

The quality of rebuilding plans in Canada

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Rebuilding our depleted fisheries is critical to restoring the health of Canada's oceans and maintaining and strengthening our coastal communities that depend on them. Fisheries and Oceans Canada (DFO) has committed to developing rebuilding plans for several depleted stocks (DFO 2017a, DFO 2018a). But it will not be easy, so it is important that we have good rebuilding plans to guide our efforts. It is important that the plans are consistent with internationally accepted best practices and include elements that increase the chances depleted populations will recover to a healthy level of abundance. This report provides a critique of rebuilding plans developed since the release of the [Fishery Audit 2017](#) (Oceana Canada 2017a) to assess how well they meet globally accepted best practices, as recommended by Oceana Canada (Oceana Canada 2017b).

Synopsis

By the end of June 2018, two more critical zone stocks had been included in rebuilding plans (Atlantic cod on the Scotian Shelf/Bay of Fundy — North Atlantic Fisheries Organization [NAFO] 4X5Y; and yelloweye rockfish – inside population). With the expiry of one rebuilding plan at the end of May (Atlantic cod in the Northern Gulf of St. Lawrence — NAFO 3Pn, 4RS), four of the 26 critical zone stocks are now included in a rebuilding plan.¹

Unfortunately, neither of these two new plans fully meet the majority of the requirements for rebuilding plans. Neither stock was assessed prior to the development of the rebuilding plans, making it challenging to develop robust plans. The most recent estimates of biomass were completed in 2008 and 2009 for Atlantic cod 4X5Y (DFO 2009) and yelloweye rockfish – inside population (DFO 2011), respectively. The yelloweye rockfish – inside population rebuilding plan has targets, timelines and probability estimates but lacks information on how and when they were developed. The Atlantic cod 4X5Y rebuilding plan has weak targets and timelines and no probability estimates, but this could improve with a new framework stock assessment planned for 2018/19. Neither plan includes new management measures developed to promote rebuilding and, instead, summarize previously developed management efforts without any demonstration they are effective.

While we commend DFO, stakeholders and rightsholders for taking important actions in the past for both stocks, we would expect the rebuilding plan development process to include a meaningful assessment of various potential rebuilding measures and scenarios (DFO 2013). Doing so should produce new management measures, over and above those already in place, that are required to drive the rebuilding process, or it should at least provide evidence that those measures in place are working. Both rebuilding plans provide a decent overview of issues surrounding the rebuilding of the stocks, with the Atlantic cod 4X5Y plan providing more detail on relevant topics. Importantly, the Atlantic cod 4X5Y rebuilding plan included a discussion outlining future action items to promote rebuilding, with timelines and responsible sectors identified in a table. It provides guidance to DFO, rightsholders and stakeholders about what needs to be done, when and by whom, as well as transparency for everyone about the next steps. We recommend DFO consider including action items to promote rebuilding, with timelines and responsibilities outlined, in rebuilding plans moving forward, especially when there are key knowledge gaps and uncertainties identified that need to be addressed to assist the development of management measures to promote rebuilding.

¹ This differs from the value of three stocks reported in our 2018 Fishery Audit because the Atlantic cod 4X5Y rebuilding plan, although approved, is still not publicly available, which is a requirement of the materials we use to update the audit.

Yelloweye rockfish – inside population

The yelloweye rockfish – inside population was added to the existing multi-species rebuilding plan for groundfish in the Pacific region, which already included Bocaccio and the yelloweye rockfish – outside population (DFO 2014, 2016). This rebuilding plan is available as an appendix to the Integrated Fisheries Management Plan (IFMP) for Pacific Region groundfish (DFO 2018b), and although not available to the public online via the summary page for the IFMP, it is available with the complete IFMP in search results from the Federal Science Library (<https://science-libraries.canada.ca/eng/home/>).

This rebuilding plan, including all three stocks, did not fully meet many of Oceana Canada's recommended requirements for rebuilding plans, scoring 4.5/9 against the minimum requirements for rebuilding plans (Table 1) and 3/6 against the further comprehensive rebuilding plan recommendations (Table 2). The new section pertaining to the yelloweye rockfish – inside population contains abundance targets, timelines and associated probability estimates that targets will be met in the timeframe. However, the abundance target is not quantified in terms of biomass, the probability it will be met is not high (i.e., less than 75 per cent), and the details of how timeframes and probability estimates were made are not included. We suspect they originate from the most recent stock assessment (DFO 2011), which means the timeframes and probabilities were nine years old at the time of inclusion in the plan (the rebuilding plan was published in 2018, and the last biomass estimate for the stock was conducted in 2009). The plan could be improved by clearly citing the sources for the determination of timeframes and probabilities and the year they were made, as well as including a brief overview of the methods used. Furthermore, since the stock has not had a biomass estimate in nearly a decade, indices of relative abundance (i.e., survey trends), or references to them, should be included so there is at least some recent indication of stock status and trajectory.

