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COMMENT ON 2021 MANAGEMENT MEASURES FOR NORTHERN COD

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Atlantic cod is an iconic species, deeply connected to the communities that have long lived along the shores of northeast Newfoundland and Labrador, where the population, or fish stock, is known as northern cod (Northwest Atlantic Fisheries Organization divisions 2J3KL). Northern cod was recently assessed by scientists and stock growth has stalled and northern cod remains deep in the critical zone (at 52% of its Limit Reference Point). A management advisory committee meeting was just held (April 13, 2021) and Fisheries and Oceans Canada (DFO) is seeking input on management measures for the 2021 fishing season.

Considering the long overdue rebuilding plan DFO finally released at the end of last year (December 2020) offers little guidance on how they plan to rebuild northern cod, Oceana Canada recommends DFO immediately begin **updating the rebuilding plan to include a target reference point, timelines and a science-based simulation tested harvest control rule**.

In the interim, while the rebuilding plan is being updated, Oceana Canada recommends the following measures to ensure sustainable northern cod fisheries in 2021:

1. **Follow scientific advice and keep fishing removals to the lowest possible level. Recognizing the importance of a stewardship fishery, do not allow the maximum authorized harvest from all sources of fishing (including recreational and bycatch removals) to exceed that set in 2018 (i.e., 9,500 t); and**
2. **Implement the national Fishery Monitoring Policy for northern cod, prioritizing the recreational fishery component to ensure reliable scientific estimates of landings can be made.**

The Canadian government must implement effective rebuilding plans for depleted populations as outlined in the amended *Fisheries Act* that include clear timelines and targets. Quota decisions must be based on science and prioritize the long-term health of the population. The new Fishery Monitoring Policy must be implemented to support sustainable fisheries management.

Improvements to the rebuilding plan

Northern cod was included in a long-awaited rebuilding plan in late December 2020,[1] and we applaud the department for finally taking this important step towards rebuilding the stock. However, the rebuilding plan provided requires several improvements to ensure it effectively promotes rebuilding.[2,3]

[1] DFO (2021). Rebuilding plan for Atlantic Cod – NAFO Divisions 2J3KL. Available online (https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/cod-morue/2020/cod-atl-morue-2020-eng.html)

[2] For further information on rebuilding plan development, see Garcia et al. (2018), particularly chapters 7 and 8.
Garcia, S.M., Ye, Y., Rice, J. & Charles, A., eds. (2018). Rebuilding of Marine Fisheries. Part 1: Global Review. FAO Fisheries and Aquaculture Technical Paper No 630/1. Available online: (http://www.fao.org/3/ca0161en/CA0161EN.pdf)

[3] Hutchings, J.A., G A. Rose, and P. A. Shelton (2021). The flawed new plan to rebuild Canada's iconic Northern cod. Policy Options. Available online (https://policyoptions.irpp.org/magazines/march-2021/the-flawed-new-plan-to-rebuild-canadas-iconic-northern-cod/)

Importantly, the rebuilding plan must be revised to include a rebuilding target reference point. The rebuilt target must be above the Limit Reference Point (LRP) and ideally above the yet to be determined Upper Stock Reference (USR), the reference point that acts as the boundary between the cautious and healthy zones. Without identification of what a rebuilt stock looks like, it is impossible for the rebuilding plan to take us there. By only including reference to the LRP, not only does the plan not meet international standards (that require limit *and* target reference points),[4] but the plan also risks that the rebuilt target will be assumed to be just above "*the point below which serious harm is occurring to the stock*" (i.e., the LRP plus one fish).[5] Additionally, the rebuilding plan should include all the other components of DFO's decision-making framework incorporating the Precautionary Approach (hereafter 'PA Framework'), such as removal references for each stock status zone. Science-based removal references would allow for increased confidence that removals are truly sustainable and will promote recovery.

