Northwest Atlantic Fisheries Organization

Serial No. N6894 **NAFO SCS Doc. 18/20**

SCIENTIFIC COUNCIL MEETING – 17 - 21 SEPTEMBER 2018

Scientific Council Annual Meeting Participants

17- 21 September 2018

Back row: Cristina Ribeiro, Herlé Goraguer, Konstatin Fomin, Antonio Ávila de Melo, Kalvi Hubel, Fernando González Costas, Ricardo Alpoim, Tom Blasdale, Pierre Pepin, Martha Krohn, Dayna Bell MacCallum

Front row: Carmen Fernandez, Mar Sacau-Cuadrado, Diana González Troncoso, Brian Healey, Karen Dwyer, Lisa Hendrickson, Katherine Sosebee

Missing from photo: Carsten Hvingel, Tom Nishida

REPORT OF SCIENTIFIC COUNCIL MEETING

17-21 September 2018

Chair: Brian Healey Rapporteur: Tom Blasdale

I. PLENARY SESSIONS

The Scientific Council met at the Radisson Blu Hotel Olumpia, Tallinn, Estonia during 17-20 September 2018, to consider the various matters in its agenda. Representatives attended from Canada, the European Union (Estonia, European Commission, Portugal, and Spain), France (with respect to St. Pierre et Miquelon), Japan, Norway, the Russian Federation and the United States of America. The Scientific Council Coordinator was in attendance.

The Executive Committee met prior to the opening session of the Council to discuss the provisional agenda and plan of work.

The opening session of the Council was called to order at 09:45 on 17 September 2018.

The Chair welcomed participants to the 40th Annual Meeting and thanked Estonia for hosting this event. The provisional agenda was adopted without amendment and the Council appointed Tom Blasdale, the Scientific Council Coordinator, as rapporteur.

The Council and its Standing Committees met through 17-20 September 2018 to address various items in its agenda. The Council considered and adopted the reports of the STACFIS and STACREC Standing Committees on 20 September 2018. The final session was called to order at 09:00 on 20 September 2018 and the Scientific Council agreed that the report of this meeting would be finalized by correspondence. The meeting was adjourned at 13:00 hours on 20 September 2018.

The Reports of the Standing Committees as adopted by the Council are appended as follows: Appendix I - Report of Standing Committee on Research Coordination (STACREC), and Appendix II - Report of Standing Committee on Fisheries Science (STACFIS).

The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Representatives, Advisers and Experts, are given in Appendices III, IV, and VI, respectively.

II. REVIEW OF SCIENTIFIC COUNCIL RECOMMENDATIONS

There were no Scientific Council recommendation requiring immediate attention at this meeting, A detailed review of recommendations was deferred to the June 2019 meeting.

III. JOINT SESSION OF COMMISSION AND SCIENTIFIC COUNCIL

The Commission and Scientific council met in joint sessions on 18 September and 20 September to discuss the 2018 NAFO performance review, the Scientific Councils response to requests for advice from the Commission, the reports of the joint SC/Commission Working Groups and other matters of common interest.

1. 2018 Performance Review

The Report of the 2018 NAFO Performance Review (PR2) was presented by the panel chair, Jane Willing.

Contracting Parties thanked the panel for their report and looked forward to implementing the recommendations.

The EU noted that the cumulative impact of various human activities on the marine environment had been raised during the first performance review, which recommended that NAFO consider where other activities may affect stocks. The EU was encouraged to note that this was referred to throughout the current Performance Review report but it expressed disappointment that there was no recommendation on this issue.

The Commission and Scientific Council **accepted** the report and all its recommendations. It was further agreed that the issue of cumulative effects from human activities should be addressed during the implementation process.

The Executive Secretary presented a working paper which gives general suggestions on which NAFO body or bodies could address each of the 36 recommendations.

The EU suggested the addition of a second table of recommendations that were considered un-implemented or partially implemented from the 2011 Performance Review (PR1). The SC Chair made the following suggested revisions to working paper arising from discussion within SC, referencing the numbering of the PR2 recommendations as in the working paper:

- item 13: This could also be a Scientific Council responsibility.
- item 18: What list of endangered species is referred to here?
- item 26: SC working papers likely to remain as internal documents.
- item 28: This should also involve the Commission, possibly through WG-RBMS
- item 33: SC could possibly also be involved in this.

The working paper was revised to accommodate the comments and suggestion and they are reflected in COM-SC WP18-04 Rev.2.

A proposal to establish a working group to develop an action plan to address the PR2 recommendations was **adopted** by the Commission (COM WP-46 Rev. 3).

2. Presentation of scientific advice by the Chair of the Scientific Council

The Scientific Council Chair presented the Scientific Council response to requests for advice from the Commission (SCS Doc 18/19). CPs thanked the Scientific Council for its efforts throughout the year noting the very heavy workload they have been under. USA stated that they will be adding a request for the SC to develop a 3-5 year work plan (Com. WP 18-36) and they look forward to returning to this next year and Canada commented that they would like to continue the discussion regarding prioritization of the requests for advice.

The Scientific Council received feedback questions from Canada, Norway and the Russian Federation. The SC chair reported that written responses to these requests would be provided later during the current meeting.

Norway made a further request for clarification. 1) noting SC advice on ALF is not to allow exploitation to expand above current levels, what are the current levels? 2) noting the two sets of landings data: STATLANT 21 and STACFIS, how are these discrepancies explained? The SC Chair noted that the definition of "recent catches" would depend on the period used. SC provided a written response to explain the discrepancies between the two data sources during the current meeting.

SC responses to all Commission requests for clarification are presented in section VI of this report and in Commission (COM WP 18-50).

3. Meeting Reports of the Joint Commission–Scientific Council Working Groups

a) Working Group on Improving Efficiency of NAFO Working Group Process

The Executive Secretary presented the report of the joint Commission/SC Efficiency Working Group (COM-SC WP 18-02). The WG recommends three (3) two-week periods where intersessional meetings by STACTIC and other WGs can be held (COM-SC WP 18-08). This was accepted in principle. In this regard, the Tentative Schedule for 2018/2019 NAFO Meetings was developed (COM-SC WP 18-10 Rev.2). This will serve a guide for the WGs in determining exact dates of the meetings.

b) Joint Commission–Scientific Council Working Group on Risk-based Management Strategies (WG-RBMS), August 2018

The co-Chair of WG-RBMS Jacqueline Perry and Brian Healey (interim co-chair) presented the report of WG-RBMS 2018 (COM-SC Doc. 18-02).

There was discussion of the proposed Greenland halibut Exceptional Circumstances protocol, the work plan for the development of a management strategy evaluation (MSE) for cod in 3M and the review of NAFO's review of the Precautionary Approach framework.

Norway requested clarification on whether the exceptional circumstances protocol would take account of biological parameters such as recruitment failure? The SC chair noted that low recruitment scenarios had been

tested in the Greenland halibut Management Strategy Evaluation, however monitoring of recruitment will continue to be included in annual monitoring for Exceptional Circumstances.

Regarding the Management Strategy Evaluation for 3M cod, DFG enquired whether consideration had been given to what would happen if the work is not complete by next year? The SC Chair noted that during the 2018 Greenland halibut MSE process, SC developed one-year advice during the June meeting to guard against the possibility that the MSE could not be completed in time. Possibly something like this needs to be built into the 3M cod timeline.

Regarding the PA review: USA acknowledged the problems associated with the development of the PA approach but urged SC to continue to make efforts. USA will be considering appropriate responses to alleviate the situation.

All the recommendations of WG-RBMS were **adopted** (COM-SC WP 18-06).

c) Joint Commission–Scientific Council Working Group on Ecosystems Approach Framework to Fisheries Management (WG-EAFFM), August 2018

WG-EAFFM co-Chair Elizabethann Mencher presented the 2018 report (COM-SC Doc 18-03).

There were discussions on the major recommendations.

DFG noted that stopping trawl surveys in VME closured areas would result in lost survey data: is there a way to get comparable data without trawling? The SC chair responded that SC has done work on this issue for the stocks which are managed by the Commission, and the difference from eliminating the survey stations within the existing protected areas was found to be minimal.

