



Serial No. N7156

SCS Doc. 21/03

SCIENTIFIC COUNCIL - 2021**Canada's Request to NAFO SC for Coastal State Advice - 2022****1. Greenland halibut (Subarea 0 + 1 (offshore))¹**

Advice on Greenland Halibut in Subareas 0 and 1 was provided in 2020 for 2021 and 2022. Canada requests that the Scientific Council monitor the status of this stock in 2021, and, should a significant change be observed in stock status (e.g. from surveys or in bycatches in other fisheries), provide updated advice as appropriate.

2. Shrimp (Subarea 1 and Division 0A)

Canada requests the Scientific Council to consider the following options in assessing and projecting future stock levels for Shrimp in Subarea 1 and Division 0A:

The status of the stock should be determined and risk-based advice provided for catch options corresponding to Z_{msy} , in 5,000-10,000t increments (subject to the discretion of Scientific Council), with forecasts for 2022 to 2024. These options should be evaluated in relation to Canada's Harvest Strategy (attached) and NAFO's Precautionary Approach Framework, and presented in the form of risk analyses related to B_{msy} , 80% B_{msy} , B_{lim} (30% B_{msy}) and Z_{msy} .

Presentation of the results should include graphs and/or tables related to the following:

- Historical and current yield, biomass relative to B_{msy} , total mortality relative to Z_{msy} , and recruitment (or proxy) levels for the longest time period possible;
- Total mortality (Z) and fishable biomass for a range of projected catch options (as noted above) for the years 2022 to 2024. Projections should include both catch options and a range of effective cod predation biomass levels considered appropriate by the Scientific Council. Results should include risk analyses of falling below: B_{MSY} , 80% B_{msy} and B_{lim} (30% B_{msy}), and of being above Z_{msy} based on the 3-year projections, consistent with the Harvest Decision Rules in Canada's Harvest Strategy; and
- Total area fished for the longest time period possible.

Please provide the advice relative to Canada's Harvest Strategy as part of the formal advice (i.e., grey box in the advice summary sheet).

¹ The Scientific Council has noted previously that there is no biological basis for conducting separate assessments for Greenland halibut throughout Subareas 0-3, but has advised that separate TACs be maintained for different areas of the distribution of Greenland halibut.



Harvest Strategy (HS) for SFA1 Shrimp

November 1, 2015

Preamble

Shrimp Fishing Area (SFA) 1 is the Canadian management unit that is part of a trans-boundary stock that is harvested and managed separately by both Greenland and Canada. While an agreement with respect to TAC-setting or quota shares has not yet been reached, there is full cooperation with respect to scientific research, surveillance and enforcement, and a full exchange of information between the two jurisdictions. Both States refer to the NAFO/ICES Pandalus Assessment Group (NIPAG) for formal scientific advice, which is provided annually. The stock is assessed as a single population.

Stock Assessment

The assessment framework incorporates a logistic stock-recruit model, fitted by Bayesian methods, that uses CPUE and survey series as biomass indicators, and includes as removals catch data, assumed free of error, as well as a term for predation by Atlantic Cod, using available series of cod biomass. The model is used to provide short term (1 year) and medium term (5 year) projections.

Stock Status deficiencies

After a decade of increasing biomass and expanding distribution in the 1990's, both the biomass and the fishery have contracted back towards the north. Fishable biomass has declined since its 2003 peak, but is currently estimated to remain above Bmsy; the risk of being below Blim (30% of Bmsy) is very low (<1%).

Harvest Control Rules (HCRs)

Preamble

In the absence of a TAC-setting and quota-sharing agreement with Greenland on this trans-boundary stock, the approach outline below will be taken by Canada. Reference points and scientific advice are based on a quantitative assessment model and stock composition indices as articulated by the Scientific Council (SC) of the Northwest Atlantic Fisheries Organization (NAFO). Previous work by the SC has shown that a maintained mortality risk of 35% is low enough to keep stock levels safely at or above Bmsy.

The Harvest Strategy will remain in place until such time that Canada and Greenland may adopt common Harvest Decision Rules.

Objectives

- Achieve/maintain the stock in the Healthy Zone (>80% of Bmsy).
- Avoid serious harm to the reproductive capacity of the stock by maintaining biomass >30% of Bmsy.
- Avoid total removals in excess of maximum sustainable yield.
- Manage the TAC and quotas to facilitate a balance of opportunity and stability in the industry, subject to the need to respond to precipitous biomass declines.
- Maintain Canada's quota share of this trans-boundary stock.

