestones be (not be) met. Such a collaborative decision-making approach supports a transparent and shared-stewardship approach, and increases the level of buy-in (OECD, 2010).

Where they exist, fisheries managers and science advisors should use existing fishery advisory processes to engage fishery participants and co-management bodies under land claims agreements, as well as other potential fishery interests. Where advisory processes do not exist, or are unsuitable from a rebuilding perspective, DFO should take steps to establish appropriate engagement processes. Where DFO has determined that there is a legal duty to consult with Aboriginal groups, the Department must ensure that the existing process for consultations, or any new process designed for this purpose, meets the requirements outlined in the *Interim Guidelines for Federal Officials to Fulfill the Legal Duty to Consult, February 2008*.

6.0 Socioeconomic Considerations

Stock rebuilding efforts will often be associated with some socioeconomic costs. These may include a reduction in fishing opportunities, with resulting financial and societal impacts on harvesters and other fishery interests. This problem may be exacerbated further by the fact that rebuilding can take years or even decades (Worm *et. al.,* 2009). As noted in Section 3.3, the impacts of rebuilding efforts may even extend beyond the depleted stock and impact harvesting opportunities for healthy stocks if both are pursued through multispecies or mixed-stock fisheries, or the depleted stock is intercepted as bycatch. Such costs may create strong resistance among fishery interests (particularly among commercial, recreational and subsistence harvesters) and impede rebuilding efforts. As such, short-term and long-term socioeconomic factors should always be considered in any rebuilding initiative, and incorporated in the development of rebuilding objectives (Section 3.0), timeframes (Section 4.0) and management measures.

While short-term socioeconomic costs associated with rebuilding measures may be significant, it is important to consider and effectively communicate the long-term socioeconomic benefits of healthy stocks and sustainable fisheries. If rebuilding is successful, the socioeconomic losses associated with the rebuilding process can result in the long-term restoration (and possible improvement) of fishing opportunities and overall economic rent. However, such arguments may only be effective if the long-term benefits are tangible to those who will be making the immediate sacrifices. If harvesters could secure access rights to the fishery of the future, they might be more willing to bear the current costs (Hammer *et. al.*, 2010).

As discussed in Section 3.3, stock rebuilding may result in changes in predator-prey abundance. This in turn could shift catch opportunities among fleets and potentially

change the distribution of wealth allocation within the overall fishing industry. Such secondary (and potentially negative) socioeconomic impacts should be considered in developing options for rebuilding depleted stocks.

Where resources allow, the inclusion of a cost-benefit analysis would provide a valuable instrument in the development and implementation of a rebuilding plan. It should consider such factors as the impact of reduced catches (considering both the depleted stock and other associated stocks/species which may be affected by rebuilding efforts), delivery costs associated with management measures, overall loss of economic rent from depleted stocks, and potential benefits of a rebuilt fishery. A cost benefit analysis would articulate the socioeconomic trade-offs of management decisions in a transparent manner, and may prove essential in gaining support from fishery participants, co-management bodies under land claims agreements and others with an interest in the fishery.

7.0 Factors Influencing Rebuilding

While the results of domestic and global rebuilding efforts have been variable, it has been demonstrated that collapsed and severely depleted fish stocks may recover and be rebuilt. However, there are various factors which will influence the degree of success. These factors should be acknowledged and addressed, where possible, in any successful rebuilding process. The following provides an overview of some key influential factors.

7.1 Life History Characteristics

A species' life history characteristics (e.g. growth rates, fecundity, longevity, age-at-maturity, size-at-maturity) are critical elements to consider in determining a stock's response to both fishing pressures and rebuilding measures. For example, long-lived, slow-growing species with low fecundity are more likely to decline under high fishing pressure, and are less likely to recover or recover more slowly compared with short-lived, early-maturing, high-fecundity species (UNCOVER, 2010). As such, the specific life history characteristics of the stock in question should be considered in developing a rebuilding regime, as not all species should be expected to respond in the same manner to specific management measures.

7.2 Environmental Conditions

Various environmental conditions (e.g. temperature, salinity) will impact the rebuilding dynamics of a stock by affecting life history characteristics, such as fecundity, growth and general productivity. Environmental conditions will also influence predator and prey abundance, which in turn impacts a stocks' overall health and recruitment. Environmental conditions which are favourable for the species in question are generally associated with improved recruitment and rebuilding opportunities, while less favourable conditions may lessen rebuilding success.

However, given the dynamic nature of environmental conditions, our ability to fully comprehend and predict their impacts on rebuilding success is limited. Relationships between stock condition and environmental condition, as demonstrated in historical data, may not remain true for a depleted stock, or for one in which the overall trophic dynamics of the ecosystem have been significantly shifted compared to historical norms. The uncertainty regarding the influence of environmental conditions on recovery success is further compounded by the uncertain effects of global climate change.

Despite such uncertainties, the influence of environmental conditions on rebuilding should be considered and incorporated into rebuilding efforts for depleted stocks. Rebuilding plans should be developed using the best science advice available, recognizing the risks and uncertainties (Section 7.7) associated with our knowledge of such relationships and future trends in oceanic conditions. Rebuilding practices and tools should be adaptable enough to address the reasonable range of potential environmental conditions that may exist within the timeframe of the rebuilding plan, and may even include specific measures to address shifts in oceanic conditions. Given the high uncertainty about future ocean conditions and how the depleted stock will respond to those conditions, rebuilding objectives (Section 3.0) and their underlying assumptions should be regularly revisited.

