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**SCIENTIFIC COUNCIL - 2022**

**The Commission's Request for Scientific Advice on Management in 2023 and Beyond of Certain Stocks in Subareas 2, 3 and 4 and Other Matters**

(From NAFO/COM Doc. 21-20)

Following a request from the Scientific Council, the Commission agreed that items 1, 2, 4, 7, and 9 should be the priority for the June 2022 Scientific Council meeting subject to resources and COVID-related restrictions.

- The Commission requests that the Scientific Council provide advice for the management of the fish stocks below according to the assessment frequency presented below. In keeping with the NAFO Precautionary Approach Framework (FC Doc. 04/18), the advice should be provided as a range of management options and a risk analysis for each option without a single TAC recommendation. The Commission will decide upon the acceptable risk level in the context of the entirety of the SC advice for each stock guided and as foreseen by the Precautionary Approach.

<b>Yearly basis</b>	<b>Two-year basis</b>	<b>Three-year basis</b>
Cod in Div. 3M Northern shrimp in Div. 3M	Redfish in Div. 3M Thorny skate in Div. 3LNO Witch flounder in Div. 3NO Redfish in Div. 3LN White hake in Div. 3NO Yellowtail flounder in Div. 3LNO Northern shrimp 3LNO	American Plaice in Div. 3LNO American Plaice in Div. 3M Northern shortfin squid in SA 3+4 Redfish in Div. 3O Cod in Div. 3NO

To implement this schedule of assessments, the Scientific Council is requested to conduct a full assessment of these stocks as follows:

- In 2022, advice should be provided for 2023 for Cod in Div. 3M and Northern shrimp in Div. 3M. With respect to Northern shrimp in Div. 3M, Scientific Council is requested to provide its advice to the Commission prior to the 2023 Annual Meeting based on the survey data up to and including 2023.
- In 2022, advice should be provided for 2023 and 2024 for: Thorny skate in Div. 3LNO, Redfish in Div. 3LN, Witch flounder in Div. 3NO.
- In 2022, advice should be provided for 2023, 2024 and 2025 for: SA 3+4 Northern shortfin squid, Redfish in Div. 3O.

Advice should be provided using the guidance provided in **Annexes A or B as appropriate**, or using the predetermined Harvest Control Rules in the cases where they exist (currently Greenland halibut 2+3KLMNO).

The Commission also requests the Scientific Council to continue to monitor the status of all other stocks annually and, should a significant change be observed in stock status (*e.g.*, from surveys) or in bycatch in other fisheries, provide updated advice as appropriate.



2. The Commission requests the Scientific Council to monitor the status of Greenland halibut. Conditional on the absence of other reasons for Exceptional Circumstances arising (other than the missing Canadian spring 3LNO survey), to calculate in 2022 the HCR adjusting the TAC advised for 2022 using four survey indices (Canadian fall 2J3K, Canadian fall 3LNO, EU 3M 0-1400m, and EU-Spain 3NO surveys) to provide TAC advice for 2023. If other reasons for exceptional circumstances are occurring, the EC protocol will provide guidance on what steps should be taken.
3. The Commission requests that Scientific Council continue its evaluation of the impact of scientific trawl surveys on VME in closed areas and the effect of excluding surveys from these areas on stock assessments.
4. Scientific Council initiate the first steps in both the 2+3KLMNO Greenland halibut and 3LN redfish MSE processes during 2021-2022, namely:
  - a. Compile catch and survey data and any additional sources of information used in the current models;
  - b. Review and finalize the data inputs for review at the June 2022 Scientific Council meeting when conducting both the 3LN redfish assessment and the assessment of Greenland Halibut Exceptional Circumstances/ Provision of TAC advice
  - c. Time permitting, further work on the respective MSE work plans by the SC-GHL and SC-Redfish subgroups for presentation to WG-RBMS or SC.
5. The Commission requests that Scientific Council continue work on the sustainability of catches aspect of the Ecosystem Roadmap, including:
  - a. In consultation with WG-EAFFM via co-Chairs, convene independent experts to do a scientific review of; a) the estimation of fisheries production potential and total catch indices, and b) the adequacy of this analysis for their proposed use within the NAFO roadmap (Tier 1), while considering how species interactions are expected to be addressed in the future (Tier 2) within the overall Roadmap structure. The outcomes of this review would need to be tabled in June at Scientific Council to be available in advance of the planned workshop in 2022.
  - b. Work to support the WG-EAFFM workshop in 2022, which will explore ecosystem objectives and further develop how the Roadmap may apply to management decision making.
  - c. Continue its work to develop models that support implementation of Tier 2 of the EAFM Roadmap.
6. The Commission requests that Scientific Council, in relation to VME analyses:
  - a. Conduct a re-assessment of its previously recommended closures of 7a, 11a, 14a and 14b, incorporating catch and effort data for fisheries of shrimp from 2020 and 2021 into the fishing impact assessments. This work is to be completed by the 2023 Scientific Council meeting.
  - b. Review the effectiveness of NAFO CEM, Chapter 2 from a scientific and technical perspective and report back to the WG-EAFFM. WG-EAFFM would subsequently in 2022 consider whether any modifications to this Chapter should be recommended.
7. The Commission requests Scientific Council to continue progression on the review of the NAFO PA Framework in accordance to the PAF review work plan approved in 2020 (NAFO COM-SC Doc. 20-04).
8. The Commission requests Scientific Council to continue to develop a 3-5 year work plan, which reflects requests arising from the 2021 Annual Meeting, other multi-year stock assessments and other scientific inquiries already planned for the near future. The work plan should identify what resources are