The rebuilding plan summarizes the current measures, in place since 2012, but fails to demonstrate if they were effective and does not outline any new measures developed to rebuild the yelloweye rockfish – inside population. The plan states that the 2012 management measures were intended to achieve a 15-tonne total mortality cap, and that DFO believed achieving that cap would promote stock rebuilding. But, there was no description of the rationale for the choice of management measures nor any evidence to demonstrate they would achieve the mortality cap and promote rebuilding. For example, we are left to wonder why the 15-tonne mortality cap over an 80-year timeframe was chosen when it has a lower probability estimate (56 per cent) than a five-tonne cap under the same time horizon (78 per cent probability of the stock growing to exceed the abundance limit reference point in 80 years, starting in 2010; DFO 2011). Furthermore, the current measures outlined and implemented in 2012 do not appear to have been evaluated to determine their effectiveness, and there is no indication if they have been achieved thus far. This evaluation should be done and included (i.e., indicate what was the realized estimated total mortality in the years following 2012), especially considering that this plan was published six years after the intended implementation of the mortality cap.

Atlantic cod 4X5Y – Scotian Shelf and Bay of Fundy

Although not yet available to the public online, departmental officials in the Maritimes region did approve a finalized rebuilding plan for Atlantic cod on the Scotian Shelf and Bay of Fundy (NAFO 4X5Y) by the end of March 2018, and a copy of the approved plan was shared with Oceana Canada (DFO 2018c).

This rebuilding plan failed to fully meet most of Oceana Canada's recommended requirements for rebuilding plans, scoring 2.5/9 against the minimum requirements for rebuilding plans (Table 3) and 3.5/6 against the further comprehensive rebuilding plan recommendations (Table 4). Most notably, it lacked a short-term quantified target abundance, had weak timeframes and had no probability estimates associated with meeting targets in timeframes. This is because the stock has not been fully assessed since 2009, and the determination of target abundance or probability estimates was not possible in the absence of a recent assessment. The plan is illustrative of the difficulty of developing a rebuilding plan

without a recent stock assessment. This stock has no recent estimates of spawning stock biomass (SSB), fishing mortality (F) or natural mortality (M) to inform the development of a rebuilding plan. The short-term objective remains the same as the last few years (i.e., maintaining the stock below the fishing mortality reference for the critical zone), but an evaluation of this objective cannot be done without a new stock assessment. Furthermore, the fishing mortality reference for the critical zone is assumed to be appropriate but does not appear to be based on scientific advice. A new stock assessment would determine whether the current objective is appropriate and being met, ideally using as much information as available from all sources of fishing mortality.

The rebuilding plan does not include new management measures for the groundfish fishery or mandatory measures for other fisheries interacting with this stock. As such, it fails to include a suite of management measures demonstrated to meet the objectives with a high probability of success. Like the Pacific groundfish rebuilding plan, the Atlantic cod 4X5Y rebuilding plan predominantly summarizes recent and current management actions pertaining to the stock for mixed-species groundfish fisheries that interact with and/or target Atlantic cod without any demonstration of their effectiveness. However, this rebuilding plan clearly identifies knowledge gaps and future management considerations to address known or suspected issues in relation to the rebuilding of the stock in all fisheries that interact with Atlantic cod, including commercial (mixed groundfish and others, like lobster fisheries); recreational; and Indigenous food, social and ceremonial. It also considers illegal and unreported catches.

Importantly, the rebuilding plan clearly outlines these issues in a table of future action items to support rebuilding, with the issue, action, timeline for completion and responsible sectors identified. These items include a plan to conduct a new framework stock assessment in 2018/19 and to revisit the rebuilding plan and total allowable catch (TAC) once the stock assessment is completed. The table outlining action items to promote rebuilding, with timelines and responsibilities identified, saves this rebuilding plan from being only a summary of current and past actions and turns it into a plan for what needs to be addressed moving forward. It provides guidance to DFO, rightsholders and stakeholders about what needs to be done, when, and by whom, as well as transparency for everyone about the next steps. We recommend DFO consider including action items with timelines and responsible sectors in all rebuilding plans.

