



Serial No. N6899

NAFO SCS Doc. 18/22

**SCIENTIFIC COUNCIL MEETING – OCTOBER 2018**

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**SC-NIPAG Participants 2018**



**Back Row:** Tom Blasdale, Antoine Balazuc, Kalvi Hubel, Carsten Hvingel, Frank Rigét

**Front Row:** Guldborg Søvik, AnnDorte Burmeister, Susan Thompson, Brian Healey, Dayna Bell MacCallum

**Missing from photo:** Katherine Skanes

**Report of the Scientific Council Meeting  
17 to 22 October 2018**

Chair: Brian Healey

Rapporteur: Tom Blasdale

**I. PLENARY SESSIONS**

The Scientific Council met at NAFO secretariat, Dartmouth, Nova Scotia from 17 to 22 October 2018, to consider the various matters in its Agenda. Representatives attended from Canada, Denmark (in respect of Greenland), European Union (Estonia), and Norway. The Scientific Council Coordinator and Scientific Information Administrator were in attendance.

The opening session of the Council was called to order at 10:00 on 17 October 2018. The Chair welcomed representatives, advisers and experts to the opening session of Scientific Council. The Chair noted that the primary reason for this meeting was to provide advice on shrimp stocks based on the assessments provided by the joint NAFO/ICES *Pandalus* Assessment Group (NIPAG). ICES members of NIPAG were granted observer status at the Scientific Council meeting, and the Chair wished all NIPAG members a productive and successful meeting.

The Scientific Council Coordinator, Tom Blasdale, was appointed Rapporteur.

Several sessions were held throughout the course of the meeting to deal with specific items on the agenda. The concluding session was convened at 0900 hours on 22 October 2018 when the Council then considered and adopted Sections III.1–4 of the “Report of the NAFO/ICES *Pandalus* Assessment Group” (NAFO SCS Doc. 18/21, ICES CM 2018/ACOM:08). The Council, having considered the results of the assessments of the NAFO stocks, provided advice and recommendations and noted the requests of the Fisheries Commission and Coastal States had been addressed.

The meeting was adjourned at 1500 hours on 22 October 2018, 1 day ahead of the scheduled finish.

The revised Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Representatives, Advisers and Experts, are given in Appendix I, II and III, respectively.

**II. REVIEW OF RECOMMENDATIONS IN 2017**

These were reviewed in the appropriate sections of the NIPAG report.

**III. NAFO/ICES PANDALUS ASSESSMENT GROUP**

In 2018, NIPAG fully assessed two stocks of relevance to NAFO: northern shrimp in Subareas 0 and 1, and northern shrimp in Denmark Strait and off East Greenland. The Scientific Council summary sheets, conclusions and advice for these stocks are presented in Section IV of this report. Additionally, NIPAG conducted interim monitoring for two stocks for which multi-year advice was previously given: Northern shrimp in NAFO Division 3M and Northern shrimp in NAFO Divisions 3LNO. The full NIPAG report is available in NAFO SCS Doc. 18/21 and ICES CM 2018/ACOM:08.

**IV. FORMULATION OF ADVICE (SEE ANNEXES 1, 2 AND 3)**

**1. Request from Fisheries Commission**

**Monitoring of stocks (3LNO shrimp and 3M shrimp) for which multi-year advice was previously given.**

In 2017, SC provided two year management advice for Northern shrimp in Divs. 3LNO and also in Div. 3M. In both cases, it was advised that there should be no directed fishing in 2018 and in 2019 as the stocks were estimated to be below  $B_{lim}$ . In Divs. 3LNO, the current years’ survey data indicates that the stock clearly remains in a poor state. In Div. 3M, the 2018 survey point has shown positive trends since 2014 and indicates that in 2018, the stock has a low probability of being below  $B_{lim}$ . However, considering that the stock remains in a state of impaired recruitment and well below what may be considered healthy levels, the advice for 2019 for no directed fishing was not changed.

The Commission has requested the SC to provide advice for Northern shrimp in Div. 3M for 2020 in advance of the 2019 NAFO annual meeting. Although the NIPAG 2019 meeting will occur in November, NIPAG in conjunction with SC will meet by WebEx in early September 2019 to provide updates of stock status and also advice for Div. 3M in 2020, and for Divs. 3LNO in 2020 and 2021. In November 2019 NIPAG in conjunction with SC will produce provisional advice for 3M in 2021, which will be updated if required in a WebEx in September 2020.