7.3 Evolutionary Changes

Excessive fishing pressure can have evolutionary effects on a stock, resulting in genetic-based changes to life history characteristics such as growth, size-at maturity, age-at-maturity and overall behavioural/reproductive traits. Indeed, rapid evolutionary effects may occur and have been demonstrated for collapsing stocks. Rebuilding to the original state in terms of genetic and phenotypic stock structure can be extremely slow (i.e. much slower than that required to rebuild stock biomass alone). Generally, however, the influence of evolutionary changes is likely to be small compared to the direct effects of overfishing leading to depletion. Thus, evolutionary changes are not expected to be generally responsible for a lack of recovery, even though they may contribute to a slower rebuilding rate. As such, addressing the evolutionary effects of fishing is less urgent than reducing the direct, detrimental effects of overfishing on depleted stocks (UNCOVER, 2010). However, there may still be a need to both develop clear management goals for genetic diversity in long-term objectives (Section 3.1) and implement management measures which contribute to the rebuilding of the stock beyond the simple increase in biomass (Section 3.2).

7.4 Feasibility of Rebuilding

If significant fisheries-induced evolutionary changes have taken place, the historical age-structure has been significantly altered or environmental change has altered the productivity and demography of a stock or has altered ecosystem structure, rebuilt stocks

could differ markedly from those before depletion. Therefore, rebuilding to former biomass levels and restoration of stock structure (e.g. genetic, physiological and/or ecological traits) might not always be possible for all stocks, owing to dominance shifts in the ecosystem and/or to evolutionary effects. As such, the feasibility of rebuilding a stock to its historical condition should be considered in developing overall objectives for the stock in question. The role of socioeconomic factors in determining rebuilding feasibility should only be considered with great caution, and should not be viewed as an easy "off-ramp" from the rebuilding process. Infeasibility due to socioeconomic factors should only be considered in the most extreme of cases, and informed by a cost benefit analysis (Section 6.0).

7.5 Multispecies Interactions

Multispecies interactions have a strong influence on stock recovery potential, and the magnitude of influence depends on the prevailing environmental conditions. Both predation and availability of prey have a high impact on recruitment success and hence the rebuilding potential of depleted stocks. As noted in UNCOVER (2010) interspecific (i.e. between different species), and to a lesser extent density dependent intraspecific (i.e. between members of a single species), trophic interactions may lead to different and mostly slower rebuilding rates of depleted fish stocks, compared to single species predictions. When conditions are beneficial for the targeted stock, the speed and magnitude of stock rebuilding will be more effective when compared with unfavourable conditions.

Multispecies interactions are important factors to consider in defining rebuilding objectives and management measures for any specific stock. Indeed, in defining stock objectives it is important to acknowledge that it is not possible to simultaneously achieve yields corresponding to Maximum Sustainable Yield (MSY) predicted from single-species assessments for a system of multiple, interacting species (Shelton and Sinclair, 2008; UNCOVER, 2010). As such, rebuilding efforts should be approached within an ecosystem context to the extent possible.

7.6 Illegal, Unreported and Unregulated Fisheries

A key requirement of the PA Framework is that the removal references take into account all fishing mortality (i.e. retained catch and estimate of mortality from discards). Rebuilding success, as well as overall sustainability based on the PA Framework, will be contingent on remaining within these set PA compliant removal limits. However, unrecorded fish removals, specifically illegal, unreported and unregulated (IUU) catches, may result in total removals that are above maximum limits required to conserve and rebuild the stock, and hence undermine rebuilding efforts.

As unreported catches pose a threat to accurate science assessments and resulting fisheries management processes, it is important that all IUU catches be minimized or

eliminated, where possible, through compliance and enforcement programs (Section 8.5), and that effective and appropriate catch monitoring and reporting (Section 8.6) processes be in place to ensure removals are reflected in the data.

However, it is important to note that in many smaller or subsistence-based fisheries, catches may be unreported or unregulated but still legal. These situations may pose significant challenges to the implementation of rebuilding measures under a PA framework. In such cases, new and innovative approaches to data collection and/or catch monitoring are encouraged.

7.7 Uncertainty and Risk

Stock rebuilding remains a poorly understood process. There are inherent uncertainties and risks associated with rebuilding processes, including those relating to stock biology, the impact of variable environmental conditions, stock assessment methodologies and the effectiveness of various rebuilding techniques. A clear understanding of the range and magnitude of risks and uncertainty is crucial to the rebuilding process. There is never a guarantee that rebuilding will occur even if the fishing mortality is reduced, good management practices are introduced and other favourable measures are implemented.

The precautionary approach stresses that uncertainty should not be seen as a reason to postpone or fail to take action. The key to dealing with uncertainty and risk is to acknowledge where it exists and take the most appropriate actions to address it, to the extent possible. Further information regarding the management of uncertainty in implementation of an overall precautionary approach is outlined in the PA Framework.