necessary to successfully address these issues, gaps in current resources to meet those needs and proposed prioritization by the Scientific Council of upcoming work based on those gaps.

9. The Commission requests that Scientific Council do a full assessment for Div. 3LN redfish and provide advice based on the projection for various harvest levels for two-years (2023 and 2024) to evaluate the impacts according to the performance statistics from NAFO CEM Annex I.H.
10. The Commission requests that any new results from stock assessments and the scientific advice of Cod 2J3KL (Canada), Witch 2J3KL (Canada) and Pelagic *Sebastes mentella* (ICES Divisions V, XII and XIV; NAFO 1) to be presented to the Scientific Council and request the Scientific Council to prepare a summary of these assessments to be included in its annual report.
11. The Commission requests Scientific Council, jointly with the Secretariat, to conduct ongoing analysis of the Flemish Cap cod fishery data by 2022 in order to:
  - a. monitor the consequences of the management decisions (including the analysis of the redistribution of the fishing effort along the year and its potential effects on ecosystems, the variation of the cod catch composition in lengths/ages, and the bycatch levels of other fish species, benthos in general, and VME taxa in particular), and
  - b. carry out any additional monitoring that would be required, including Div. 3M cod caught as bycatch in other fisheries during the closed period.
12. The Commission requests Secretariat and the Scientific Council with other international organizations, such as the FAO and ICES to inform the Scientific Council's work related to the potential impact of activities other than fishing in the Convention Area. This would be conditional on CPs providing appropriate additional expertise to Scientific Council.
13. The Commission request that Scientific Council proceed with developing the ecosystem summary sheets for 3M and 3LNO move toward undertaking a joint Workshop with ICES (International Council for the Exploration of the Sea) as part of a peer review of North Atlantic ecosystems.

## ANNEX A: Guidance for providing advice on Stocks Assessed with an Analytical Model

The Commission request the Scientific Council to consider the following in assessing and projecting future stock levels for those stocks listed above. These evaluations should provide the information necessary for the Fisheries Commission to consider the balance between risks and yield levels, in determining its management of these stocks:

1. For stocks assessed with a production model, the advice should include updated time series of:
  - Catch and TAC of recent years
  - Catch to relative biomass
  - Relative Biomass
  - Relative Fishing mortality
  - Stock trajectory against reference points
  - And any information the Scientific Council deems appropriate.

Stochastic short-term projections (3 years) should be performed with the following constant fishing mortality levels as appropriate:

- For stocks opened to direct fishing:  $2/3 F_{msy}$ ,  $3/4 F_{msy}$ ,  $85\% F_{msy}$ ,  $90\% F_{msy}$ ,  $95\% F_{msy}$ ,  $F_{msy} 0.75 \times F_{status\ quo}$ ,  $F_{status\ quo}$ ,  $1.25 \times F_{status\ quo}$ ,  $F=0$ ; TAC  $F_{status\ quo}$ ,  $85\% TAC\ Status\ quo$ ,  $90\% TAC\ Status\ quo$ ,  $95\% TAC\ Status\ quo$
- For stocks under a moratorium to direct fishing:  $F_{status\ quo}$ ,  $F = 0$ .