The EU enquired as to what work will be required to re assess all 6 FAO criteria (particularly the missing ones relating to ecosystem function). The co-Chair of SC WG-ESA, Pierre Pepin responded that functionality of VMEs is being assessed through literature review. This aspect of the FAO criteria is challenging and WG-ESA has come up with a protocol (decision tree) to deal with this.

Several CPs expressed differing views on the question of whether area 14 should remain closed following the expiry of the existing closure.

The co-Chair of SC WG-ESA Pierre Pepin elaborated WG-EAFFM recommendations on the implementation of the ecosystem approach to fisheries management

Several Contracting Parties commented that they were impressed with the work that has been done but that work will be required to integrate this into the management. For Coastal States, there will be additional challenges in considering how this is going to be implemented domestically as well as in the NAFO context.

Several CPs commented that it will be important to use appropriate terminology to avoid using words that may have set legal meanings. Pierre Pepin reported that a WebEx meeting is planned for October to discuss terminology used in the EAFM recommendation and this discussion is expected to continue to develop over the course of a year or so.

All the recommendations of WG-EAFFM were **adopted** (COM-SC WP 18-07)

d) Joint Commission–Scientific Council Catch Estimation Strategy Advisory Group (CESAG), 2018

WG-CESAG co-Chair, Katherine Sosebee presented the report of this group in 2018 (Com-SC Doc. 18-01).

The recommendations from WG-CESAG were **adopted** (COM-SC WP 18-05).

4. Formulation of Request to the Scientific Council for Scientific Advice on Management in 2020 and Beyond of Certain Stocks in Subareas 2, 3 and 4 and Other Matters

In accordance with the procedure outlined in FC Doc 12-26, a steering committee was formed to assist in the drafting of the Commission request. The committee was comprised of the SC Coordinator, Sandra Courchesne (Canada), Cristina Ribeiro (EU) and Élise Lavigne (Canada).

The Commission, as requested by SC, prioritized the request items, placing the 3M Cod Management Strategy Evaluation and PA Framework as top priorities.

The Commission request is presented in COM WP 18-51 Rev 2.

IV. RESEARCH COORDINATION

The Council adopted the Report of the Standing Committee on Research Coordination (STACREC) as presented by the Chair, Carmen Fernandez. The full report of STACREC is at Appendix I.

V. FISHERIES SCIENCE

The Council adopted the Report of the Standing Committee on Fisheries Science (STACFIS) as presented by the Chair, Karen Dwyer. The full report of STACFIS is at Appendix II.

VI. REQUESTS FROM THE COMMISSION

1. Requests deferred from the June Meeting

No requests were deferred from the June meeting

2. Requests received from the Commission during the Annual Meeting

Requests for clarification of scientific were received in advance of the meeting from Canada, Norway and the Russian Federation. Further requests which arose as questions within the SC/Commission joint session or within the Commission's discussions were submitted in writing to SC during the meeting. All of these requests are addressed below.

i) In relation to the Scientific Council's advice on 3NO Witch flounder (From Canada COM WP 18-34)

Taking into account that the relative biomass is higher in 2018 than 2017 and is projected to increase further under all five removal scenarios considered by the recent assessment of the Scientific Council (including Fmsy), and observing that the TAC has not been taken since the fishery re-opened in 2015, Canada requests the Scientific Council to comment on the difference in the following TAC/removal scenarios, in terms of biomass growth and probability of being below B_{lim}:

Question 1. No Directed Fishing in 2019 and 2020, with bycatch in the range of 300-400t that was observed during 2008-14 before the fishery was re-opened

SC responded:
Catches in the range of 300 to 400 t are bracketed within the first two rows of the risk table provided in the summary sheet. The risk of $B<B_{lim}$ is between 20% and 22% in 2020 and between 15% and 19% in 2021. In terms of biomass growth, the probability that B2021>B2018 under this scenario would be between 67-72%.

Question 2. TAC of 1175t, which is the Commission's decision for 2019 that was made last year based on 2/3 F_{msy}=0.04

SC responded:
Catches of 1175 t in 2019 and 2020 are bracketed within 3rd and 4th rows of the risk table provided in the summary sheet. The risk of $B<B_{lim}$ is between 23% and 24% in 2020 and between 21-23% in 2021. In terms of biomass growth, the probability that B2021>B2018 under this scenario would be between 63-65%.

Question 3. TAC of 979t in 2019 and 1035t in 2020, using the re-calculated 2/3 F_{msy}=0.04 that was the basis of the Commission's decision made last year

SC responded:
Catches of 979 t in 2019 and 1035 t in 2020 correspond to row 3 of the risk table provided in the summary sheet. The risk of $B<B_{lim}$ is 23% 2020 and 21% in 2021. In terms of biomass growth, the probability that B2021>B2018 under this scenario would be 65%.

in conclusion, **SC responded**: There is little difference in risk among these catch scenarios; however in all cases, there is a 15% or greater risk of being below Blim.

ii) In relation to the Scientific Council's advice on 3NO Witch flounder

From the Russian Federation (Commission WP 18-27)

Question 1. The 2017 witch flounder assessment has shown that almost all projected scenarios had the probability of fishing mortality getting above the Flim rather high (15-42% for 2018, 16-43% for 2019), with the probability of biomass declining below the Blim being within 18-19% and 16-19% for the same years respectively, even in case of no fishery. SC has decided to recommend the TAC in accord with the F2016 scenario, which did not have the lowest possible mortality value. The 2018 assessment has shown the improvement of the stock and comparable projected scenarios; however, SC has chosen to recommend the moratorium for directed witch flounder fishery despite having several scenarios, including a more sparing one in compare with previous years, available. Have there been any additional factors not included in the assessment that might have affected the SC decision?

SC responded:
When Witch flounder Div 3NO was assessed in 2017, SC accepted the model but because of uncertainty related to the model fit and proximity to reference points, SC scheduled another assessment for 2018. In 2018, the model formulation was improved by adjusting to accommodate rapid declines in survey biomass indices from 2014-16 and the issue was resolved. The stock status was worse in 2018 than had been seen in 2017 (according to the 2017 assessment the stock was 52% Bmsy versus 34% Bmsy in the 2018 assessment). Because of this, the probability of being below
B_{lim} was higher in 2018 (0.29 versus 0.15 in the 2017 assessment) and in all projections. The basis for the advice is that according to NAFO's PA framework (FC Doc 04-18) there should be a very low probability (eg. 5-10%) of biomass being below B_{lim} and all projections carried out in 2018 indicated that all probabilities were greater than or equal to 15%.

In 2018, further evidence of ecosystem wide decline in productivity (NAFO SCS 18-19 page 170; SCS 17-16 page 22) made SC more certain both about this change in productivity and the ability of the model to accommodate it.

Question 2. The witch flounder assessment uses commercial fishery data as part of its input. Should there be no directed fishery for that stock, will the witch flounder bycatch data from other fisheries be enough to use in the assessment? In addition, if there will be no sufficient survey coverage for witch flounder, do there exist any methods of assessing the stock with such lack of data?

SC responded:
if there is no directed fishery on this stock, the stock will still be assessed using all available information including bycatch data. This could be either by an analytical assessment or a survey-based assessment as before the re-opening of the fishery in 2015.
Witch flounder uses two annual scientific surveys (Canadian fall and spring surveys) to assess the stock and these surveys cover most of the distribution of witch flounder. These are expected to continue in future years so sufficient survey coverage would persist.

Question 3. *Current Conservation and Enforcement Measures limit the 3NO witch flounder bycatch as 5% of haul or 1250 kg, whichever is greater. The rest of bycatch in case of no directed fishery would be inevitably discarded. Notwithstanding the 'move-on rule' when exceeding the mentioned limit (which only increases the time of fishery, without actually reducing the fishing effort), the systematic high bycatches of witch flounder do contribute to the increase in fishing mortality, regardless of whether the fish is retained or discarded. Has there been any research for the approximate amount of discard-related mortality increase. In general, are the bycatches and discards accounted for when assessing any stock and have they been accounted for when assessing the 3NO witch flounder.*

SC responded: there has been no research on discard-related mortality for the witch flounder Div. 3NO stock. However in NE US waters discard mortality was found to be 52% after 1.5-3 hours. Tow duration was not

recorded and the study was based on a small sample size of juvenile witch flounder (27 animals; Ross and Hokenson 1997) caught at a depth of 110 m. This is likely an under-estimate as the mortality was only recorded for a up to 3 hours or less. Additionally, it has been found that witch flounder die after 15 min of exposure to air (Davis 2002).
Data on discards are included in the catch estimates that have been produced using the CESAG/CDAG method. Bycatches and discards are accounted for in all assessments including witch flounder.

