SCIENTIFIC COUNCIL MEETING – 2016

Fisheries Commission's Request for Scientific Advice on Management in 2017 and Beyond of Certain Stocks in Subareas 2, 3 and 4 and Other Matters

1. Fisheries Commission requests that the Scientific Council provide advice for the management of the fish stocks below according to the assessment frequency presented below. The advice should be provided as a range of management options and a risk analysis for each option (rather than a single TAC recommendation).

Yearly basis	Two year basis	Three year basis
Northern shrimp in Div. 3LNO	American plaice in Div. 3LNO Cod in Div. 3M Redfish in Div. 3M Northern shrimp in Div. 3M Thorny skate in Div. 3LNO White hake in Div. 3NO Witch flounder in Div. 3NO	American plaice in Div. 3M Capelin in Div. 3NO Cod in Div. 3NO Northern shortfin squid in SA 3+4 Redfish in Div. 3O Witch flounder in Div. 2J+3KL Yellowtail flounder in Div. 3LNO

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

In 2016, advice should be provided for 2017 for Northern shrimp in NAFO Div. 3LNO

In 2016, advice should be provided for 2017 and 2018 for American plaice in Div. 3LNO and for Thorny skate in Div. 3LNO.

In 2016, advice should be provided for 2017, 2018 and 2019 for Redfish in Div.3O, Witch flounder in Div. 2J+3KL and Northern shortfin squid in SA 3+4.

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.

The Fisheries Commission also requests the Scientific Council to continue to monitor the status of all these 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 Fisheries Commission adopted in 2010 an MSE approach for Greenland halibut stock in Subarea 2 + Division 3KLMNO (FC Doc. 10/12) and agreed to use it until 2017 (FC Doc.13/23). This approach considers a survey based harvest control rule (HCR) to set a TAC for this stock on an annual basis. The Fisheries Commission requests the Scientific Council to:

   a) Monitor and update the survey slope and to compute the TAC according to HCR adopted by the Fisheries Commission according to Annex 1 of FC Doc. 10/12.
   b) Advise on whether or not an exceptional circumstance is occurring.

3. The Fisheries Commission adopted in 2014 an MSE approach for Redfish in Division 3LN (FC Doc. 14/24). This approach uses a Harvest Control Rule (HCR) designed to reach 18 100 t of annual catch by

2019-2020 through a stepwise biannual catch increase, with the same amount of increase every two years The Fisheries Commission request Scientific Council conduct a full assessment in 2016 to evaluate the effect of removals in 2014 and 2015 on stock status.

4. The Fisheries Commission requests the Scientific Council to continue to develop work on Significant Adverse Impacts in support of the reassessment of NAFO bottom fishing activities required in 2016, specifically an assessment of the risk associated with bottom fishing activities on known and predicted VME species and elements in the NRA.

    FC further requests that:

    a) that Scientific Council should take into account the protection afforded to VME areas outside the NAFO fisheries footprint in the calculation of the VME area and biomass at risk of bottom fishing impact;
    b) that Scientific Council refine VME kernel density analysis polygon boundaries, taking into account current understanding of distribution patterns in relation to environmental variables.

5. FC requests the Scientific Council consider widening the scope of the NAFO coral and sponge identification guides to include other relevant species on seamounts.

6. FC requests that Scientific Council consider options to expedite a risk assessment of scientific trawl surveys impact on VME in closed areas, and the effect of excluding surveys from these areas on stock assessments.

7. FC requests the Scientific Council consider, based on analysis of logbook data and patterns of fishing activity, to be conducted by the Secretariat, to examine relative levels of bycatch and discards of 3M cod/redfish, and stocks under moratoria in the different circumstances (e.g. fisheries, area, season, fleets, depth, timing)

8. It is difficult to match the current F_{lim} proxy with the 3M cod assessment results given by the 2015 Bayesian XSA assessment. These results were presented to SC in June and used for short term (2016-2017) projections under several F options (NAFO SCR 15/33 González-Troncoso, 2015); NAFO SC June 2015 Report). Focusing on the last assessment and projections, assuming at the same time a candidate $F_{lim} = F_{30\%}$SPR=0.131, they would imply that:

    • During the past five years (2010-2014) 3M cod has been exploited at an average F_{bar} level over two fold F_{lim}.
    • While SSB was sustained at a high average level representing 87% of the highest estimated SSB of the 1972-2014 interval (36 7041 on 1972).
    • The two highest year classes since 1992 occurred in 2011-2012.

    Under these circumstances the Scientific Council is requested to analyze whether the current F_{lim} value for 3M cod is currently underestimated and to revise if required the relevant fishing mortality and biomass reference points appropriately.