References

1. DFO (2009). Cod on the Southern Scotian Shelf and in the Bay of Fundy (Div. 4X/5Y). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/015. http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2009/2009_015-eng.htm
2. DFO (2011). Stock Assessment for the Inside Population of Yelloweye Rockfish (*Sebastes ruberrimus*) In British Columbia, Canada for 2010. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/084. http://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2011/2011_084-eng.html
3. DFO (2013). Guidance for the Development of Rebuilding Plans under the Precautionary Approach Framework: Growing Stocks out of the Critical Zone. <http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precautionary-precaution-eng.htm>
4. DFO (2014). Pacific Region Integrated Fisheries Management Plan, Groundfish, Effective February 21, 2014, Version 1.0. <http://waves-vagues.dfo-mpo.gc.ca/Library/365005.pdf>
5. DFO (2016). Pacific Region Integrated Fisheries Management Plan, Groundfish, Effective February 21, 2016, Version 1.3. <http://waves-vagues.dfo-mpo.gc.ca/Library/361424.pdf>
6. DFO (2017a). Fisheries and Oceans Canada's Work Plans for Fiscal from 2017 to 2018 in Response to Recommendation 2.28, 2.63 and 2.65 in the Commissioner of the Environment and Sustainable Development's (CESD) October 2016 Report 2: Sustaining Canada's Major Fish Stocks: Fisheries and Oceans Canada. <http://www.dfo-mpo.gc.ca/ae-ve/audits-verifications/16-17/work-plan-travail-eng.html>
7. DFO (2017b). *DRAFT* 4VWX5 Groundfish Integrated Fishery Management Plan Scotia-Fundy Sector Maritimes Region. In effect August 29, 2017. Not yet available, and cited from draft version shared for consultation with the Scotia-Fundy Groundfish Advisory Committee on October 23rd, 2017.
8. DFO (2018a). Work Plans for Fiscal 2018-19. Fisheries and Oceans Canada's Work Plans for Fiscal 2018-19 in Response to Recommendation 2.28, 2.63 and 2.65 in the Commissioner of the Environment and Sustainable Development's (CESD) October 2016 Report 2 — Sustaining Canada's Major Fish Stocks — Fisheries and Oceans Canada. <http://www.dfo-mpo.gc.ca/ae-ve/audits-verifications/18-19/work-plan-travail-eng.html>
9. DFO (2018b). Pacific Region Integrated Fisheries Management Plan, Groundfish, Effective February 21, 2018, Version 1.01. <http://waves-vagues.dfo-mpo.gc.ca/Library/40657814.pdf>
10. DFO (2018c). Rebuilding Plan for Atlantic Cod (*Gadus morhua*) NAFO Division 4X5Y 2017. Last Updated: February 5, 2018. Not yet available, and cited from approved version shared by Penny Doherty, June 12th, 2018.
11. Oceana Canada (2017a). Fishery Audit 2017. oceana.ca/FisheryAudit2017
12. Oceana Canada (2017b). Requirements for Fisheries Rebuilding Plans. oceana.ca/FisheryAudit2017

Tables

Table 1. A comparison of Ocean Canada's minimum requirements for rebuilding plans to DFO's Pacific Region rebuilding plan for groundfish species.

To rebuild, a plan must <i>at a minimum</i> :		Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet minimum requirement?	Score
Be legally binding: All fisheries interacting with the target stock must comply with the rules in place to rebuild the stock.		No – It is clearly stated that the plan is not legally binding. However, management measures currently in regulations and license conditions in the groundfish fishery are mandatory.	0/1
Be developed and implemented in consultation with rightsholders and stakeholders: All parties directly affected by the rebuilding plan should be consulted.		Partially – The plan does not clearly state the process followed for its development or outline the consultations that were conducted. No formal rebuilding plan working group or development process was established. However, it is likely industry was consulted in plan development considering the outline of the review process indicates that the Commercial Industry Caucus and other groundfish fishery advisory boards will be consulted regarding changes in the fall of each year. The plan could be improved by clearly outlining the consultation process followed during the development of the plan and associated management measures.	0.5/1
Set objectives for rebuilding, including:	a target abundance that is in the healthy zone — i.e., at or near the biomass that supports maximum sustainable yield (MSY) — and allows the stock to support a high-yield sustainable fishery.	Partially – There is the same primary abundance target for each of the three stocks. However it is only to achieve rebuilding out of the critical zone: “ <i>Achieve rebuilding throughout the species’ range and grow out of the critical zone...</i> ” (DFO 2018b). While the target is not an explicitly stated biomass, the critical zone was defined earlier in the plan in relation to biomass at maximum sustainable yield (0.4 B _{MSY}) and thus could theoretically be quantified. The plan could be improved by explicitly quantifying the biomass targets. The plan does mention longer-term objectives to “ <i>Continue stock growth into the healthy zone</i> ” (DFO 2018b). But, notes the IFMP will be used to achieve growth into the healthy zone.	0.5/1
	a timeframe based on a scientific estimate of how long rebuilding will take.	Partially – There are timeframes associated with the primary abundance targets for all three stocks, expressed in generations for Bocaccio (three generations) or years for yelloweye rockfish – outside population (15 years) and yelloweye rockfish – inside population (80 years). However, it is unclear if these are based on a scientific estimate of how long rebuilding will take as the details and source of the timeframe are not included. As currently stated, it is difficult to determine what year is the first year of the timeframe. For example, the yelloweye rockfish – outside population was included in this multi-stock rebuilding plan in 2016, while the yelloweye rockfish – inside population was just added in 2018, and yet it is	0.5/1