References

Davis, M. W. 2002. Key principles for understanding fish bycatch discard mortality.Can. J. Fish. Aquat. Sci. 59: 1834-1843

Ross, M.R. and S.R. Hokenson 1997. Short-term mortality of discarded finfish bycatch in the Gulf of Maine fishery for northern shrimp *Pandalus Borealis. N. Am. J. Fish. Man. 17: 902-907.*

iii) In relation to the Scientific Council's advice on Cod in 3M,

From Norway (from COM Working Paper 18- 26REV)

The projection table indicates that a substantial change in quota advice from 2019 to 2020 is to be expected as the fish from the good recruitment years is gradually being fished out. If the 75%Fmsy-approach used for the 2019 advice is applied also for 2020 to this year's assessment results, the projections table indicate a decrease in TAC of about 40% (from 20,796 t to 12,359t). If the Commission, for the purpose of promoting stability in the fishery, was to consider evening out the large variations in TACs going from 2018 to 2020, i.e. choose to accept a lower TAC for 2019 to allow for a larger TAC in 2020, what would be the cost in loss of biomass to natural mortality?

Given the options in the provided table for yield in 2019, compute the projected yield in 2020 that would result in the same level of SSB2021 as the F=0.75 F.MSY scenario (i.e. 32,204 t)

Option	**Yield (tonnes)**			**loss**
#	2019	2020	total	%
1	20 796	12 359	33 155	0 %
2	18 000			
3	16 000			
4	14 000			

SC responded:

SC noted that the advice of June 2018 for 3M cod was made only for one year, as the development of a MSE is in progress for this stock and it is scheduled to be in force for the next Annual Meeting to generate the TAC for 3M cod for 2020.

Projections assuming catches in 2019 equal to 18000, 16000 and 14000 tons were produced, and yield for 2020 that maintains the SSB in 2021 at the same value as in the projections made in June (F = ¾ Flim, median SSB=32 204 with 90% of confidence interval of (23 660 – 42 420)) was computed. The results of these projections, including the risks, are below:

	Yield					P(B < Blim)				P(F > Flim)		
F_{2020}	2018	2019	2020	Total (2019+2020)	Loss (%)	2018	2019	2020	2021	2018	2019	2020
0.115	11145	20796	12359	33155	0.00%	<1%	<1%	<1%	1%	<1%	1%	5%
0.131	11145	18000	14450	32450	2.25%	<1%	<1%	<1%	1%	<1%	<1%	18%
0.142	11145	16000	15956	31956	3.82%	<1%	<1%	<1%	1%	<1%	<1%	32%
0.152	11145	14000	17458	31458	5.26%	<1%	<1%	<1%	1%	<1%	<1%	49%

Decreasing the catch in 2019 increases the catch in 2020 without jeopardizing the SSB in 2021, but at the expense of increasing rapidly the risk of being above F_{lim} in 2020. The loss in yield for the sum of 2019 and 2020 is between 2.25% and 5.26%.

iv) Regarding Alfonsino catches

from Norway (in plenary)

1. What are the "current levels" (SC advice grey box):

a. The average of STATLANT 21 catch figures for the period 2009-2017

b. The average of STATLANT 21 catch figures for a selected number of years during the period 2009-2017? , if , yes, which years?

c. The average of STACFIS catch figures for the period 2009-2017?

d. The average of STACFIS catch figures for a selected number of years during the period 2009-2017? if , yes, which years?

SC responded: "Current levels" of catches, using the same number of years as in the 2015, advice is 139 t. The table below has catch data from:

- STATLANT 21A data available during June SC 2018
- STATLANT 21A data available during September 2018
- STACFIS estimates

	Alfonsino Catches (t) Div. 6G									**Mean**
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2012-2017**
STATLANT June 2018[1]		53		298	112	118	77		51	**109**
STATLANT Sep 2018		53		298	112	118	77	129	51	**131**
STACFIS	479	52	152	302	114	118	122	127	51[2]	**139**

SC reiterates its advice that it is unable to advise on an appropriate TAC for this stock.

2. How are the STACFIS catch estimates as tabled in the advice sheet derived?

SC responded:

Due to the problems with the availability and quality of the STATLANT, the catches used in the STACFIS are based on the data collected by NAFO and scientific observers until the year 2016. The 2017 catches are those estimated by CESAG.

3. What is the explanation for using STACFIS figures – if that is the case – rather than the officially reported STATLANT 21 figures?

[1] Note that in the table in June 2018 SC report, the STATLANT values for the period 2012 to 2015 were accidentally reversed

[2] mistakenly reported as 55 t in the June 2018 SC report.

SC responded:

STACFIS estimates were used because they were considered more reliable. This is consistent with other stocks (eg. Brodie 2013, History of catch estimates, SCR Doc. 13/051)

v) Regarding the Div. 3M Cod MSE

From Norway (in plenary)

Can SC confirm that HCRs with starting points (TAC for 2020) which are independent of the 2019 TAC – e.g. not constrained by "max/min variation constraint" – will also be explored during the MSE process for 3M cod?

SC responded:

WG-RBMS is the main body tasked to develop the HCRs to be tested and any adopted HCR would have to be compliant with the prescribed management objectives. Expecting a similar procedure as for GHL, a variety of HCRs will indeed be tested. In this case with the expected low recruitment to the fishable stock in the coming years, it is likely that a range of starting points (2020 TAC) will need to be tested in order to meet management objectives, independent of the 2019 TAC.

VII. MEETING REPORTS

1. Joint Commission – Scientific Council Working Group on the Ecosystem Approach Framework to Fisheries Management (WG-EAFFM)

This joint working group met at the NEAFC Secretariat, London, UK during 17th and 17th August 2018 and was co-Chaired by Elizabethann Mencher (USA) and Brian Healey (Canada, in lieu of co-chair Andrew Kenny, EU). The Scientific Council was advised of progress of this group by the co-Chairs in their presentation of the report to the joint session of Commission and Scientific Council (see section III of this report).

2. Joint Commission–Scientific Council Working Group on Risk-based Management Strategies (WG-RBMS)

This joint working group met at the NEAFC Secretariat, London, UK during 13th to 15th August 2018, co-Chaired by Jaqueline Perry (Canada) and Brian Healey (Canada, as acting co-Chair). The Scientific Council was advised of progress of this group by the co-Chairs in their presentation of the report to the joint session of Commission and Scientific Council (see section III of this report).

3. Joint Commission-Scientific Council Catch Estimation Strategy Advisory Group (CESAG).

WG-CR met via WebEx on 12 March 2018 and 26 April 2018, The meetings was chaired by co-Chairs co-Chairs Katherine Sosebee (USA) and Temur Tairov (Russian Federation). The Scientific Council was advised of progress in this group by the Chair in her presentation of the report to the joint session of Commission and Scientific Council (see section III of this report).

VIII. SPECIAL SESSIONS

Scientific Council noted the intent to hold meetings on the management strategy evaluation of 3M cod in 2019. This was highlighted in the presentation of the SC budget and an additional $35 000 has been added to the budget in 2019 to ensure resources are available to support participation.

IX. REVIEW OF FUTURE MEETING ARRANGEMENTS

1. Scientific Council (in conjunction with NIPAG), 17- 23 October 2018

The next Scientific Council shrimp meeting is scheduled to meet NAFO secretariat, Dartmouth, Canada from 17 to 23 October 2018.

2. Scientific Council 3M Cod MSE meeting, 28 – 31 Jan 2019

Secretariat will explore options for location.