9. The stock of redfish 3M covers catches of three Sebastes species and the scientific advice is based on data of only two species (*S. mentella* and *S. fasciatus*). Golden redfish, *Sebastes marinus* (aka norvegicus), represents part of the catch but has not yet been subject to a full assessment in NAFO. The Scientific Council is requested to explore the possibility and options of an individual assessment of the golden redfish (*S. marinus*, aka norvegicus) and of including this species in the scientific advice for 2018-2019. The Scientific Council is also requested to advice on the implications for the three species in terms of catch reporting and stock management.

10. As part of the Greenland halibut's MSE review scheduled for 2016-2017, the SC is asked to specifically monitor and evaluate Contracting Parties surveys with the aim of optimizing resources in order to avoid duplication of data, identify data gaps and streamline survey methodologies, so that all data is used in the assessment.

11. Article 23 NCEM foresees a reassessment of bottom fishing activities in 2016. The NAFO Roadmap for Developing an Ecosystem Approach to Fisheries extends the work of the Scientific Council to include the assessment of potential impacts of activities other than fishing. Also, impacts of human activities in

ecosystems should not be analyzed in isolation since cumulative effects might occur representing more than the sum of the individual factors. The Scientific Council is therefore requested to develop a workplan at its meeting in 2016 that will allow to address and analyze the potential impact of activities other than fishing (eg. oil and gas exploration, marine cables, ocean dumping, marine transportation) on NAFO VMEs, in particular VME closed areas.

12. The Fisheries Commission requests the Scientific Council to conduct a full assessment of Greenland halibut in Subarea 2 + Division 3KLMNO (using both XSA and SCAA[1]) and to consider the weighting of each survey as a first step to inform the 2017 MSE review.

13. The Fisheries Commission requests the Scientific Council to advise on how many SSB points above 30,000t are considered sufficient to conduct a review of Blim of cod in 3NO.

14. The Fisheries Commission requests the Scientific Council to provide survey biomass trend(s) of witch flounder in Div. 3M for as long as data is available.

15. The Fisheries Commission requests the Scientific Council to review the results of the 2015 Canadian in situ photographic surveys for non-coral and sponge VME indicator species on Grand Bank (tail of Grand Bank) in relation to previous analyses presented in 2014 (that modelled their distribution using research vessel survey trawl bycatch data), and to identify areas of significant concentrations of non-coral and sponge VME indicator species using all available information.

16. Recognizing the importance of the 3M cod fishery to NAFO.

    Mindful that even though the current SSB is well above B_{lim}, the recruitment of the two most recent years is low.

    Noting that according to the Scientific Council stock assessment we are currently fishing only on two year-classes – once they are depleted in about two years time prospects for a continued fishery at the current level is not likely to be possible.

    Further noting that recent assessment of the stock has shown some year-to-year instability and that estimation of risk levels associated with given fishing mortalities cannot be calculated at this time, which further adds to our concern for the future of this fishery and its management.

    It is proposed that Scientific Council organize a full benchmark review of the 3M cod assessment in two stages: For 2016 Scientific Council will agree on a standardized approach and prepare a plan for the benchmark process at NAFO including required resources. For 2017 SC will review the benchmark assessment methodology for 3M cod.

[1.]SCAA will not be possible unless a contractor can be hired.

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

The Fisheries 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: $2/3\ F_{msy}$, $3/4\ F_{msy}$ $85\%\ F_{msy}$, $75\%\ F_{2015}$, F_{2015}, $125\%\ F_{2015}$,
- For stocks under a moratorium to direct fishing: F_{2015}, $F = 0$.

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.

				Limit reference points													
				$P(F>F_{lim})$			$P(B<B_{lim})$			$P(F>F_{msy})$			$P(B<B_{msy})$			$P(B2019 > B2016)$
F in 2016 and following years*	Yield 2017 (50%)	Yield 2018 (50%)	Yield 2019 (50%)	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018	
$2/3\ F_{msy}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$3/4\ F_{msy}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$85\%\ F_{msy}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F_{msy}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$0.75\ X\ F_{2015}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F_{2015}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$1.25\ X\ F_{2015}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$F=0$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%

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_{2015}, F_{2015}, 125% F_{2015},
- For stocks under a moratorium to direct fishing: F_{2015}, 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 2016 and following years*	Yield 2017	Yield 2018	Yield 2019	P(F.>F_{lim})			P(B<B_{lim})			P(F>F0.1)			P(F>F_{max})				P(B2019 > B2016)
				2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018		
F0.1	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
66% F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
75% F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
85% F_{max}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
0.75 X F_{2015}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
F_{2015}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%
1.25 X F_{2015}	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%		%

Limit reference points

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.