To rebuild, a plan must <i>at a minimum</i> :		Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet minimum requirement?	Score
		not clear in the rebuilding plan when the 15- and 80-year timeframes, respectively, started. Furthermore, the timeframes seem to originate from the latest stock assessments, which again differ from when the plans were developed, sometimes by many years, meaning the timeframes and probabilities were actually a number of years old at the time of inclusion in the plan. For example, the difference is nine years for the yelloweye rockfish – inside population, which has a timeframe and probability estimate in the rebuilding plan published in 2018 that was likely based on the last biomass estimate for 2009 in the 2010 assessment published in 2011 (see 80-year horizon in Table 2 of DFO 2011). The plan could be improved by clearly citing the sources of the determination (i.e., stock assessment) and the year it was made, as well as including a brief overview of the methods used.	
	a probability estimate of at least 75 per cent that the target abundance will be met within the timeframe.	Partially – There is an estimated probability of success associated with the primary objective, but this is below 75 per cent for all stocks (65 per cent for Bocaccio; 57 per cent for yelloweye rockfish – outside population; and 56 per cent for yelloweye rockfish – inside population), and it is unclear how they were estimated as no details about, or sources for, the determinations are included. The plan could be improved by clearly citing the sources of the determinations (i.e., stock assessment) and when they were made, as well as including a brief overview of the methods used. Furthermore, the plan should clearly indicate why alternative scenarios with higher probabilities of success were not chosen, when estimated. For example, for the yelloweye rockfish – inside population, the probability estimate likely originated from the 2010 assessment (see Table 2 of DFO 2011), which uses an 80-year time horizon at 15-tonne total allowable catch (TAC). Yet in the same time horizon, a five-tonne TAC would have had a 78 per cent probability of exceeding the limit reference point (LRP) in the timeframe.	0.5/1
	associated milestones: specific and measurable interim targets that represent the steps towards rebuilding.	Yes – The objective includes associated specific and measurable milestones for all three stocks: For Bocaccio: “Achieve a positive stock trajectory trend in each 5 year interval, such that the biomass at the end of each 5 year period is greater than the biomass at the beginning of the same 5 year period. Between major assessments, progress towards this goal will be monitored by annually reviewing fishery dependent and fishery independent indices of stock trajectory” (DFO 2018b). For yelloweye rockfish – outside population: “Achieve a positive outside stock trajectory trend in each 10 year interval, such that the biomass at the end of each 10 year period is greater than the biomass at the beginning of the same 10 year period; Achieve catch reduction targets within three years”	1/1

To rebuild, a plan must <i>at a minimum</i> :	Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet minimum requirement?	Score
	<p>For yelloweye rockfish – inside population: “Achieve a positive outside stock trajectory trend in each 10 year interval, such that the biomass at the end of each 10 year period is greater than the biomass at the beginning of the same 10 year period” (DFO 2018b).</p> <p>To enable these milestones to be more easily measurable, they should be improved by clearly indicating when each year period begins. The milestones for both yelloweye rockfish stocks should be further improved by including a similar milestone as the one stated for Bocaccio regarding the monitoring of progress towards goals with annual review of fishery-dependent and fishery-independent indices of stock trajectory.</p>	
<p>Set management measures that will have a high probability of success of meeting the objectives. Management measures will require, at a minimum, harvest decision or control rules and will often also require immediate and substantial reductions in fishing mortality.</p>	<p>Partially – The plan contains a section dedicated to management measures, with subsections for each of the three stocks, where multiple measures are discussed. However, the plan lacks a clear demonstration that they will meet the objectives with a high probability of success, particularly for the yelloweye rockfish – inside population. The discussion for all stocks is largely limited to one overarching measure: catch reductions using mortality caps. The plan does not include harvest decision rules for any of the stocks, besides the reduction in total mortality, that would outline how mortality caps might be increased in the event that rebuilding is successful. However, given the timelines indicated, as well as the annual review and evaluation processes outlined in the rebuilding plan, these harvest decision rules may not be necessary at this time. The plan does indicate that it will be expanded over the coming years to set out a longer-term approach. Further details of the management measures for each stock follow below.</p> <p>Bocaccio: Implement catch reductions across all sectors of total Bocaccio harvest from the estimated total catch mortality of 137 tonnes in 2012 to a mortality cap of 75 tonnes over three years (2013/14 to 2015/16), including a breakdown of the cap by sector. The plan also outlines recent changes to management measures that promote rebuilding that were introduced in 2013/14 and 2015/16, as well as the further reduction of the TAC mortality cap for the trawl sector in 2016/17 from 110 tonnes to 80 tonnes. This is above the total mortality cap target of 75 tonnes the plan outlines as the target for 2015/16. The plan also outlines current initiatives in salmon troll; recreational; and food, social and ceremonial fisheries, with the emphasis on increasing awareness and improving catch monitoring. The management measures section for this stock in this annually updated rebuilding plan should be improved</p>	<p>0.5/1</p>