The first year of the projection should assume a catch equal to the agreed TAC for that year.

Results from stochastic short-term projection should include:

- The 10%, 50% and 90% percentiles of the yield, total biomass, spawning stock biomass and exploitable biomass for each year of the projections
- The risks of stock population parameters increasing above or falling below available biomass and fishing mortality reference points. The table indicated below should guide the Scientific Council in presenting the short-term projections.

F in 2022 and following years*	Yield 2022 (50%)	Yield 2023 (50%)	Yield 2024 (50%)	Limit reference points						P(B2024 > B2021)						
				P(F>F <sub>lim</sub> )			P(B<B <sub>lim</sub> )				P(F>F <sub>msy</sub> )			P(B<B <sub>msy</sub> )		
				2022	2023	2024	2022	2023	2024		2022	2023	2024	2022	2023	2024
2/3 F <sub>msy</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
3/4 F <sub>msy</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
85% F <sub>msy</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
90% F <sub>msy</sub>																
95% F <sub>msy</sub>																
F <sub>msy</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
0.75 X F <sub>status quo</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F <sub>status quo</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
1.25 X F <sub>status quo</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F=0	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
TAC Status quo																
85% TAC Status quo																
90% TAC Status quo																
95% TAC Status quo																

2. For stock assessed with an age-structured model, information should be provided on stock size, spawning stock sizes, recruitment prospects, historical fishing mortality. Graphs and/or tables should be provided for all of the following for the longest time-period possible:

- historical yield and fishing mortality;
- spawning stock biomass and recruitment levels;
- Stock trajectory against reference points
- And any information the Scientific Council deems appropriate

Stochastic short-term projections (3 years) should be performed with the following constant fishing mortality levels as appropriate:

- For stocks opened to direct fishing:  $F_{0.1}$ ,  $F_{max}$ ,  $2/3 F_{max}$ ,  $3/4 F_{max}$ ,  $85\% F_{max}$ ,  $75\% F_{status\ quo}$ ,  $F_{status\ quo}$ ,  $125\% F_{status\ quo}$ ,
- For stocks under a moratorium to direct fishing:  $F_{status\ quo}$ ,  $F = 0$ .

The first year of the projection should assume a catch equal to the agreed TAC for that year.

Results from stochastic short-term projection should include:

- The 10%, 50% and 90% percentiles of the yield, total biomass, spawning stock biomass and exploitable biomass for each year of the projections
- The risks of stock population parameters increasing above or falling below available biomass and fishing mortality reference points. The table indicated below should guide the Scientific Council in presenting the short-term projections.

F in 2022 and following years*	Yield 2022	Yield 2023	Yield 2024	Limit reference points									P(B2024 > B2021)														
				P(F > F <sub>lim</sub> )			P(B < B <sub>lim</sub> )			P(F > F <sub>0.1</sub> )				P(F > F <sub>max</sub> )													
				2022	2023	2024	2022	2023	2024	2022	2023	2024		2022	2023	2024											
F <sub>0.1</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%				
F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%			
66% F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		
75% F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		
85% F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
0.75 X F <sub>2018</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
F <sub>2018</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
1.25 X F <sub>2018</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%



**ANNEX B. Guidance for providing advice on Stocks Assessed without a Population Model**

For those resources for which only general biological and/or catch data are available, few standard criteria exist on which to base advice. The stock status should be evaluated in the context of management requirements for long-term sustainability and the advice provided should be consistent with the precautionary approach.

The following graphs should be presented, for one or several surveys, for the longest time-period possible:

- a. time trends of survey abundance estimates
- b. an age or size range chosen to represent the spawning population
- c. an age or size-range chosen to represent the exploited population
- d. recruitment proxy or index for an age or size-range chosen to represent the recruiting population.
- e. fishing mortality proxy, such as the ratio of reported commercial catches to a measure of the exploited population.
- f. Stock trajectory against reference points

And any information the Scientific Council deems appropriate.