3. Scientific Council, 31 May – 13 June 2019

Scientific Council agreed that its June meeting will be held on 31 May to 13 June 2018, at St Mary's University, Halifax.

4. Scientific Council, 23-27 September 2019

The 2018 NAFO annual meeting is scheduled to take place in Paris, France during 23-27 September 2019.

5. NAFO/ICES Joint Groups

a) Joint NAFO/ICES *Pandalus* Assessment Group (NIPAG) 17- 23 October 2018

The next meeting of NIPAG is scheduled to take place in NAFO secretariat, Dartmouth, Canada from 17 to 23 October 2018.

b) WG-DEC, 2019

This meeting has not yet been scheduled.

c) Joint NAFO/ICES *Pandalus* Assessment Group (NIPAG) 2019

The timing of this meeting will be decided during NIPAG 2018, taking into consideration the Commission's request that 2019 shrimp advice should be delivered before that year's annual meeting.

6. NAFO SC Working Groups

a) WG-ESA, 13- 22 Nov, 2018

The Working Group on Ecosystem Science and Assessment will meet at the NAFO Secretariat, Dartmouth, Nova Scotia, Canada, 13-22 November, 2018.

X. FUTURE SPECIAL SESSIONS

1. Discussion of proposed topics

The 11th International Flatfish Symposium will take place in 2020 in New Hampshire or Boston, USA. The symposium organizers have approached NAFO to ask whether NAFO would be interested in co-sponsoring this event. This will be considered further at the June SC meeting.

NAFO will co-sponsor the NAFO/ICES/PICES symposium, *Shellfish - Resources and Invaders of the North* which will be held in Tromsø, Norway, 5-7 November 2019. Bernard Sainte-Marie (DFO, Quebec Region, Canada) will be the NAFO convener. Funds have been allocated in the SC budget to cover travel expenses.

The possibility of an invited speaker on the topic of sampling rates and precision of survey estimates or possibilities for combining surveys from different areas and/or time periods has previously been proposed as a topic for an invited speaker. This will also be considered as a possible for a future special session. It is unlikely that a special session could be held in 2019 due to the additional meeting of WG-RBMS which is expected to occur immediately prior to the Annual Meeting. The possibility of holding a special session on this topic will be discussed in June.

XI. OTHER MATTERS

1. Timelines for completion of Reports

Following on from previous discussions during the SC meetings in April and June of this year, the Chair expressed concern about the ability to complete meeting reports due to the busy agenda of recent meetings. It was noted that in an attempt to complete the agenda of meetings, work was continuing to the close of these sessions, and little time was spent in plenary agreeing to report text. As a consequence, some reports – notably the intersessional meetings on GHL in 2017 and Cod 3M in 2018 – were published several months post-meeting. SC members agreed that it would be valuable to return to past practice and ensure that the majority of reports were completed during meeting time, even if at the expense of completing the full agenda.

2. Attendance of observers in meetings

Scientific Council discussed the process for allowing Observers to sit in during SC meetings. This item was also discussed in the June 2018 meeting, and it was noted that:

a) within the NAFO rules of procedure, Observers who have followed the application process are permitted to observe 'non-restricted' NAFO sessions, and,
b) under the rules of procedure, SC is free to amend its own rules of procedure as necessary.

Given these points, it was agreed that the SC rules of procedure with respect to Observers would be clarified to indicate that all SC meetings would be open to representatives of organizations that are granted NAFO Observer status. In the event of discussions on any topic that could present a conflict due to the presence of Observers, the SC Chair could temporarily restrict the meeting to SC Representatives and Experts/Advisors until such matters were resolved. It was further clarified that these restrictions would be very atypical of the normal work of the Council, i.e. virtually all discussions would be open to observers.

3. Meetings attended by the Secretariat (Deferred from the June meeting)

a) FIRMS/BlueBridge Global Record of stocks and Fisheries (GRSF)

The GRSF aims at providing an innovative environment supporting the collaborative production and maintenance of a comprehensive and transparent inventory of stocks and fisheries records that will boost regional and global stocks and fisheries status. It was developed by a consortium which included the FAO FIRMS partnership, within the framework of the EU funded BlueBridge project which came to an end in 2017. The primary function of this meeting was consider options for continuation of the GRSF beyond the end of BlueBridge. It was proposed that management of the GRSF should be adsorbed into to the FIRMs partnership with FIRMS partners becoming the steering committee of GRFS.

b) Thirteenth round of Informal Consultations of State Parties to the UN Fish Stocks Agreement (UNFSA) "Science-policy interface", 22- 23 May 2018, New York, New York, USA

The Executive Secretary attended these Informal Consultations as an observer. Included in these Informal Consultations was a session entitled "Experiences, challenges and opportunities at the regional level" at which representatives of NPFC, NEAFC, ICCAT and SPRFMO made presentations. During this session the Executive Secretary made an intervention based on NAFO's written submission to these Informal Consultations sent to the UN earlier this year (NAFO/18-098 of 29 March 2018). He mentioned, in particular, the recent establishment by NAFO to create joint working groups of scientists and managers that allows discussion with the purpose to make recommendations on complex issues related to catch reporting, risk-based management strategies and an ecosystem approach framework to fisheries management much earlier than what had been under NAFO's previous decision-making process. The Informal Consultations also included a session on "Experiences, challenges and opportunities at the national level", in which presentations were made by the EU (Sebastian Rodriguez Alfaro) and Canada (Pierre Pepin). The points raised at these Informal Consultations will be considered at the next Review Conference of the UNFSA scheduled for not earlier than 2020.

c) Second meeting of the Sustainable Ocean Initiative (SOI) Global Dialogue with Regional Seas Organizations and Regional Fisheries Bodies on Accelerating the Progress towards the Aichi Biodiversity Targets, 10-13 April, 2018 in Seoul, Korea

The Executive Secretary attended this meeting, organized by the Secretariat of the Convention on Biological Diversity (CBD), to bring together representations of Regional Fisheries Management Organizations (RFMOs), Regional Seas Organizations (RSOs) and other regional initiatives "aimed at identifying concrete ways and means to further enhance cross-sectoral cooperation at the regional scale" … "with a view to accelerate national and regional efforts towards achievement of the Aichi Biodiversity Targets and Sustainable Development Goals related to marine biodiversity". At this meeting, the Executive Secretary gave a presentation focused on NAFO's ecosystem approach framework to fisheries management, including the NAFO's ecosystem approach Roadmap and NAFO's VME closures, and was a rapporteur for a number of the breakout group discussions. A full report of this meeting will be available on the CBD website.

4. Work plan for 3M cod Management Strategy Evaluation (MSE)

SC noted the work plan for the 3M cod Management Strategy Evaluation (MSE) agreed by WG-RBMS (Com-SC Doc. 18-02). SC considers this plan to be very ambitious: there is a high likelihood that the work may not be completed by September 2019. The Greenland halibut MSE completed in 2017 should not be considered as an example of an appropriate pace for completion of such work.

The next major task to be addressed by SC in this work plan will be to meet in January to:

- Review OMs and approve initial set of OMs, including the acceptability of their conditioning, and/or suggest further refinements
- Approve Projection Specifications
- Comments on initial set of HCR (if required)

It was agreed that this meeting will take place during the week of 28 January at a location in Europe (with preference for London or Iberia). The duration of the meeting will be four days. SC participants proposed that the same external reviewers who reviewed the cod benchmark meeting in 2018 (with the exception of Carmen Fernandez, who is now an SC participant) should be approached, and that if either of those reviewers are unavailable, additional experts will be invited.

5. Possible external reviewer for the SC June meeting

It was proposed that a reviewer should be appointed for a multi-year period. The reviewer will be present for the full first week of the meeting (Monday to Friday) and will concentrate on a small number of stocks. Priorities for 2019 will be witch flounder in 3NO and redfish (including golden redfish) in 3M. There will be a section in the report for reviewer's comments.

A number of potential reviewers were suggested and the SC chair will contact these people to determine their availability and if they would be willing.

6. Participation and Capacity during SC meetings.

SC discussed the level of participation and capacity to complete its work at several times during the meeting, including the Joint Session with the Commission. In addition to having sufficient capacity to conduct its work, some concern was raised regarding the number of CPs available to participate in meetings, particularly during WGs and the recent intersessional meetings of SC.