To rebuild, a plan must <i>at a minimum</i> :	Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet minimum requirement?	Score
	<p>by clearly reporting on progress towards mortality caps and explaining why TACs have been set above mortality cap targets.</p> <p>Yelloweye rockfish – outside population: Implement catch reductions across all sectors of total yelloweye rockfish – outside population harvest from the estimated total catch mortality of 287 tonnes in 2014 to a mortality cap of 100 tonnes over three years (2016/17 to 2018/19). The plan indicates the commercial groundfish TAC has been reduced by 78 per cent since the 2015/16 season (and adjustments have been made to spatial allocation), but it fails to indicate that sector's or the total TAC mortality cap for the current fishing year. The plan also outlines the recent 2016/17 reduction in recreational fishing opportunities and the focus on improved reporting and avoidance of yelloweye rockfish in the salmon troll fishery. The management measures section for this stock in this annually updated rebuilding plan should be improved by clearly reporting on progress towards mortality caps and what the levels of TAC are in each sector in each year.</p> <p>Yelloweye rockfish – inside population: The main management measure discussed is the 2012 implementation of the intent to restrict total mortality to 15 tonnes across all sectors. The sector-specific management measures currently in place are identified in detail. It is assumed these have been in place since 2012, but it is unclear. Since these measures were likely introduced in 2012, the plan could be improved by including an evaluation of their achievement (i.e., what the realized estimated total mortality was in the years following 2012) and their effectiveness in promoting rebuilding. It should also include a brief description of the rationale for the implementation of those measures in 2012 and any sources to provide evidence of why they believed the measures would promote rebuilding (i.e., any demonstration of this prior to implementation).</p>	
<p>Establish a plan for monitoring, review, evaluation and revision to track progress towards rebuilding objectives and make changes as needed.</p>	<p>Partially – The plan includes a section dedicated to evaluation and performance review. It indicates an adaptive management approach will be used, acknowledging the need to monitor progress towards objectives and milestones and adapt management where needed. The plan highlights an annual review process, which includes: in-season review of catch to date and periodic summaries of surveys to ensure mortality caps are appropriate for rebuilding; considering additional measures or changes necessary to achieve mortality caps the following season in the event mortality caps are exceeded; and implementation of adjusted or new measures. However, despite this multi-stock plan being in place for a</p>	<p>0.5/1</p>

To rebuild, a plan must <i>at a minimum</i> :	Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet minimum requirement?	Score
	number of years, there is no reporting on these annual reviews. These should be included in future versions of this multi-stock annually updated rebuilding plan. The plan indicates that consultation on any additional measures will occur through the Commercial Industry Caucus and other groundfish fishery advisory boards in the fall of each year, and that implementation of adjusted or new management measures will be through licence conditions and/or the groundfish IFMP, both of which are renewed for issuance on February 21 st of each year. Although the plan is an appendix to the IFMP, which is reviewed annually, this section fails to explicitly outline the process for reviewing and adjusting the rebuilding plan itself.	
Be publicly available to increase transparency of decision making and ensure everyone has access to the information required to evaluate the plan.	Partially – The rebuilding plan is not readily available on the DFO website. The plan is published as an appendix to the Pacific groundfish IFMP, which is available upon request. A summary of the IFMP is available on the website. The full IFMP is also available to the public via the Federal Science Library.	0.5/1
REBUILDING PLAN MINIMUM REQUIREMENTS TOTAL SCORE		4.5/9

Table 2. A comparison of Ocean Canada's further comprehensive rebuilding plan criteria to DFO's Pacific Region rebuilding plan for groundfish species.

A comprehensive rebuilding plan <i>should</i> also contain:	Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet additional criteria?	Score
Other stock-specific objectives , such as target size or age structure, restoring historical distribution, maintaining social or cultural value, or restoring economic benefits.	Partially – The plan does indicate in the objectives for all three stocks the intent to achieve rebuilding throughout the entire stock areas, but it does not include any further stock-specific objectives other than those pertaining to abundance.	0.5/1
An overview of all fisheries interacting with the stock , including all directed commercial fisheries and all other fisheries (including bycatch, recreational, bait and food-social-ceremonial, with a summary of socio-economic and cultural importance;	Partially – The plan includes a section dedicated to an overview of the fisheries interacting with the stocks, briefly outlining information about the types of fisheries in which the species are captured (both as targeted catch and bycatch), gear types used and the general location of the fisheries. The plan also includes a section dedicated to management issues, which provides an overview of all contributions to fishing mortality for the two species but fails to clearly outline differences between the two yelloweye rockfish stocks. These sections should	0.5/1