Reference Points

- Healthy Zone = >80% of Bmsy
- Cautious Zone = >30%Bmsy and < 80%Bmsy
- Critical Zone is <30%Bmsy
- Limit Reference Point for biomass (Blim) = 30% of Bmsy

Limit Reference Point for total mortality = Z_{msy}

Harvest Decision Rules (HDRs)

The Canadian quota will be 17% of 5/6 of the TAC designated by Canada, or 14.2% of the entire designated TAC.

- When the biomass is above 80% of B_{msy} , the risk of being above Z_{msy} should be less than 35%, based on the 3-year projections.
- When the biomass is between 30-80% of B_{msy} , the risk of being above Z_{msy} based on the 3-year projections should not exceed 17-35%, with the risk tolerance being lower the closer the biomass is to B_{lim} , with 17% at the lower end and 35% of the upper end of this range.
- If the biomass is below the Healthy Zone and approaching B_{lim} (middle of the cautious zone) then a special meeting will be sought with Greenland to develop actions that endeavor to mitigate or reverse the decline (e.g., a rebuilding plan). In the absence of agreement on measures to be taken, special conservation measures may be taken unilaterally by Canada.

Notes:

- Biomass refers to fishable biomass as calculated by the assessment model. Biomass values are to be based on point estimates.
- Precipitous decline: When the biomass decreases by more than 25% in the cautious zone; a special NSAC discussion will be held to evaluate all available biomass signals and the recent stock trend to determine if special conservation measures are required and/or consultations with Greenland on appropriate measures will be triggered
- Canadian quotas that are uncaught in one year may be carried forward to the following year in accordance with criteria and levels to be agreed between DFO and quota holders as long as the harvest level is consistent with the HDRs above.
- These HDRs are subject to change as Canada further develops guidance on the application of the PA framework on its domestic fisheries. This could include rules that provide stability in TAC (i.e., a maximum and minimum percentage change).

Management Plan

Canada is following a policy of establishing a TAC that is equal to or less than the Scientific Council's recommended TAC level, and then establishing a Canadian Quota by applying its claimed quota share against this TAC. While the summation of individual quotas within Canada is higher than the Canadian Quota, it is explicitly recognized that it is the announced Canadian Quota that determines the maximum catch for the totality of the Canadian fleet, and the fishery will be closed once that Canadian Quota is caught, even if individual sector or vessel quotas remain uncaught. Canada's annual catch remains significantly less than the Canadian Quota.

Until there is a quota-sharing agreement, it is likely that the combined total of quotas set by Canada and Greenland will in most years exceed advice provided by the Scientific Council. However, it is the combined catch rather than the combined quotas that creates fishing mortality. Canada has not been harvesting the entirety of its quotas, not even the quota that Greenland reserves for the Canadian catch, and the shrimp biomass remains in the Healthy Zone.

It is acknowledged that fishing mortality is only one component of total mortality, and fluctuations in the shrimp resource may be driven to a significant extent by natural mortality and productivity. Given this reality, while an objective is to maintain the biomass at or above Bmsy, this objective is not to be embraced at all costs. To illustrate this point, if the biomass is 85% of Bmsy, but Bmsy cannot be achieved without draconian cuts to the fishery, then it would be reasonable to accept such limitations, with the focus being to avoid or mitigate further biomass declines, while promoting growth where practical.

Within the Canadian management system, Integrated Fishery Management Plans (IFMP) are developed for fisheries to outline objectives and management measures by stock and area. The Northern Shrimp IFMP is an evergreen document that covers all the SFAs. (<http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/shrimp-crevette/shrimp-crevette-2007-eng.htm>). The IFMP outlines the formal structure and detailed terms of reference of the NSAC, covering such things as its purpose, scope, membership and operating procedures. NSACs main focus is quota allocations and management measures such as seasons, size limits, gear restrictions, other conservation and compliance issues and licensing policy.

Management Tools & Measures

Principal management tools and measures for managing the Canadian Northern shrimp fishery in all areas include:

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- An overall TAC for quota holders, which takes priority over individual quotas
- Individual quotas for quota holders
- An Enterprise Allocation (EA) system for the 17 year-round license holders, in which available quotas are shared equally.
- Technical conservation measures, including a minimum mesh size of 40 mm and the mandatory use of the Nordmore grate with 28 mm grate spacing
- Closed areas to protect vulnerable habitats
- 100% observer coverage
- Mandatory VMS surveillance
- Daily reporting of position and catch and submission of vessel fishing log books
- Random dockside monitoring of landings by 3rd party contractors or Fishery Officers

- At-sea observations by patrol vessels and/or fixed-wing aircraft
- Catch database to track catch against EAs
- A court-based system of fines that can result in fines up to \$500,000, jail terms, and forfeiture of catch