While it is recognized that the primary consideration for SC is having sufficient capacity regardless of their CP, and that SC members participate as experts and are not representative of CP positions, having a limited number of CPs present also presents challenges. It can mean that items produced by the SC may not be fully understood by CPs, potentially leading to inefficiencies within the SC. Noting positive discussions on workload and capacity had occurred earlier in the week during the Joint Session with the Commission, it was agreed that the SC chair would informally discuss the issue of CP participation with the Commission chair.

7. Overview of ICES transition from PA to MSY management frameworks

In line with what was agreed at the WG-RBMS meeting in August in London (COM-SC Doc 18-02), the SC vice-Chair, Carmen Fernández, prepared a summary presentation on the ICES PA and MSY frameworks, and how ICES implemented the transition between them. This was with the aim to help inform future work on the review of the NAFO PA framework.

The presentation explained that ICES used the PA framework as the basis to provide advice during the 1990s and 2000s, whereas a transition to the MSY framework occurred around 2010. The PA framework was focused on avoiding impaired recruitment, and used biomass and fishing mortality limit points, B_{lim} and F_{lim}, with B_{lim} being the equilibrium long-term stock biomass corresponding to F_{lim} fishing mortality. Operationally, the PA framework used precautionary reference points, B_{pa} and F_{pa}, that took into account uncertainty in the estimates of stock biomass and fishing mortality. The MSY framework is focused on maximising long-term yield on average while safeguarding against low stock biomass; it uses two reference points, FMSY and MSY $B_{trigger}$, the latter corresponding to the lower end of fluctuation in equilibrium long-term stock biomass with FMSY fishing mortality. Some restrictions are applied to F_{MSY} and MSY $B_{trigger}$ to ensure consistency with the PA framework, a main one being that the ICES MSY advice rule should correspond to no more than 5% probability of the stock

being below B_{lim} in the long-term. Stochastic simulation, including accounting for uncertainties in stock assessments and forecasts, is central in the development and implementation of the ICES MSY framework. A PA advisory framework has also been developed by ICES for stocks without analytical assessments. ICES also addresses situations where a management plan is desired by managers for a certain stock or set of stocks and how that fits with the rest of its advisory framework.

The developments noted above, and their implementation in the ICES advisory system, have required substantial effort over several years, with multiple workshops convened to address different conceptual and implementation aspects; these are mainly addressed in the series of so-called WKMSYREF workshops (5 so far) and WKLIFE workshops (8 so far), for which reports are available on the ICES website. NAFO's remit includes fewer stocks than ICES' and, hopefully, experiences gained in ICES and in other areas of the world can be used to help in the review of the NAFO framework. Nevertheless, it will not be a minor task and adequate planning is necessary.

The SC noted that input from the NAFO Commission would be necessary on certain aspects concerning objectives and risks.

8. Appointment of chairs

Carmen Fernandez was appointed as interim co-Chair (for one year only) for WG-RBMS

The EU has nominated Miguel Caetano as chair of STACFEN. SC welcomed the nomination and it was decided that the Executive Committee of SC will consider this proposal by correspondence immediately after this meeting (not all members were present at the current meeting) and the Secretariat will inform the EU of the SC decision, expected to be available within a week or two.

9. A tribute to Enrique de Cardenas

Scientific Council was informed of the passing of Spanish colleague Enrique de Cardenas (Quique), who was a valued member of the SC for 25 years. During that time, Quique was deeply involved in research studies and the assessment of several stocks, namely cod, American plaice in Div. 3M and Greenland halibut, being leader or co-leader of several scientific projects. Even after he left the Spanish Oceanographic Institute for the Spanish Fishery Administration, Quique never stopped pursuing the best science for NAFO, and in that context he was the head of the NEREIDA project, one of the first multidisciplinary research projects with an ecosystem-wide focus within NAFO. Quique passed away peacefully on Thursday September 20th, 2018. SC recalled many of Quique's exceptional qualities – the dedication he had to his work and colleagues, his friendliness, his openness and the positivity he displayed. Quique's friends at an SC dinner raised a glass to his memory.

XII. ADOPTION OF REPORTS

1. Committee Reports of STACREC and STACFIS

The Council reviewed and adopted the Reports of the Standing Committees (STACREC and STACFIS).

2. Report of Scientific Council

The Council at its concluding session on 20 September 2018 agreed that the report would be adopted by correspondence following the meeting.

XIII. ADJOURNMENT

There being no other business, the meeting was adjourned at 13:00 hours on 20 September 2018. The Chair thanked the Scientific Council Coordinator for his support. The Chair thanked the EU for their hospitality in hosting the Annual Meeting. Finally, the chair thanked the members of Scientific Council for their hard work and wished everyone a safe journey home.

APPENDIX I. REPORT OF STANDING COMMITTEE ON RESEARCH COORDINATION (STACREC)

Chair: Carmen Fernandez Rapporteur: Tom Blasdale

1. Opening, appointment of rapporteur

The Committee met in Tallinn, Estonia, during 19-20 September 2018, to consider the various matters in its agenda. Representatives attended from Canada, European Union (Estonia, European Commission, Portugal, Spain), France (with respect to St. Pierre et Miquelon), Japan, Norway, the Russian Federation and the United States of America. The Scientific Council Coordinator was in attendance. The STACREC Chair (Carmen Fernández) opened the meeting and welcomed everyone. Tom Blasdale was appointed the Rapporteur.

2. Fishery Statistics

a) Progress report on Secretariat activities

A presentation, for STACREC's information, was given by the NAFO Secretariat on an Android application that is being developed for transferring the information collected by NAFO observers on fishing vessels to the NAFO Secretariat via the internet.

STACREC considered this development very useful, although it was noted that STACREC was not able to say if all data that may be required from observers was appropriately represented in the application (e.g. some gear characteristics or the possibility to record weights in units less than 1 kg appeared not to be included in the application at present; it was also noted that the hardware device should be tested on salt water, not just on fresh water). The developer of the application noted that testing would be happening over the next year and that a presentation to STACREC would again be given during the SC meeting in June 2019, to show updates and to allow SC members not present at this meeting to see it, and to gather additional ideas. STACREC members from the USA and Spain indicated that national scientific observers from their countries could also help with testing the application, if that was considered useful.

The possible use of this application to help communicate relevant scientific studies to fishing fleets was discussed and is presented below in this report (see section "Outstanding matters from previous recommendations").

b) Review of STATLANT 21

The following table updates the situation with the submission of STATLANT. There are still a few outstanding submissions and the Secretariat will follow up with the data providers.

Table 1. Dates of receipt of STATLANT 21A and 21B reports for 2014-2017 up to 15 September 2018

Country/component	STATLANT 21A (deadline, 1 May)			STATLANT 21B (deadline, 31 August)		
	2015	2016	2017	2015	2016	2017
CAN-CA	4 May 16	30 May 17	31 May 18	4 May 16	30 May 17	31 May 18
CAN-SF	31 May 16	28 Apr 17	05 May 18	30 Aug 16	7 Sep 17	11 Sep 18
CAN-G	18 May 16	26 May 17	30 Apr 18	30 Aug 16	16 Aug 17	24 Aug 18
CAN-NL	21 Apr 16	26 Apr 17	17 May 18	29 Aug 16	29 Aug 17	
CAN-Q						
CUB						
E/BUL						

E/EST	20 Apr 16	22 May 17	04 May 18	23 Aug 16	30 Aug	13 Sep 18
E/DNK		23 May 17	23 Apr 18	15 Jun 16	31 Aug	03 Sep 18
E/FRA						
E/DEU	28 Apr 16	25 Apr 17	25 Apr 18	29 Aug 16	31 Aug	30 Aug 18
E/LVA	10 Mar 16	20 Apr 17				
E/LTU		9 May 17	24 Apr 18		31 May 17	24 Apr 18
EU/POL						
E/PRT	26 Apr 16	19 Apr 17	20 Apr 18	23 Aug 16	29 Aug 17	03 Sep 18
E/ESP	5 May 16	31 May 17	30 May 18	5 Aug 16	7 Aug 17	02 Aug 18
E/GBR		25 Apr 17	31 May 18			24 Jul 18
FRO	26 May 16	2 May 17	18 May 18	1 Jun 16	09 Jun	
GRL	30 Apr 16	1 May 17	30 Apr 18	30 Aug 16	22 Aug 17	
ISL						
JPN		19 Apr 17	01 May 18		30 Aug 17	31 Aug
KOR						
NOR	26 Apr 16	4 May 17	23 Apr 18	29 Aug 16	25 Aug 18	16 Aug 18
RUS	20 May 16	11 May 17	04 May 18	1 Sep 16	21 Jul 17	
USA	19 Jul 16					
FRA-SP	25 Apr 16	25 May 17	18 May 18	8 Jun 16		5 Jul 18
UKR						

3. Research Activities

a) Biological sampling

i) Report on activities in 2017/2018

In June 2018, STACREC reviewed the list of Biological Sampling Data for 2017 prepared by the Secretariat and noted that any updates would be inserted during the summer. SCS document 18/12 was now finalized.

ii) Report by National Representatives on commercial sampling conducted.