A comprehensive rebuilding plan <i>should</i> also contain:	Does the Pacific Region rebuilding plan for groundfish species (including Bocaccio, yelloweye rockfish – outside population and yelloweye rockfish – inside population) meet additional criteria?	Score
history of management and assessment; and an overview of all contributions to fishing mortality.	be improved by providing more stock-specific details quantifying the removals from each fishery that interacts with the stocks. There is a section dedicated to a biological synopsis of each species and stock statuses, which briefly outlines the stock status determinations of the most recent stock assessments and Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports. There is no historic perspective of the fisheries interacting with these stocks or any details of historic assessments and management practices. The plan does have a section dedicated to socio-economic and cultural importance but has few details and refers to the IFMP for further information. Overall, this multi-stock rebuilding plan would benefit from inclusion of further stock-specific and quantified details on all fisheries interacting with the stocks.	
A review of impediments to successfully rebuilding the stock , including considerations of the biology of the species, any recent evolutionary changes, impacts of environmental conditions, multi-species interactions, other fisheries impacts, and the levels of uncertainty and risk.	Partially – There is no section dedicated to a review of impediments to successfully rebuilding the stock, but some factors are noted briefly in various sections. These include fisheries interactions, the identification of potential predators and a very brief overview of relevant life-history traits. The plan could be improved by providing a section dedicated to stock-specific impediments to rebuilding, which should include any recent evolutionary changes, potential impacts of environmental conditions, and details on the levels of uncertainty and risk associated with any suspected impediments to rebuilding.	0.5/1
An evaluation or consideration of alternative management measures to increase transparency of decision making.	No – The plan does not outline any management measures evaluated or considered other than those previously put in place or anticipated to be in place in relation to mortality caps.	0/1
An overview of economic, social and ecological impacts of the rebuilding plan to reduce surprises and allow for mitigation planning.	Partially – There is a section titled “Cost Benefit Analysis,” which briefly discusses socio-economic impacts in a qualitative manner. There is no discussion of ecological impacts.	0.5/1
An outline of the steps to follow when objectives are met to prepare for changes to management once the stock is rebuilt and fishing efforts may be increased.	Yes – The plan indicates that once the primary objective of exceeding the limit reference point is met for each stock, the standard IFMP process will be used to support the longer-term objective of stock growth into the healthy zone.	1/1
REBUILDING PLAN ADDITIONAL CRITERIA TOTAL SCORE		3/6

Table 3. A comparison of Ocean Canada's minimum requirements for rebuilding plans to DFO's Atlantic cod 4X5Y rebuilding plan.

To rebuild, a plan must <i>at a minimum</i>:		Does the Atlantic cod 4X5Y rebuilding plan meet it?	Score
<p>Be legally binding: All fisheries interacting with the target stock must comply with the rules in place to rebuild the stock.</p>		<p>No – It is clearly stated that the plan is not legally binding. However, management measures currently in regulations or license conditions in the groundfish fishery are mandatory.</p>	0/1
<p>Be developed and implemented in consultation with rightsholders and stakeholders: All parties directly affected by the rebuilding plan should be consulted.</p>		<p>Partially – The plan does not clearly state the process followed for its development or outline consultations conducted. No formal rebuilding plan working group or development process was established. However, the Scotia-Fundy Groundfish Advisory Committee (SFGAC), an industry-DFO advisory committee for groundfish stocks in the Maritimes region, was consulted on the plan developed by DFO managers. It is clear SFGAC have been partners in developing much of the existing mitigation strategies outlined, and the plan does indicate they will be involved in reviewing it in the future. It is unclear in the plan if the respective lobster and scallop advisory committees in the region have been consulted during the development process, although the table of action items to support rebuilding identifies the lobster fishing industry and the Full Bay inshore scallop fleet as responsible sectors on action items. The section on plan enhancement, evaluation and performance review indicates DFO is working with Aboriginal organizations to improve reporting of catches in food, social and ceremonial (FSC) fisheries. It is unclear in the plan the level of involvement of these groups in the development of the plan, although several organizations have representatives on the SFGAC.</p>	0.5/1
<p>Set objectives for rebuilding including:</p>	<p>a target abundance that is in the healthy zone — i.e., at or near the biomass that supports maximum sustainable yield (MSY) — and allows the stock to support a high-yield sustainable fishery.</p>	<p>Partially – The plan includes short-, mid- and long-term objectives. The short-term objective is to “... <i>ensure that total fishing mortality from the groundfish fishery does not exceed F_{LIM} [fishing mortality limit reference] for the critical zone</i>” (DFO 2018c). This objective fails to have a target abundance. It also fails to incorporate all sources of fishing mortality in the comparison to the fishing mortality target reference (F_{REF}) (i.e., mortality from fisheries other than the groundfish fleets). Furthermore, without a recent stock assessment it is difficult to know whether this pre-existing objective is even being met now. With the assessment in 2018/19, we expect this to be evaluated. Ideally, the short-term objective also contains a target abundance representing an interim step towards the healthy zone. The mid-term objective is generically stated as: “<i>In general, when a stock is in the Critical Zone, rebuilding</i></p>	0.5/1