As noted in Section 5.0, uncertainty and risks associated with science advice and management actions should be clearly communicated to fishery interests, particularly harvesters, so as to reduce future conflicts or misunderstandings should the projections outlined in rebuilding plans not hold true. However, providing advice or a management option with high levels of uncertainty may make it difficult to build support. Alternatively, expressing too little uncertainty could erode the credibility of science and management advice when, for instance, overly optimistic predictions turn out to be wrong. One way to address this dilemma is to report advice such that a certain management action is expected to produce stock improvements to reach specified milestones over a set planning horizon with some estimated probability (Hammer *et. al*., 2010).

7.8 Impacts of Rebuilding on Other Fisheries

As outlined in Section 3.3, rebuilding efforts for a depleted stock harvested in a mixed-stock or multispecies fishery ***may*** result in reduced fishing opportunities on targeted stocks/species whose populations are healthy. As a result, substantial sacrifices may be required by harvesters who are required to forgo catches of the healthy stocks to protect

the weaker stocks. Such a situation may lead to conflict between fishery interests, risk a loss of support, and result in both increased management costs and regulatory complexity (OECD, 2010).

The challenge of rebuilding stocks in these situations may be tempered by following a management approach that is adaptive and ecosystem-based, which balances the objectives for rebuilding depleted stocks with the maintenance of fishing opportunities directed at healthy stocks.

8.0 Best Management Practices

The following provides an overview of best management practices that have proven useful in the rebuilding of depleted stocks, as documented in the current literature (see references and further reading in Section 13.0). The feasibility and value of each management option will depend heavily on local characteristics of the fishery, environment and governance structure (Worm *et. al*., 2009). As such, the selection of best management practices should be done on a case-specific basis. Typically, a combination of best management practices, rather than a single method, is desirable in meeting rebuilding objectives. Indeed, experience has indicated that the application of combinations of rebuilding methods (including those outlined below) applied through both an adaptive and ecosystem-based (vs. single species) approach can lead to significant rebuilding success.

8.1 Catch Reductions

The PA Framework requires that removals from all fishing sources are kept to the lowest possible level until the stock has cleared the Critical Zone, with no tolerance for preventable decline. When a stock is in the Critical Zone, long-term sustainable fishery benefits can only be realized by emphasizing considerable restraint through the stock rebuilding phase.

Experience has indicated that the most successful rebuilding programs are characterized by immediate and substantial reductions in total mortality from fishing (Hammer *et. al.*, 2010; OECD, 2010; UNCOVER, 2010), including those from directed fishing, bycatch and discards. Stocks with very low abundance generally have poor productivity, and therefore, rebuilding is even more challenging. Protection of a sizeable spawning stock biomass (SSB), and thereby the generation of new recruits, is essential. Hence, it is vital to ensure that rapid reduction in fishing mortality prevents the SSB from falling below sub-optimal threshold levels where there may be uncertainty about both the nature of the stock-recruitment relationship (due to lack of experience and appropriate data) and the potential inability of a heavily depleted stock to generate sufficient recruits for effective rebuilding (UNCOVER, 2010).

Gradual, long-term reductions may delay or prevent the onset of rebuilding. This is because the effect of small reductions may easily be misinterpreted in relation to the overall uncertainty of the assessments. As a result of small reductions, there may be a sequence of years in which rebuilding responses are not evident. A lack of evidence of rebuilding may fuel public debate on the need for further catch reductions, thus undermining both the credibility of the science advice and the entire rebuilding process (UNCOVER, 2010).

There are various methods to reduce total fishing mortality of a depleted stock. Input controls (i.e. effort controls) seek to restrict the amount or intensity of inputs used to harvest fish, including fishing vessels, gear, number of trips or days at sea, and fishing season lengths. Output controls seek to restrict in some form the amount of fish harvested (the "output" of a fishery), and include measures such as total allowable catch (TAC) and quotas. The method(s) selected for catch reduction should be made on a case-specific basis, and consider such factors as species biology, fishing practices, socioeconomic consequences, availability of monitoring and enforcement measures, and the support of fishery interests.

8.2 Gear Modifications and Restrictions

Not all fishing gear types are equal in terms of impacts on target species, bycatch and habitat. Gear modifications (e.g. bycatch reduction devices such as Nordmore grates), improvements to deployment, use and retrieval methods, and gear restrictions have all proven useful in increasing selectivity and reducing undesirable mortality due to bycatch of the depleted stock. Such practices can prove useful in maintaining catches within desired levels, and thus should be considered in any rebuilding plan. Further information on the potential impacts of various fishing gears, as well as suggested mitigation measures, are outlined in DFO's Canadian Science Advisory Secretariat (CSAS) Science Advisory Reports 2006/25 (DFO, 2006) and 2010/003 (DFO, 2010*a*).

8.3 Closed Areas

Spatial and temporal closures, which are often gear specific, are currently employed by DFO as part of the overall fisheries management regime. Such closures have also been successfully incorporated into stock rebuilding programs, particularly when combined with additional management techniques. Closed areas can serve various functions in the rebuilding process, such as conserving vulnerable concentrations of the depleted stock (e.g. overwinter concentrations) and protecting essential fish habitat (e.g. spawning and nursery grounds). Currently, DFO utilizes several processes to create closed areas, with fisheries closures created via the *Fisheries Act* being the primary instrument. Some Marine Protected Areas (MPA) created via the *Oceans Act* have played a role in fisheries management and stock rebuilding processes, as illustrated by the Eastport MPA which has focused on the conservation and growth of local lobster stocks. Voluntary closures

negotiated with the fishing industry (e.g. North Labrador Sea Coral Closure) have also been utilized in recent years.