There were no outstanding matters from the June meeting.

iii) Report on data availability for stock assessments (by Designated Experts)

During the June meeting, Designated Experts were reminded to provide the stock assessment data to the NAFO Secretariat and it was agreed to store the files on the meeting SharePoint under a folder entitled "DATA". The importance of having these data available was stressed again at this meeting and the Secretariat indicated they would check and ensure any expert that had not provided them so far was made aware that they were missing. For the future, not only the data but any "non-standard" software or code used in the stock assessments should also be stored.

The Secretariat will follow up with DEs who have not made their data and/or code available.

b) Biological surveys

i) Review of survey activities in 2017

There were no outstanding matters from the June meeting.

ii) Surveys planned for 2018 and early 2019

Two SCS documents were updated for this meeting and will be finalized by the time of the NIPAG meeting in October.

c) Tagging activities

As agreed during the June meeting, an SCS document 18/11 was now finalized.

d) Other research activities

There were no outstanding matters from June

4. Review of SCR and SCS Documents

No new documents were presented to STACREC for review at this meeting

5. Other Matters

a) Outstanding matters from previous recommendations

- Including a notification in the STATLANT Extraction Tool webpage to inform researchers of discrepancies between STATLANT and STACFIS data. As agreed earlier, the SC Chair discussed the issue intersessionally with other relevant NAFO bodies and it has now been agreed to include this note.
- Communication of tagging and/or other scientific activities to vessels from Contracting Parties and Coastal States fishing in the Convention Area. An initial idea was considered in the June meeting, consisting of having an up-to-date NAFO webpage providing all relevant information and making use of the Android application developed for the NAFO observers to notify the fishing fleets, particularly when new items were uploaded to the webpage. This issue was again discussed when the Android application was presented at this meeting. It was noted that, in the not too distant future, it is possible that NAFO observer coverage is lower than the current 100%, and this could be a problem. Other possible ways of communicating this information were discussed (e.g. via VMS information when vessels enter the NAFO area, or during the NAFO Annual Meeting, given the wide attendance of the fishing industry). No ideal way to solve this communication issues was found. However, the original idea of June (webpage and Android application for NAFO observers) was still considered useful, and the Scientific Council chair and the NAFO Secretariat agreed to discuss over the next few months possible ways to implement this and to present an update to the STACREC meeting in June 2019.
- Analysis of sampling rates and combining multiple surveys, as a possible future Special Session. In June it was noted that this could be a possibility for a future special session and that SC would discuss this in September, as part of a more general discussion on possibilities for future special sessions. The SC agreed at the September meeting that this constitutes a relevant topic for a future special session, but that this could not, in any case, occur in 2019 because of already scheduled MSE work for 3M cod. For information of SC members, it was noted that ICES is holding a workshop on "Unavoidable survey effort reduction" (WKUSER) in Seattle in January 2019.

b) Other business

NAFO Catch Estimates Methodology Study: The STACREC chair informed members that an MRAG document describing the simulation methodology developed by MRAG for this study, and an associated software tool, had been made available earlier in September and that the MRAG had invited comments from SC members, with deadline of September 30. However, because of unresolved issues concerning this and CESAG's work, the document was not distributed to the entire SC at this stage. Nonetheless, STACREC noted that this is an interesting and relevant project and wishes to give it due consideration, although this will likely only happen in June next year.

APPENDIX II. REPORT OF STANDING COMMITTEE ON FISHERIES SCIENCE (STACFIS)

Chair: Karen Dwyer Rapporteur: Tom Blasdale

1. Opening

The Committee met at the Radisson Blu Olumpia, Tallinn, Estonia, during 17-21 September 2018, to consider the various matters in its agenda. Representatives attended from Canada, European Union (Estonia, European Commission, France, Portugal, and Spain), France (with respect to St. Pierre et Miquelon), Norway, the Russian Federation and the United States of America. The Scientific Council Coordinator was in attendance.

2. Nomination of Designated Experts

There were no changes to the current Designated Experts for stocks.

3. Other matters

a) Review of SCR and SCS Documents

There were no SCR documents submitted.

b) Assessments deferred from the June 2018 meeting.

There were no assessments deferred from the June 2018 meeting.

c) FIRMS Classification for NAFO Stocks

STACFIS reiterates that the Stock Classification system is not intended as a means to convey the scientific advice to the Commission, and should not be used as such. Its purpose is to respond to a request by FIRMS to provide such a classification for their purposes. The category choices do not fully describe the status of some stocks. Scientific advice to the Commission is to be found in the Scientific Council report in the summary sheet for each stock.

Stock Size (incl. structure)	Fishing Mortality			
	None–Low	Moderate	High	Unknown
Virgin–Large	3LNO Yellowtail Flounder 3LN Redfish			
Intermediate	3M Redfish[3] 3M Cod	SA0+1 Northern shrimp[1] DS Northern shrimp[1] 0&1A Offshore. & 1B–1F Greenland halibut		Greenland halibut in Disko Bay[2] SA1 Spotted Wolffish SA2+3KLMNO Greenland halibut
Small	SA3+4 Northern shortfin squid 3NOPs White hake 3NO Witch flounder 3LNOPs Thorny skate			Greenland halibut in Uummannaq[2] Greenland halibut in Upernavik[2]
Depleted	3M American plaice 3LNO American plaice 2J3KL Witch flounder 3NO Cod 3M Northern shrimp[1,3] 3LNO Northern shrimp[1]			SA1 Redfish SA1 Atlantic Wolffish
Unknown	SA2+3 Roughhead grenadier 3NO Capelin 3O Redfish			6G Alfonsino

Shrimp will be re-assessed at the SC shrimp meeting in September 2018
[2] Assessed as Greenland halibut in Div. 1A inshore
[3] Fishing mortality may not be the main driver of biomass for Div. 3M Shrimp and Redfish

4. 2019 Invited Speaker

Funds are available to support the attendance of an invited speaker at the June 2019 STACFIS meeting. The STACFIS chair will identify an appropriate speaker at the earliest opportunity to ensure their availability.

5. Adjournment

The meeting was adjourned on 20 September 2018.