The rebuilding plan must be revised to include timelines associated with rebuilding targets, identifying how long rebuilding might take.[3] This timeline should be based on long-term projections from DFO scientists estimating how long rebuilding will take under different management scenarios that are all included in the plan. These projections must include a scenario with zero fishing removals so that trade-offs in the decision among timelines to a rebuilt state are informed and transparent.[6]

Improvements to the Harvest Decision Rule

While we also commend the department for including a Harvest Decision Rule (HDR) to guide harvest level decisions in the rebuilding plan, we note several aspects of the HDR suggest it is not consistent with international best practices or the intent DFO's decision-making framework incorporating the Precautionary Approach (hereafter 'PA Framework'):[3]

1. The HDR was designed by management with apparently little input or evaluation by scientists. This means the HDR was not simulation tested to ensure removals remain sustainable and promote stock growth, and DFO Science has not evaluated whether it is compliant with the DFO PA Framework. Independent scientific peer review and some form of simulation testing must be done during the rebuilding plan update.
2. The HDR as outlined in the rebuilding plan will allow for catches to increase while in the critical zone, contrary to PA Framework indicating total removals from all sources must be kept to the lowest possible levels until the stock clears the critical zone.[5]
3. Policy indicates HDRs should consider total removals from all fisheries when determining removal rates.[5] But in the rebuilding plan for northern cod there is

[4] FAO (2020). The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (in force as from 11 December 2001) Overview. Available online (https://www.un.org/Depts/los/convention_agreements/convention_overview_fish_stocks.htm)

[5] DFO (2009). A fishery decision-making framework incorporating the precautionary approach. Available online (https://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precaution-eng.htm).

[6] DFO (2021). Science Guidelines to Support Development of Rebuilding Plans for Canadian Fish Stocks. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2021/006. (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2021/2021_006-eng.html)

ambiguity as to if the HDR is using, and thus outputting, total removals (as estimated by the assessment model, that accounts for and estimates unknown recreational and other unreported landings) or only stewardship reported landings. The axis in the figure of the HDR in the rebuilding plan is labelled as "*total removals*", implying the former, but the figure caption simply indicates "*removals in 2017*" with 12,848 t indicated in brackets.[7] This value is lower than the 2017 estimate of total removals (15, 054 t) by the assessment model.[8] This is an important distinction. If the HDR uses total removals, the output requires adjustment for anticipated recreational and bycatch removals before being used to establish maximum allowable harvest limits for the stewardship fishery. The latest assessment results specify the output of the HDR indicates a value of 12,999 t for the stewardship fishery,[9] but that level of catch was not specifically tested in projections. If 12,999 t were caught in the stewardship fishery, total removals would likely be at or above the upper levels tested in projections, adding increased uncertainty for HDR use this year in the current form.

4. The HDR adjusts removals relative to a base level set at total removals in 2017, the highest level since the moratorium was introduced in 1992. Meanwhile, since 2017 stock recovery has stalled under sometimes high, but variable, levels of natural mortality (M) and fishing mortality rates (F) that have been slightly lower than 2017. Given the observations of the stock since 2017, use of the 2017 removals as a baseline without simulation testing is not precautionary.[3] A more reasonable base level would be at or lower than the 9,500 t maximum allowable harvest in 2018, when reported landings were 9,496 t (excluding unknown amounts of recreational landings).[10] Even with a 30 per cent increased harvest limit (12,350 t) in 2019 and 2020, total reported landings remained closer to 10,000 t.[11,12] This suggests 9,500 t could be considered a reasonable maximum level of harvest to prevent declines (but not promote growth) under recent stock and ecosystem conditions. A more precautionary base level would be to return to

[7] Which, incidentally, is also different from what the DFO 2018 assessment of the stock indicates as reported landings, where it states reported landings in 2017 were 12,707 t from the stewardship fishery, 173 t in the sentinel surveys, 102 t taken as by-catch (Canadian and non-Canadian). Source: DFO. 2018. Stock assessment of Northern cod (NAFO Divisions 2J3KL) in 2018. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/038. (Erratum: August 2018) (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2018/2018_038-eng.html)

[8] This value is from the 2018 stock assessment meeting Science Advisory Report. More recent estimates are not stated in the 2019 Science Advisory Report and the 2021 Science Advisory Report is not yet published. No Research Documents are available either since that for the 2016 stock assessment meeting. Source: DFO. 2018. Stock assessment of Northern cod (NAFO Divisions 2J3KL) in 2018. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2018/038. (Erratum: August 2018) (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2018/2018_038-eng.html)

[9] DFO (2021). Technical Briefing. Northern cod (NAFO Div. 2J3KL) Newfoundland & Labrador April 1, 2021. Presented by Karen Dwyer, Stock Assessment Biologist.