Closed areas should be designed to meet the specific rebuilding needs of the stock in question and may involve the exclusion of all or certain gear types, as well as other human impacts. Care should be taken in implementing closures; they should not result in the simple displacement of the fishing pressure to other locations. Such a result may do little to aid the rebuilding of the stock in question, and may even result in additional harm to other stocks which could be subjected to the displaced fishing pressures. For this reason, closures should be viewed as a complementary tool to be used in combination with other rebuilding measures, specifically effort and/or catch controls and reductions.

8.4 Harvest Decision Rules

Pre-agreed harvest decision rules are an essential component of any PA compliant fisheries management plan, including rebuilding plans. General guidance for harvest decision rules for a stock in the Critical Zone, as outlined in the PA Framework, include:

- conservation considerations should prevail; management actions cannot be inconsistent with secure recovery;
- harvest rates, taking into account all sources of removals, should be kept to an absolute minimum until the stock has cleared the critical zone; and
- management actions must promote stock growth.

Based on this general guidance, fishery-specific harvest decision rules should be developed with the aim of rebuilding the stock towards objectives and milestones and securely above the LRP within a set timeframe. Harvest decision rules govern how much of a stock is to be harvested and take into account the stock's status, growth trends, objectives and milestones, and other factors. It is essential that the rules include provisions for additional restrictions on catches, as well as a provision that application of the measures is mandatory if the stock does not show signs that rebuilding is occurring.

Harvest decision rules should be designed so that they do not restrict management from taking the actions necessary to react to significant stock declines. Actions must be taken as soon as possible to halt preventable stock declines. Where harvesting is being permitted on a depleted stock below its LRP, conservation must take priority over other objectives. Harvest decision rules should not allow for increases in allowable removals based upon short-term trends in stock growth, unless the trend is determined to be "true" by the responsible fisheries managers and scientists. This is necessary to ensure that the trend is indicative of actual stock changes rather than normal fluctuations or "noise" associated with survey and modelling errors.

Harvest decision rules must be developed in cooperation with fishery participants and co-management bodies under land claims agreements (Section 5.0) to ensure they are engaged and supportive of the conservation measures. Without their engagement,

compliance with management measures (and hence rebuilding success) may be significantly reduced. Harvest decision rules should also be clearly communicated, such that there is no misinterpretation among fishery interest groups.

8.5 Compliance and Enforcement

Successful implementation of a rebuilding plan is largely dependent on full harvester compliance with the management measures contained within it. This is essential to ensure that mortality levels remain at or below allowable limits for rebuilding. As such, each rebuilding plan should include a compliance and enforcement strategy that outlines key compliance and enforcement issues (e.g. bycatch, IUU), and a strategy to address each. Such strategies should be developed in full consideration of resource limitations of both Departmental staff and the harvesters themselves. Further guidance on the development of compliance and enforcement strategies is outlined in *Preparing an Integrated Fisheries Management Plan (IFMP): Guidance Document* (DFO, 2010*b*).

8.6 Monitoring and Reporting

As outlined in the PA Framework, rebuilding plans must be associated with ongoing monitoring and reporting requirements. Such monitoring is necessary to allow management measures to be updated and adjusted, as defined by the harvest decision rules (Section 8.4), on a regular basis to ensure rebuilding is occurring within defined parameters. It may be necessary to review the adequacy of the catch monitoring and reporting systems for all the fisheries that harvest or intercept the stock to ensure that all mortality from fishing is being estimated as accurately as possible. If not, the systems may have to be improved.

Monitoring and reporting should include all retained and non-retained catch of a stock from all fisheries (commercial, recreational and subsistence) whether targeted or intercepted as bycatch. Monitoring and reporting methods can include standard techniques, such as at-sea observers, video monitoring, dockside monitoring and logbooks. Given that reduced harvesting would be anticipated for a stock in the Critical Zone, the role of fishery-independent monitoring may increase. Where possible and applicable, efforts should be made to improve upon and further develop methods which are effective, realistic and feasible in consideration of Departmental and harvester constraints. The full engagement of DFO's compliance and enforcement sector (Section 8.5), as well as the cooperation of the harvesters themselves, will be necessary to ensure monitoring data is accurate and all removals are recorded or accurately estimated.

It is desirable to ensure that monitoring data are accessed and analyzed in an expedient manner, such that undesirable changes in stock condition (i.e. declines or lack of growth) are recognized early enough to allow for corrective measures. Managers should, however, be very cautious about adjusting measures too quickly in response to apparent or early signs of growth based on short-term monitoring results. Indeed, the occurrence

of a good year class should be seen as a rare opportunity to rebuild stock biomass and not an excuse to increase quotas or prematurely terminate a rebuilding plan (FAO, 2005).