To rebuild, a plan must <i>at a minimum</i> :	Does the Atlantic cod 4X5Y rebuilding plan meet it?	Score
	<p><i>to a level above the LRP should be achieved ...</i>" (DFO 2018c). The LRP is defined in terms of biomass in the plan. The long-term objective is to "...grow the stock out of the Critical Zone, and eventually to achieve and maintain the Spawning Stock Biomass in the Healthy Zone (i.e., at or above the USR [upper stock reference]) ..." (DFO 2018c). This may be interpreted as having a long-term target abundance of meeting or exceeding the USR and growing into the healthy zone, but it could also easily be interpreted as only surpassing the LRP. The USR is defined in terms of biomass in the plan.</p>	
<p>a timeframe based on a scientific estimate of how long rebuilding will take.</p>	<p>No – The plan acknowledges that in the absence of a recent stock assessment and under the current conditions of low productivity and high natural mortality, it is difficult to set timelines. A new stock assessment is essential to setting timeframes based on a scientific estimate of how long rebuilding will take, even while under unfavorable conditions. The plan does indicate the general aspiration of rebuilding within a reasonable timeframe (1.5–2 generations), which for this stock would be 11–15 years. We expect a scientifically based timeframe to be provided by the 2018/19 stock assessment.</p>	<p>0/1</p>
<p>a probability estimate of at least a 75 per cent that the target abundance will be met within the timeframe.</p>	<p>No – There is no probability estimate that the abundance target will be met within a timeframe. The plan does indicate the general aspiration of rebuilding plans is to have a high degree of probability (greater than 75 per cent) of achieving abundance targets, but without a new assessment and timeframe, the probability estimate remains unknown. We expect a scientifically based probability estimate to be provided by the 2018/19 stock assessment.</p>	<p>0/1</p>
<p>associated milestones: specific and measurable interim targets that represent the steps towards rebuilding.</p>	<p>No – There are no milestones outlined in the plan.</p>	<p>0/1</p>
<p>Set management measures that will have a high probability of success of meeting the objectives. Management measures will require, at a minimum, harvest decision or control rules and will often also require immediate and substantial reductions in fishing mortality.</p>	<p>Partially – The plan does have a section dedicated to management measures. However, although it provides a good overview of recent and current management measures, discusses relevant knowledge gaps and uncertainties, and suggests potential improvements, it does not include a suite of management measures demonstrated to meet the objectives with a high probability of success. It does indicate the current quota level that is expected to bring F below F_{LIM} for the critical zone, but this cannot be directly evaluated until a new stock assessment occurs. It also does not include clearly articulated harvest decision or control rules specific to rebuilding this stock into the future. It does include a harvest strategy and tactics currently in place for the stock. However, for the most part, these are the same as the tactics for the generic harvest strategy used for all groundfish in the region, as outlined in the draft Integrated Fisheries Management Plan (IFMP; DFO 2017b). While helpful to guide</p>	<p>0.5/1</p>

To rebuild, a plan must <i>at a minimum</i> :	Does the Atlantic cod 4X5Y rebuilding plan meet it?	Score
	<p>decision making, these strategies should be augmented with stock-specific harvest decision rules that clearly outline how the stock will be harvested during the rebuilding plan. Also included in this section are three short-term management objectives related to the lobster fishery that interacts with this stock, which indicate planned management (i.e., a preliminary target for at-sea observers of one per cent) and science actions.</p>	
<p>Establish a plan for monitoring, review, evaluation and revision to track progress towards rebuilding objectives and make changes as needed.</p>	<p>Yes – The plan includes a section dedicated to plan enhancement, evaluation and performance review. It indicates that the outcomes of the plan will be reviewed periodically by the SFGAC and other relevant advisory committees as needed. It also indicates that a new stock assessment will occur in 2018/19, and the rebuilding plan will be reviewed and revised as needed following its completion. This section clearly identifies knowledge gaps and future management considerations that address known or suspected issues in relation to the rebuilding of the stock. Importantly, the rebuilding plan clearly outlines these issues in a table of future action items to support rebuilding, with the issue, action, timeline for completion and responsible sectors identified. This table outlining action items to promote rebuilding clearly indicates what needs to be addressed moving forward to help rebuild this stock. It provides guidance to DFO, rightsholders and stakeholders about what needs to be done, when, and by whom, as well as transparency for everyone about the next steps. However, this section could be improved by also including and clearly indicating when and how progress towards rebuilding objectives will be reviewed. It does indicate the importance of evaluating F and collecting quality information on all sources of F to allow incorporation in future assessments.</p>	<p>1/1</p>
<p>Be publicly available to increase transparency of decision making and ensure everyone has access to the information required to evaluate the plan.</p>	<p>No – The plan has been finalized and approved, and the intent is to publish it publicly on the website along with the IFMP for groundfish in the region. However, it is still not available to the public online.</p>	<p>0/1</p>
<p>REBUILDING PLAN MINIMUM REQUIREMENTS TOTAL SCORE</p>		<p>2.5/9</p>

Table 4. A comparison of Ocean Canada's further comprehensive rebuilding plan criteria to DFO's Atlantic cod 4X5Y rebuilding plan.