[10] 9,269 t stewardship, 148 sentinel fishery, 63 t Canadian bycatch and 16 t bycatch outside the 200-mile limit. Source: DFO (2019). Stock assessment of Northern cod (NAFO Divisions2J3KL) in 2019. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2019/050. Available online (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/SAR-AS/2019/2019_050-eng.html)

[11] Total reported landings in 2019 were 10,559 t, including 10,410 t in the stewardship fishery, 123 t in the sentinel surveys, and 2 t taken as by-catch, source: DFO (2021). 2020 Stock Status Update for Northern Cod. DFO Can. Sci. Advis. Sec. Sci. Resp. 2021/004. Available online (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/ScR-RS/2021/2021_004-eng.html)

[12] Total reported landings in 2020 were 10,227 t in 2020, most of which came from the stewardship fishery. Source: DFO (2021). Technical Briefing. Northern cod (NAFO Div. 2J3KL) Newfoundland & Labrador April 1, 2021. Presented by Karen Dwyer, Stock Assessment Biologist.

levels of reported landings from 2013-15 (4,000 to 5,000 t),[13] that allowed for stock growth under favorable environmental conditions, before the rapid increase in landings from 2016-2019 occurred (on a stock that technically remains under moratorium to directed fishing).

5. The shape of the HDR function implies that fishing mortality rates (F) will actually *increase* while the stock is *declining* in the critical zone over some ranges of Spawning Stock Biomass (SSB). The HDR is based on two quadratic equations which are not provided in the plan, but rough approximations based on the figure indicate F appropriately declines if the SSB declines from 75% of the LRP to 65% of the LRP. However, the HDR output would result in F increasing with further deterioration of the stock from 60% to 40% of the LRP.[3] Increasing F on a declining stock in the Critical Zone is imprudent and not precautionary.
6. The range of stock status over which the HDR applies should include levels above LRP and ideally into the healthy zone. At minimum, the upper end should include the boundary of the critical/cautious zone, at which point it may be permissible for total removals to start to increase more as the stock enters the cautious zone.

The HDR should be redesigned, and simulation tested by DFO science with independent peer review to ensure that it has an acceptable robustness to uncertainty, meets performance expectations and has a high probability of achieving management objectives. Northern cod remains deep in the critical zone (52% of its LRP) and DFO policy and science advice indicated that removals from all sources must be kept to the lowest possible level until it has cleared this zone.[5,9] Allowing for increases in commercial harvest levels, which the output of the HDR this year indicates, combined with unknown harvest levels in the recreational fishery, conflicts with this policy and advice.

Maximum allowable harvest levels for 2021

Considering there is high uncertainty for the conditions in the broader ecosystem, including for key prey of northern cod, like capelin and shrimp, that are expected to negatively impact northern cod productivity,[9] the department must be more precautionary in its decision making intended to rebuild the stock. Given the apparent importance of fluctuations in M driven by bottom-up processes on northern cod population dynamics,[14] it is important to limit exploitation to the lowest possible levels so that sufficient biomass remains to allow the stock to be more resilient to future and uncertain changes

[13] Average reported landing 2013-15 were 4,604 t. Source: Brattey, J., Cadigan, N., Dwyer, K. S., Healey, B. P., Ings, D. W., Lee, E. M., Maddock Parsons, D., Morgan, M. J., Regular, P., Rideout, R. M. 2018. Assessment of the Northern Cod (Gadus morhua) stock in NAFO Divisions 2J3KL in 2016. DFO Can.Sci. Advis. Sec. Res. Doc. 2018/018. v + 107p. Available online (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2018/2018_018-eng.html)