8.7 Habitat Restoration and Enhancement

For some stocks, habitat availability and suitability may play a role in the overall rebuilding processes. Such issues may be particularly relevant for freshwater and anadromous/catadromous species (e.g. salmon, American eel). Habitat restoration techniques can include riparian restoration, creation of in-stream habitat and allowing/restoring habitat access. While often considered outside the realm of conventional fisheries management processes, habitat restoration and enhancement should nonetheless be incorporated into the overall rebuilding process where applicable and appropriate.

9.0 Management Strategy Evaluation (MSE)

Management Strategy Evaluation (MSE) provides a framework for comparing candidate management strategies based on trade-offs between performance measures related to stock status and fishery catch. While MSE uses simulation modeling, it differs from simple stochastic simulation because it keeps track of both the *true* and *perceived* populations. For each management strategy considered, a mathematical-statistical model is used to project the simulated *true* fishery system forward in time. Observed monitoring data with measurement error is generated from the *true* fish population, and an estimate of population status (i.e. the perceived population) is developed by applying an assessment method to the observed data. Simulated management decisions throughout the projection time period are made based on the *perceived* state of the stock, which leads to management actions (e.g. catch) that affect the *true* population. Performance measures are calculated based on the state of the *true* population. MSE does not seek to recommend an optimal management strategy, but rather provides users with the information needed to evaluate trade-offs among performance measures arising from conflicting objectives. In addition, it allows the robustness of candidate management strategies to be considered, where robustness represents the ability of a management strategy to produce acceptable trade-off relationships over a range of scenarios representing plausible hypotheses about uncertain stock and fishery dynamics.

In the context of stock rebuilding, MSE can help examine the consequences of alternative management measures aimed at rebuilding depleted stocks. Current models allow for the incorporation of scenarios related to stock productivity, fleet structure, environmental change, gear restrictions, area closures and economic constraints. Examples of performance measures used to evaluate rebuilding plans in other jurisdictions include probability of reaching the target biomass within a specified number of years, number of years until biomass exceeds the target biomass, average ratio of fishing mortality to fishing mortality at MSY ($F:F_{MSY}$) over the rebuilding time period, average annual variation in catch over the rebuilding time period, and average age of fish. Examples of

uncertain stock dynamics that have been considered when evaluating the robustness of rebuilding plans include the shape of the spawner-recruitment curve, productivity, natural mortality rate, depensation at low stock sizes, and the impact of climatic regimes on recruitment.

An interesting result from some MSE applications has been that simple feedback harvest decision rules based on recent trends in survey data can outperform more complex management strategies based on a formal stock assessment of biomass relative to reference points. For fisheries in which simple feedback harvest decision rules are more practical than formal stock assessment models, possibly due to data limitations, MSE can help ensure that PA reference points and risk tolerances are not exceeded. An example of a performance measure developed in this case could be the risk of exceeding F_{MSY} being less than 20%.

While MSE has the potential to be a useful tool for ensuring that rebuilding strategies for stocks in the Critical Zone are robust to uncertainties, the approach is usually a resource- and time-intensive undertaking, and thus may not be practical for all fisheries. Furthermore, the application of MSE does not guarantee a successful rebuilding strategy. Key sources of uncertainty may be missed when constructing a model to represent fishery systems, which can lead to unexpected outcomes. For example, few MSE applications have attempted to incorporate multi-species interactions thus far.

As MSE is usually consultative in nature, with managers, scientists, fishery participants and co-management bodies under land claims agreements providing input into the candidate management strategies and alternative scenarios to be considered, the approach is beneficial in building stronger working relationships between sectors and external parties. The approach demands clearly defined performance measures that are derived from measurable management objectives (Section 3.0) to do the evaluations against, and as such forces participants to be specific and clear about rebuilding objectives.

10.0 Governance

Experience has indicated that the single most important factor in determining the success or failure of a rebuilding plan is the degree to which it is successfully implemented (UNCOVER, 2010). As stock collapse is often associated with a failure of the previous governance structure in respect to controlling removals and fishing effort within sustainable limits, rebuilding plans are not likely to work without rethinking the overall governance structure itself (Hammer *et. al.*, 2010). Strong governance, which includes a commitment by both management to fully implement the plan and harvesters to comply with agreed management measures (e.g. harvest decision rules), is essential in any rebuilding process. Importantly, the political will to support the rebuilding plan should not waver (UNCOVER, 2010).

A re-examination of the governance structure should not be time limited to the rebuilding process itself. Failure to resolve any underlying governance and management issues that

contributed to the decline in the stock in the first place will allow them to resurface once again after any rebuilding measures are removed and management returns to standard processes. Once stocks are rebuilt, managing for a sustainable fishery will require a governance and management framework that avoids the mistakes of the past and allows for long-term sustainability. As such, rebuilding efforts may be accompanied by the restructuring of the fishery itself, and include a mechanism for managing fishing capacity to reduce susceptibility to overexploitation. In many cases, a rebuilt fishery may rely on higher product value, lower product volume and reduced competition between harvesters in order to achieve greater profitability and sustainability.

11.0 Performance Review

The review of the overall performance of the rebuilding plan is an essential part of any rebuilding process. Clear performance criteria should be outlined in the rebuilding plan, and explicitly linked to the objectives and associated milestones, as well as management measures. Reviews should be completed on a regular basis (e.g. maximum 3 year intervals), with timelines determined by the management team based on the specifics of the stock in question. Reviews should be conducted at regular enough intervals such that failures of the plan (e.g. prolonged declining or stagnant stock growth) can be detected, and changes made as required.