A comprehensive rebuilding plan <i>should</i> also contain:	Does the draft Atlantic cod 4X5Y plan meet additional criteria?	Score
<p>Other stock-specific objectives, such as target size or age structure, restoring historical distribution, maintaining social or cultural value, or restoring economic benefits.</p>	<p>Partially – The long-term objective includes a component related to socio-economic and cultural values that aims to eventually “... <i>achieve and maintain the Spawning Stock Biomass in the Healthy Zone (i.e., at or above the USR) for the benefit of all Canadians, including harvesters, industry and the coastal communities which depend on the resource for their livelihood, and to provide reasonable fishing opportunities during the rebuilding period.</i>” The plan also includes an overview of the five overarching objectives of the groundfish IFMP, which include broad objectives pertaining to productivity, biodiversity, habitat, culture and sustenance, and prosperity. There are no further stock-specific objectives related to the biological characteristics of the stock, such as targeted size, age structure or spatial distribution.</p>	<p>0.5/1</p>
<p>An overview of all fisheries interacting with the stock, including all directed commercial fisheries and all other fisheries (including bycatch, recreational, bait and FSC), with a summary of socio-economic and cultural importance; history of management and assessment; and an overview of all contributions to fishing mortality.</p>	<p>Partially – There is a brief overview of the mixed-species groundfish fishery included in the plan, with referral to the groundfish IFMP for further details. Current stock-specific fleet shares are included. It is only mentioned briefly that several other fisheries catch cod as bycatch in 4X5Y, and that there are also recreational and FSC removals. Although some of these potential contributions to fishing mortality outside the groundfish fishery are mentioned in more detail in various places in the plan, the fisheries overview section could be improved by including more and detailed information about <i>all</i> fisheries interacting with the stock. There is a detailed section discussing relatively recent stock assessments and updates, which outlines key findings. There is also a detailed section related to management issues, which does a good job of highlighting recent management strategies.</p>	<p>0.5/1</p>
<p>A review of impediments to successfully rebuilding the stock, including considerations of the biology of the species, any recent evolutionary changes, impacts of environmental conditions, multi-species interactions, other fisheries impacts, and the levels of uncertainty and risk.</p>	<p>Yes – There is a section dedicated to a biological synopsis that provides an overview of key stock-specific aspects of the biology of the species, including recent changes. A recovery potential assessment (RPA) conducted in 2011, which reviewed threats to survival of the stock, is cited in various sections of the plan, as are key findings from subsequent stock assessment updates. The management issues section briefly touches upon potential impacts of environmental conditions and provides further details on potential predation by seals. In the management measures section, the plan does discuss in detail the only mitigation measure highlighted in the RPA to increase survivorship: a reduction in directed fishing and bycatch mortality. As such, it does discuss other fisheries impacts in more detail. Once read in its entirety, the plan does a reasonable job of providing an overview of the impediments to successfully rebuilding the stock. However, it could be improved by consolidating the</p>	<p>1/1</p>

A comprehensive rebuilding plan <i>should</i> also contain:	Does the draft Atlantic cod 4X5Y plan meet additional criteria?	Score
	information into one section and providing more detail on associated levels of uncertainty and risk.	
An evaluation or consideration of alternative management measures to increase transparency of decision making.	Yes – The plan does discuss the feasibility of some management actions not implemented to date, such as measures to reduce seal predation and gear modifications. It also outlines details of other measures already in place.	1/1
An overview of economic, social and ecological impacts of the rebuilding plan to reduce surprises and allow for mitigation planning.	No – The plan does not address economic, social or ecological impacts of the rebuilding plan.	0/1
An outline of the steps to follow when objectives are met to prepare for changes to management once the stock is rebuilt and fishing efforts may be increased.	Partially – The plan does not directly address the steps to follow when objectives are met. However, included in the strategies and tactics is the generic harvest strategy for setting the TAC in various scenarios of each health status zone. Additionally, since it is clearly indicated that the plan only applies while the stock is in the critical zone, it is implied that the IFMP will be used to grow the stock into the healthy zone.	0.5/1
REBUILDING PLAN ADDITIONAL CRITERIA TOTAL SCORE		3.5/6