APPENDIX III. SCIENTIFIC COUNCIL AGENDA, SEPTEMBER 2018

I. Plenary Session

1. Opening
2. Appointment of Rapporteur
3. Adoption of Agenda
4. Plan of Work

II. Review of Scientific Council Recommendations

III. Joint Session of Commission and Scientific Council

1. 2018 Performance Review
2. Presentation of scientific advice by the Chair of the Scientific Council
    a. Response of the Scientific Council to the Commission's request for scientific advice
    b. Other issues as determined by the Chairs of the Commission and Scientific Council
    c. Feedback to the SC regarding the advice and its work during this meeting.
    d. Working Group on Improving Efficiency of NAFO Working Group Process
3. Meeting Reports of the Joint Commission–Scientific Council Working Groups
    a. Working Group on Improving Efficiency of NAFO Working Group Process
    b. Joint Commission–Scientific Council Working Group on Risk-based Management Strategies (WG-RBMS), August 2018
    c. Joint Commission–Scientific Council Working Group on Ecosystems Approach Framework to Fisheries Management (WG-EAFFM), August 2018
    d. Joint Commission–Scientific Council Catch Estimation Strategy Advisory Group (CESAG), 2018
4. Formulation of Request to the Scientific Council for Scientific Advice on Management in 2020 and Beyond of Certain Stocks in Subareas 2, 3 and 4 and Other Matters

IV. Research Coordination

1. Opening
2. Fisheries Statistics
    a. Progress Reports on Secretariat Activities
    b. Review of STATLANT21
3. Research Activities
    a. Surveys Planned for 2017 and 2018
4. Other Matters
    a. Review of SCR and SCS Documents
    b. Review of Survey SCS Document
    c. Other Business

V. Fisheries Science

1. Opening

2. Nomination of Designated Experts
3. Other Matters
    a. Review of SCR and SCS Documents
    b. Assessments deferred from the June meeting
    c. Other Business

VI. Requests from the Commission

1. Requests/advice deferred from the June Meeting
    a. Scientific Council budget for 2019
    b. Requests arising from Working Groups in 2018
2. *Ad hoc* Requests from Current Meeting

VII. Review of Future Meeting Arrangements

VIII. Future Special Sessions

1. Discussion of proposed topics

IX. Other Matters

1. Timeline for completion of reports
2. Attendance of observers in SC meetings
3. Meetings attended by the secretariat
4. Possible external reviewer for the SC June meeting

X. Adoption of Reports

1. Committee Reports of STACFIS and STACREC
2. Report of Scientific Council

XI. Adjournment

Annex 1. The Commission's Request for Scientific Advice on Management in 2019 and Beyond of Certain Stocks in Subareas 2, 3 and 4 and Other Matters

(NAFO SCS Doc. 18/01)

Following a request from the Scientific Council, the Commission agreed that items 1, 3, 4, 5, and 12 should be the priority for the June 2018 Scientific Council meeting.

1. The 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
Cod in Div. 3M	American plaice in Div. 3LNO Redfish in Div. 3M Northern shrimp in Div. 3M Northern shrimp in Div. 3LNO Thorny skate in Div. 3LNO White hake in Div. 3NO Witch flounder in Div. 3NO Redfish 3LN	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 Div. 2J+3KL Yellowtail flounder in Div. 3LNO Greenland halibut 2+3KLMNO Splendid alfonsino in SA 6

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

In 2018, advice should be provided for 2019 for Cod in Div. 3M and shrimp in Div. 3M.

In 2018, advice should be provided for 2019 and 2020 for, American Plaice in 3LNO, and Thorny Skate in 3LNO.

In 2018, advice should be provided for 2019, 2020 and 2021 for Yellowtail Flounder in 3LNO, Cod in 3NO, and Capelin in 3NO and for alfonsino stocks in the NAFO Regulatory Area.

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 3LN Redfish and 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 management strategy for Greenland halibut in Subarea 2+Div. 3KLMNO will be implemented initially for 6 years beginning in 2018. Acknowledging that an Exceptional Circumstances Protocol is will be developed for this stock in 2018 (see item 3 below), the Commission requests the Scientific Council to monitor the status annually to determine whether exceptional circumstances are occurring. Scientific Council should also perform an "update assessment" in 2020. If either the annual monitoring or the update assessment indicates that exceptional circumstances are occurring, the exceptional circumstances protocol will provide guidance on what steps should be taken.

3. The Commission requests the Scientific Council conduct a full assessment of 3LN Redfish to evaluate the effect of the removals.

4. The Commission requests the Scientific Council to develop criteria for the identification of exceptional circumstances under the Greenland halibut 2+3KLMNO management strategy, this should take into account the issues noted by the WG-RBMS (COM-SC WP 17-06), to support the development of an

exceptional circumstances protocol and provide its recommendations to the WG-RBMS meeting planned for August 2018.

5. The Commission requests the Scientific Council to implement processes to conduct a full benchmark assessment of the 3M Cod in line with the work plan (FC-SC Doc. 17-02, Annex 3) and the steps of the work plan relevant to the SC for progression of the 3M Cod Management Strategy Evaluation for 2019.

6. 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.

7. The Commission requests the Scientific Council to implement the steps of the Action plan relevant to the SC for progression in the management and minimization of Bycatch and discards (COM WP 17-35).

8. The Commission requests the Scientific Council to conduct a full assessment on 3M golden Redfish in 2019 and, acknowledging that there are three species of redfish that exist in 3M and are difficult to separate in the catch, provide advice on the implications for catch reporting and stock management.

9. The Commission requests the Scientific Council provide further guidance on the implementation of an ecosystem approach and application of the Ecosystem Road Map, through examples of how advice compares to single species stock assessment, including additional factors to be considered and integrating trophic level interactions and climate change predictions.

10. In relation to the assessment of NAFO bottom fisheries, the Commission endorsed the next re-assessment in 2021 and that the Scientific Council should:

    - Assess the overlap of NAFO fisheries with VME to evaluate fishery specific impacts in addition to the cumulative impacts;
    - Consider clearer objective ranking processes and options for objective weighting criteria for the overall assessment of significant adverse impacts and the risk of future adverse impacts;
    - Maintain efforts to assess all of the six FAO criteria (Article 18 of the FAO International Guidelines for the Management of Deep Sea Fisheries in the High Seas) including the three FAO functional SAI criteria which could not be evaluated in the current assessment (recovery potential, ecosystem function alteration, and impact relative to habitat use duration of VME indicator species).
    - Continue to work on non-sponge and coral VMEs (for example bryozoan and sea squirts) to prepare for the next assessment.

11. The Commission requests the Scientific Council to continue progression on the review of the NAFO PA Framework.

12. The Commission requests the Scientific Council, by their 2018 annual meeting engage with relevant experts as needed, review additional information beyond what was provided in 2017, on the life history, population status, and current fishing mortality of Greenland sharks (*Somniosus microcephalus*), on longevity and records of Greenland shark bycatch in NAFO fisheries, and develop advice for management, in line with the precautionary approach, for consideration by the Commission.

13. The Commission requests the Scientific Council continue on a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. The strategy and the mid and long-term objectives and tasks in view of NAFO's amended convention objectives should be developed jointly with the Commission. The plan should define for each strategic objective goals, tasks and measurable targets.

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}, 75% F_{2017}, F_{2017}, 125% $F_{2017;}$
- For stocks under a moratorium to direct fishing: F_{2017}, 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(B2020 > B2016)
F in 2017 and following years*	Yield 2018 (50%)	Yield 2019 (50%)	Yield 2020 (50%)	2018	2019	2020	2018	2019	2020		2018	2019	2020	2018	2019	2020	
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_{2017}	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%	%
F_{2017}	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%	%
1.25 X F_{2017}	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_{2017}, F_{2017}, 125% F_{2017};
- For stocks under a moratorium to direct fishing: F_{2017}, 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>F0.1)			P(F>F_{max})				P(B2020 > B2016)
F in 2017 and following years*	Yield 2018	Yield 2019	Yield 2020	2018	2019	2020	2018	2019	2020		2018	2019	2020	2018	2019	2020		
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_{2017}	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
F_{2017}	t	t	t	%	%	%	%	%	%		%	%	%	%	%	%		%
1.25 X F_{2017}	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.

Annex 2. Denmark (on behalf of Greenland) Requests for Scientific Advice on Management in 2019 of Certain Stocks in Subareas 0 and 1
(NAFO SCS Doc. 18/02 Revised)

Golden Redfish, Demersal deep-sea Redfish, Atlantic Wolffish and Spotted Wolffish: Advice on Golden Redfish (*Sebastes marinus*), Demersal Deep-Sea Redfish (*Sebastes mentella*), Atlantic Wolffish (*Anarhichas lupus*) and Spotted Wolffish (*Anarhichas minor*) in Subarea 1 was in June 2017 given for 2018-2020. Consequently, the Scientific Council is requested to continue its monitoring of the above stocks and provide updated advice as appropriate in the event of significant changes in stock levels. Furthermore, the Scientific Council is asked to advice on any other management measures it deems appropriate to ensure the sustainability of these resources.