The performance review should not be confused with regular monitoring (Section 8.6); the latter being a continuous process that examines ongoing changes in stock status, resulting in implementation of associated harvest decision rules (Section 8.4). However, trends observed in long-term monitoring are an essential element for consideration in reviewing rebuilding plan performance.

12.0 Glossary

Critical Zone: The stock status zone below the LRP.

Cautious Zone: The stock status zone above the LRP and below the USR.

Harvest Decision Rules: Pre-agreed management actions to be taken under different stock status scenarios. They are often described as a function of variables related to the status of the stock. For example, a decision rule can specify how F or yield should vary with biomass. Management acts on the rules using management measures. These are how the fishery's harvest levels and fishing activity are controlled or managed. These include adjustments to TAC, effort levels or fishing time, gear modifications or usage, time and area closures, etc. Harvest decision rules are also sometimes referred to as harvest control rules and TAC decision rules.

Generation: The average lifespan of a reproductive individual in a given stock.

Healthy Zone: The stock status zone above the USR.

IUU: Fishing activities that are either illegal (meaning that the fishing activities violate applicable national or international laws or rules), unreported (activities have not been reported in areas where such reporting is required), or unregulated (activities are inconsistent with relevant international laws or rules, but either the activities are not regulated, or the involved fishing vessels are not able to be regulated because they are flying the flag of a State that is not party to the relevant regional fishery management organization or they are flying no flag at all).

Limit Reference Point (LRP): The stock status below which productivity is sufficiently impaired to cause serious harm to the resource, but above the level where extinction becomes a concern. At this point, there may also be resultant impacts to the ecosystem as a whole, associated species and long-term loss of fishing opportunities.

Management Strategy Evaluation (MSE): A simulation modeling technique that allows users to examine the consequences of a range of management strategies, and presents the results in a way that indicates the tradeoffs in performance between those strategies.

Maximum Sustainable Yield (MSY): The maximum use that a fishery resource can sustain without impairing its renewability through natural growth or replenishment.

Precautionary Approach (PA): Being cautious when scientific information is uncertain, unreliable or inadequate and not using the absence of adequate scientific information as a reason to postpone or fail to take action to avoid serious harm to the resource.

Removal Reference: The maximum acceptable removal rate for the stock, and adjusted depending on the stock's abundance. It is normally expressed in terms of fishing

mortality (F) or harvest rate; but could also be described in other ways (ex. number of traps-hauls). It includes mortality from all fishing pressures.

Target Reference Point (TSR): Represents the overall target for the stock. It is determined by productivity objectives for the stock, broader ecological considerations and socioeconomic objectives for the fishery. The TSR may (or may not) be the same as the USR.

Upper Stock Reference (USR): The stock level threshold below which the removals must be progressively reduced in order to avoid, with high probability, reaching the LRP.

13.0 References and Further Reading

DFO. 2006. Impacts of Trawl Gears and Scallop Dredges on Benthic Habitats, Populations and Communities. DFO Canadian Science Advisory Secretariat (CSAS) Science Advisory Report 2006/025

DFO. 2010*a*. Potential impacts of fishing gears (excluding mobile bottom-contacting gears) on marine habitats and communities. DFO Canadian Science Advisory Secretariat (CSAS) Science Advisory Report 2010/003.

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FAO. 2005. World Inventory of Fisheries. Depleted Stocks Recovery: a Challenging Necessity. Issues Fact Sheets. Text by Serge M. Garcia. In: FAO Fisheries and Aquaculture Department, Rome. Website: www.fao.org/fishery/topic/14767/en

Hammer, C., Kjesbu, O. S., Krusde, G. H., and Shelton, P. A. 2010. Rebuilding depleted fish stocks: biology, ecology, social science, and management strategies. ICES Journal of Marine Science.

OECD. 2010. The Economics of Rebuilding Fisheries: Workshop Proceedings. Organization for Economic Co-operation and Development (OECD). Paris, France.

Shelton, P. A. and Sinclair, A. F. 2008. It's time to sharpen our definition of sustainable fisheries management. Canadian Journal of Fisheries and Aquatic Sciences 65: pp. 2305-2314.

UNCOVER. 2010. Final Activity Report – Executive Summary (2010). The UNCOVER project: Understanding the mechanisms of fish stock/fishery recovery. UNCOVER (FP6-2004-SSP4)

Worm, B., Hilborn, R., Baum, J. K., Branch, T. A., Collie, J. S., Costello, C., Fogarty, M. J.., Fulton, E. A., Hutchings, J. A., Jennings, S., Jensen, O. P., Lotze, H. K., Mace, P. M., McClanahan, T. R., Minto, C., Palumbi, S. R., Parma, A. M., Ricard, D., Rosenberg, A. A., Watson, R., and Zeller, D. 2009. Rebuilding Global Fisheries. Science 325: pp. 578-585.

APPENDIX A:

Precautionary Approach Framework - Rebuilding Plan Template for Growing Stocks Above the Critical Zone

1.0 COVER PAGE

- Indicate stock/species (including scientific name(s)), fishing area(s) and year(s) covered by the rebuilding plan. Use standard DFO and Government of Canada word-marks, and (where available) an illustration(s) of the species.