[14] Although we note the relative strength of the importance of natural mortality (M) to population dynamics is debated: Rose, G. A., & Walters, C. J. (2019). The state of Canada's iconic Northern cod: A second opinion. Fisheries Research, 219, 105314. https://doi.org/10.1016/j.fishres.2019.105314

in natural mortality. Science, supported by policy, indicates long-term sustainable fishery benefits can only be realized by emphasizing considerable restraint through the stock recovery phase.[15,5]

If DFO is to allow a directed stewardship while work is ongoing with rebuilding plan and HDR review, it should not allow the maximum allowable harvest from *all sources of fishing* to exceed that set in 2018 (i.e., 9,500 t). A more precautionary level would be to return to levels of reported landings from 2013-15 (4,000 to 5,000 t),[16] that allowed for stock growth under favorable environmental conditions.

Implementing the Fishery Monitoring policy

Oceana Canada recognizes the value of a stewardship fishery to provide limited opportunities to fish during rebuilding as it is an important source of income for communities and provides an opportunity to get on the water and monitor the changing state of the fishery and environment. This works only if appropriate information is adequately collected using fishery monitoring tools and usage levels recommended by scientists.[17] However, we have serious concerns about current fishery monitoring of northern cod. With less than one per cent at-sea-observer coverage, it is likely difficult to detect directional discarding (i.e., high-grading), which could be achieved by comparing length frequency data from observed fishing trips to dockside monitoring data. Adequate independent observer data would also make it possible to validate data on bycatch of other species in the directed cod fishery.

Monitoring in the recreational fishery for northern cod is inadequate and does not provide dependable catch estimates.[18] Evidence suggests recreational landings are substantial, at about 25 per cent of recent commercial landings. Therefore, reported landings used to monitor the maximum allowable harvest are much lower than total catch. Ideally, given policy indicates managers must consider removals from all sources,[5] management would help offset this uncertainty with a lower allowable harvest in the stewardship fishery, while developing adequate monitoring in the recreational fishery to enable timely and accurate catch estimates.

Clearly there is much needed improvement in monitoring required for fisheries directing for northern cod. We were pleased to hear at the recent management advisory committee meeting (April 13, 2021) that the department has prioritized northern cod for implementation of the national Fishery Monitoring Policy. We support this decision and recommend that the recreational component be a priority.

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[15] For a discussion of potential long-term socio-economic benefits of rebuilding Northern cod see: Oceana Canada. (2019). Oceans of Opportunity: The Economic Case for Rebuilding Northern Cod (https://oceana.ca/sites/default/files/the_economic_case_for_rebuilding_northern_cod_report.pdf).

[16] Average reported landing 2013-15 were 4,604 t. Source: Brattey, J., Cadigan, N., Dwyer, K. S., Healey, B. P., Ings, D. W., Lee, E. M., Maddock Parsons, D., Morgan, M. J., Regular, P., Rideout, R. M. 2018. Assessment of the Northern Cod (Gadus morhua) stock in NAFO Divisions 2J3KL in 2016. DFO Can.Sci. Advis. Sec. Res. Doc. 2018/018. v + 107p. Available online (https://www.dfo-mpo.gc.ca/csas-sccs/Publications/ResDocs-DocRech/2018/2018_018-eng.html)

[17] Although we recognize that the scientific value of this fishery is debatable, given there is already a sentinel fishery where industry collects scientific information with a standardized approach and there is no documentation indicating science involvement in the stewardship fishery.

[18] The 2020 Science Response Process report provides the first quantified estimate of recreational catches using tagging data (since 2008, recreational catch estimates range from 0.62 to 4.1 kt, averaging 1.8 kt), which is an improvement. But tagging data is highly uncertain the first few years after initial tagging and is an insufficient replacement for accurate reporting requirements in the recreational fishery that would help inform management decisions in a timely manner. Furthermore, methods used to make estimates require external peer review.

Improvements to fishery monitoring through implementation of the policy will also go long way to ensuring the stewardship fishery is able to adequately contribute to science and facilitate requirements for eventual eco-certification.

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