Greenland Halibut, offshore: For Greenland Halibut in subareas 0 + 1 advice was in 2016 given for 2017 and 2018. Subject to the concurrence of Canada as regards to Subareas 0 and 1, Denmark (on behalf of Greenland) **requests** the Scientific Council before December 2018 to provide advice on the scientific basis for management of offshore Greenland Halibut (*Reinhardtius hippoglossoides*) in the following areas:

a. The offshore areas of NAFO Division 0A and Division 1 A + 1 B

b. NAFO Division 0B and 1C-F.

The Scientific Council is also asked to advise on any other management measures it deems appropriate to ensure the sustainability of these resources.

Greenland Halibut, inshore, Northwest Greenland: Advice on Greenland Halibut in Division 1A inshore was in 2016 given for 2017-2018. Denmark (on behalf of Greenland) requests the Scientific **Council** before December 2018 to provide advice on the scientific basis for management of inshore Greenland Halibut (*Reinhardtius hippoglossoides*) in Division 1A.

Northern Shrimp, West Greenland: Subject to the concurrence of Canada as regards Subarea 0 and 1, Denmark (on behalf of Greenland) requests the Scientific Council before December 2018 to provide advice on the scientific basis for management of Northern Shrimp *(Pandalus borealis)* in Subarea 0 and 1 in 2019 and for as many years ahead as data allows for.

Northern Shrimp. East Greenland: Furthermore, the Scientific Council is in cooperation with ICES requested to provide advice on the scientific basis for management of Northern Shrimp *(Pandalus borealis)* in Denmark Strait and adjacent waters east of southern Greenland in 2019 and for as many years ahead as **data** allows for.

Northern Shrimp in Subarea 0 and 1: Subject to the concurrence of Canada as regards to Subareas 0 and 1, The Scientific Council is asked to update the information about the distribution of Northern shrimp and provide advice on allocation of TAC. Further, Canada is requested to inform on its fishery patterns for the last 10 years as well as the geographical distribution of its fishery also for the last 10 years.

Annex 3. Requests for Advice from Canada

(NAFO SCS Doc. 18/03)

1. **Greenland halibut (Subareas 0 and 1) –** The Scientific Council is requested to provide an overall assessment of status and trends in the total stock area throughout its range and to specifically advise on TAC levels for 2019 and 2020, separately, for Greenland halibut in Divisions OA + 1 A (offshore) and 1 B, and Divisions OB+ 1 C-F[3]. The Scientific Council is also asked to provide advice on any other management measures it deems appropriate to ensure the sustainability of these resources.

    a) It is noted that at this time only general biological advice 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 and include likely risk considerations and implications as much as possible, including risks of maintaining current TAC levels and any risks and available details of observations that would support an increase or decrease in the TAC.[4]

    The following graphs should be presented, for one or several surveys, for the longest time-period possible:
    - Historical catches;
    - Abundance and biomass indices;
    - Age or size range chosen to represent the spawning population;
    - Age or size range chosen to represent the exploited population;
    - Recruitment proxy or index for an age or size-range chosen to represent the recruiting population;
    - Fishing mortality proxy, such as the ratio of reported commercial catches to a measure of the exploited population; and
    - Stock trajectory against reference points.

    Any other information the Scientific Council deems relevant should also be provided.

2. **Shrimp (Divisions 0A and Subarea 1) –** Canada requests the Scientific Council to consider the following options in assessing and projecting future stock levels for Shrimp in Subareas 0 and 1:

    The status of the stock should be determined and management options evaluated for catch options ranging from 30,000 t to the catch corresponding to Z_{MSY}, in 5,000-10,000 t increments (subject to the discretion of Scientific Council), with forecasts for the next 5 years if possible. These options should be evaluated in relation to the Northwest Atlantic Fisheries Organization Precautionary Approach Framework and presented in the form of risk analyses related to the limit reference points B_{lim} 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 2018 to 2022 if possible. 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}, and of exceeding Z_{MSY}; and
    - total area fished for the longest time period possible.

    Any other information the Scientific Council deems relevant should also be provided.

[3] 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.

[4] Canada encourages the Scientific Council to continue to explore opportunities to develop risk-based advice in the future, including the implications of increases in the TAC (e.g. by l 0, 15 or 25%), noting that data conditions do not allow for such advice at this time.

ANNEX 4. DESIGNATED EXPERTS IN 2018

From the Science Branch, Northwest Atlantic Fisheries Centre, Department of Fisheries and Oceans, St. John's, Newfoundland & Labrador, Canada

Cod in Div. 3NO	Rick Rideout	rick.rideout@dfo-mpo.gc.ca
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American Plaice in Div. 3LNO	Laura Wheeland	laura.wheeland@dfo-mpo.gc.ca
Witch flounder in Div. 3NO	Eugene Lee	eugene.lee@dfo-mpo.gc.ca
Witch flounder in Div. 2J+3KL	Laura Wheeland	laura.wheeland@dfo-mpo.gc.ca
Yellowtail flounder in Div. 3LNO	Dawn Maddock Parsons	dawn.parsons@dfo-mpo.gc.ca
Greenland halibut in SA 2+3KLMNO	Joanne Morgan	joanne.morgan@dfo-mpo.gc.ca
Northern shrimp in Div. 3LNO	Katherine Skanes	katherine.skanes@dfo-mpo.gc.ca
Thorny skate in Div. 3LNO	Mark Simpson	mark.r.simpson@dfo-mpo.gc.ca
White hake in Div. 3NO	Mark Simpson	mark.r.simpson@dfo-mpo.gc.ca

From the Department of Fisheries and Oceans, Winnipeg, Manitoba, Canada

Greenland halibut in SA 0+1	Margaret Treble	margart.treble@dfo-mpo.gc.ca

From the Instituto Español de Oceanografia, Vigo (Pontevedra), Spain

Roughhead grenadier in SA 2+3	Fernando Gonzalez-Costas	fernando.gonzalez@ieo.es
Splendid alfonsino in Subarea 6	Fernando Gonzalez-Costas	fernando.gonzalez@ieo.es
Cod in Div. 3M	Diana Gonzalez-Troncoso	diana.gonzalez@ieo.es
Shrimp in Div. 3M	Jose Miguel Casas Sanchez	mikel.casas@ieo.es

From the Instituto Nacional de Recursos Biológicos (INRB/IPMA), Lisbon, Portugal

American plaice in Div. 3M	Ricardo Alpoim	ralpoim@ipma.pt
Golden redfish in Div. 3M	Ricardo Alpoim	ralpoim@ipma.pt
Redfish in Div. 3M	Antonio Avila de Melo	amelo@ipma.pt
Redfish in Div. 3LN	Antonio Avila de Melo	amelo@ipma.pt

From the Greenland Institute of Natural Resources, Nuuk, Greenland

Redfish in SA1	Rasmus Nygaard	rany@natur.gl
Other Finfish in SA1	Rasmus Nygaard	rany@natur.gl
Greenland halibut in Div. 1A	Rasmus Nygaard	rany@natur.gl
Northern shrimp in SA 0+1	AnnDorte Burmeister	anndorte@natur.gl
Northern shrimp in Denmark Strait	Nanette Hammeken	nanette@natur.gl

From Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO), Russian Federation

Capelin in Div. 3NO	Ivan Tretiakov	tis@pinro.ru

From National Marine Fisheries Service, NEFSC, Woods Hole, Massachusetts, United States of America

Northern Shortfin Squid in SA 3 & 4	Lisa Hendrickson	lisa.hendrickson@noaa.gov

APPENDIX IV. LIST SUMMARY (SCS) DOCUMENTS

Summary Documents (SCS)

SCS Doc No.	Serial No.	Author	Title
SCS Doc. 18/11	N6819	NAFO Secretariat	Tagging 2017
SCS Doc. 18/12	N6821	NAFO Secretariat	List of Biological Sampling Data 2017
SCS Doc. 18/20	N6894	NAFO	Report of the Scientific Council, 17 – 21 September 2018

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