2.0 FOREWORD

All Rebuilding Plans must include the following standard text in the foreword:

- Fisheries and Oceans Canada (DFO) has developed "*A Fisheries Decision-Making Framework Incorporating the Precautionary Approach*" (PA Framework) under the auspices of the Sustainable Fisheries Framework. It outlines the departmental methodology for applying the precautionary approach (PA) to Canadian fisheries. A key component of the PA Framework requires that when a stock has reached or fallen below a limit reference point (LRP), a rebuilding plan must be in place with the aim of having a high probability of the stock growing above the LRP within a reasonable timeframe.

- The purpose of this rebuilding plan is to identify the main objectives and requirements for the (name of stock(s)) in (identify area(s) covered by the plan), as well as the management measures that will be used to achieve these objectives. This document also serves to communicate the basic information on the stock(s) and its management to DFO staff, legislated co-management boards and other fishery interests. This plan provides a common understanding of the basic "rules" for rebuilding the stock(s). The objectives and measures outlined in this plan are applicable as long as the stock(s) is below the LRP. Once the stock grows and remains consistently above the LRP, the stock(s) will be managed through the standard Integrated Fisheries Management Plan (IFMP) process. Management measures outlined in this rebuilding plan are mandatory, and may be modified to include additional catch restrictions if they fail to result in stock rebuilding.

- This rebuilding plan is not a legally binding instrument which can form the basis of a legal challenge. The plan can be modified at any time and does not fetter the Minister's discretionary powers set out in the *Fisheries Act*. The Minister can, for reasons of conservation or for any other valid reasons, modify any provision of

the rebuilding plan in accordance with the powers granted pursuant to the *Fisheries Act*.

- Where DFO is responsible for implementing a rebuilding plan in an area under a land claim agreement, the rebuilding plan will be implemented in a manner consistent with that agreement.

The Forward should include the signature and title of the DFO approval authority, and where applicable, the signature and title of other approval authorities (e.g. an authority established under land claims agreement).

3.0. BIOLOGICAL SYNOPSIS*

Provide a brief overview of the stock, including:

- Species Biology: Provide a brief overview outlining the main biological characteristics of the stock with emphasis on the aspects which impact rebuilding of the stock.

- Population and Distribution: Factors to be covered include range (both globally and Canadian), populations/stock structure. Best presented through maps.

- Habitat Requirements: including key location where applicable, migration routes and reproductive characteristics (e.g. season, behaviour, fecundity, growth rates, spawning grounds).

- Ecosystem Interactions: Briefly describe interactions with other species (including stocks of the same species) and the physical environment, particularly those which may affect rebuilding success. Where the information is available, briefly describe the potential effect of climate regime changes on stock status, particularly recruitment and stock productivity.

4.0 OVERVIEW OF THE FISHERY*

Provide a brief overview of the fisheries in which the stock is captured, including both targeted catch and bycatch:

- Type(s) of Fishery: Commercial, FSC, recreational, etc.

- Participants: Include relevant information such as numbers of licence holders, numbers of vessels, number of communities (in case of subsistence fisheries), and distribution of participants.

- Location of the Fishery: Describe the management areas/zones where fishing occurs (i.e. regulatory zones and specific areas of vessel operation) and distribution of fishing effort. Best presented through maps.

- Fishery Characteristics: Describe the gear types utilized in the fishery (e.g. fixed gear, mobile gear, etc), including numbers for each if possible, and type of method used to manage the fishery (e.g. seasons, competitive vs. IQ, input vs. output control, etc.), as well as the general timeframe (e.g. season) of when the fishery occurs.

- Governance: Briefly describe key legislation and regulations, as well as types of committees and/or land claims agreements which are part of the decision making process (based on zones, areas, regions, international considerations).

- Approval Process: Describe the general management decision-making process (i.e. decisions made by Area Director, RDG or Minister).

5.0 STOCK STATUS*

Provide a brief overview of stock's status, including:

- Precautionary Approach (PA): Provide an overview of PA references established for this species, including removal references, limit reference points, and upper stock reference points.

- Stock Assessment: Provide a summary of current stock status, particularly in relation to the PA reference points established for the stock. Also provide a brief overview of the assessment process for the stock, including types of data sources utilized (e.g. research vessel trawl surveys, tagging, index fisheries, CPUE, landing statistics, sentinel fisheries, etc.) and frequency of assessment. Updated stock assessment info should be added to the appendix as it becomes available.

- Stock Scenarios: Briefly describe stock prospects (i.e. trends) for the period of the plan, and beyond, if available.

- COSEWIC Assessment: Provide a brief overview of the assessment process and outcome for the species, including types of data sources utilized and identification of designatable units.

- Aboriginal Traditional Knowledge/Traditional Ecological Knowledge/Stakeholder Perspective: Where available, provide a brief overview of ATK/TEK and stakeholder perspectives regarding stock status.

6.0 SOCIOECONOMIC AND CULTURAL IMPORTANCE*

- Provide a brief overview of economic conditions and social, cultural and economic issues surrounding the stock. Use charts and figures where applicable.

- When extensive analysis is undertaken, summarize and provide reference to the separate analytical document.

7.0 MANAGEMENT ISSUES

- Provide an overview of the factors that have lead to the decline of the species and those issues that influence rebuilding. Include fishing (both directed and by-catch), non-fishing anthropogenic factors, natural mortality, predator/prey interactions, environmental impacts (including climate change), habitat limitations, international issues, etc.

- Consider the impacts of stock depletion/rebuilding on other stocks/species (whether positive, negative or neutral).

8.0 OBJECTIVES

- A series of both short-term and long-term objectives should be developed to guide the rebuilding process. Provide anticipated timelines where possible.

- Short-term objectives are those which are expected to be accomplished within the lifespan of the rebuilding plan (i.e. the period that is required to grow the stock above the LRP). It is these short-term objectives which drive the development of those specific management measures outlined in the rebuilding plan, and aid in the evaluation of rebuilding performance review.

- Short-term objectives may be supported by a series of milestones, which are specific and measureable targets that represent interim "steps" that direct the overall growth of a stock through and out of the Critical Zone.

- Long-term objectives are those which are expected to accomplish over a timeframe longer than the lifespan of the rebuilding plan, and are supported by one or more short-term objectives and associated milestone.

- Short-term objectives should clearly direct progress towards the long-term objectives.

- Further information regarding the development of objectives is outlined in the associated guidance document.

9.0 MANAGEMENT MEASURES

Outline those management measures that are required to meet the rebuilding objectives. Potential management measures include:

- Catch Reductions and Controls: The PA Framework requires that removals from all fishing sources must be kept to the lowest possible level until the stock has cleared the Critical Zone, with no tolerance for preventable decline. Outline management measures required to reduce and control catch (both targeted and bycatch), in commercial, FSC and/or recreational fisheries where applicable.

- Harvest Decision Rules: Outline those pre-agreed harvest decision rules to be utilized to reduce and/or control fishing mortality within allowable limits.

- Gear Modification and Restrictions: Outline any gear restrictions and/or modifications required to meet rebuilding objectives (e.g. Nordmore grates used to reduce bycatch of the depleted stock).

- Closed Areas: Outline how new and/or current closed areas (e.g. *Fisheries Act* closures, Marine Protected Areas, voluntary closures) will be utilized to meet rebuilding objectives.

- Monitoring: The PA Framework requires that rebuilding plans be associated with appropriate monitoring of stock condition to confirm the success of rebuilding. Outline the monitoring strategy, including dock-side monitoring, at-sea observers, logbooks, video-monitoring, VMS, fishery-independent surveys and other appropriate methods.

- Habitat Protection and Restoration Measures: Outline measures to address habitat concerns, including those related to spawning, nursery and feeding habitats.

- SARA Considerations: Where applicable, outline any management measures required under the *Species at Risk Act*, including those relating to both target fisheries and bycatch.

10.0 ACCESS AND ALLOCATION*

- Assuming that fishing mortality (targeted, bycatch or both) is permitted under the rebuilding plan, provide the access and allocation of the fisheries resource (including commercial, aquaculture, recreational, FSC, subsistence) under the following headings:
    - Sharing Arrangements

- Quotas and Allocations

- All rebuilding plans must include a statement in this section noting that the Minister can, for reasons of conservation or for any other valid reasons, modify access, allocations and sharing arrangements as outlined in this plan in accordance with the powers granted pursuant to the *Fisheries Act*.

11.0 SHARED STEWARDSHIP*

- Highlight any shared stewardship arrangements to meet rebuilding objectives, including increased shared decision-making.

12.0 COMPLIANCE*

- Regional Compliance Program Delivery: Provide a general description of compliance activities carried out by C&P for this stock. Include the activities conducted by third parties like the at-sea observers and dockside monitors. Describe the use of technology to help with the monitoring, control and surveillance (MCS) activities (e.g. VMS, air surveillance, video monitoring).

- Current Compliance Issues: Describe the main/current compliance problems and objectives.

- Compliance Strategy: Provide a general description of the compliance strategy that will be implemented to support the desired rebuilding objectives.

13.0 COST/BENEFIT ANALYSIS

- Provide a cost/benefit analysis of stock rebuilding, including implementation impacts from both DFO and external fishery interest perspectives. Consider such issues as impacts of reduced catches (consider both the depleted stock and other associated stocks/species which may be affected by rebuilding efforts), delivery costs associated with management measures, overall loss of economic rent from depleted stocks, and potential benefits of a rebuilt fishery. Use charts and figures where applicable.

- A summary of fishery interest perspectives and anticipated reaction to rebuilding measures is beneficial.

- When extensive analysis is undertaken, summarize and provide reference to the separate analytical document.

14.0 EVALUATION AND PERFORMANCE REVIEW

- Outline those indicators that will be used to determine if the rebuilding plan objectives are being met. These will include indicators specifically developed for this plan. Timelines for performance review (e.g. annual reviews) should also be provided.

- All updates to the performance review should be provided as an appendix to the rebuilding plan.

***** *Where rebuilding plans are an annex to an existing IFMP (as opposed to a stand alone document), it may be more efficient if these sections were not repeated in the rebuilding plan itself, but just referenced from the IFMP*.