**2. Requests from Coastal States**

**a) Northern shrimp in Subarea 1 and Div. 0A**

Advice October 2018 for 2019

**Recommendation**

In line with the stated management objective of maintaining a mortality risk of no more than 35% (subject to a risk of biomass being below  $B_{lim}$  of less than 5%), Scientific Council advises that catches in 2019 should not exceed 105 000 t.

**Management Objectives**

A management plan and management objectives have been defined by the Government of Greenland in 2018. The objective is to maintain a mortality risk of no more than 35% (subject to a risk of biomass being below  $B_{lim}$  of less than 5%). Advice was also drafted to be consistent with the NAFO precautionary approach (FC Doc. 04-12).

Objective	Status	Comment/consideration
Apply Precautionary Approach	●	Stock status is both estimated and forecast relative to precautionary reference points

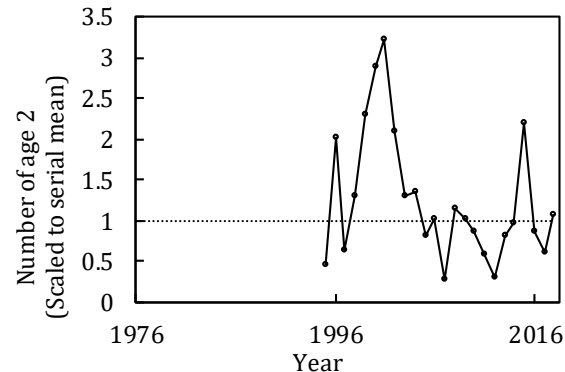
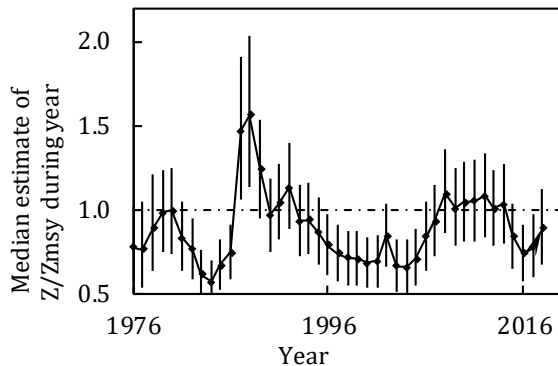
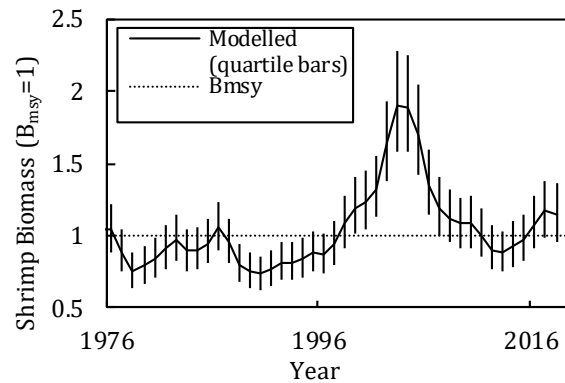
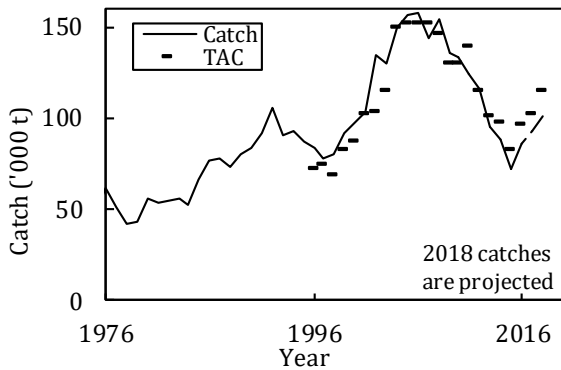
● OK

**Management unit**

The stock, considered distinct from all others, is distributed throughout Subarea 1, extends into Div. 0A east of 60°30'W, and is assessed as a single stock.

**Stock status**

Biomass at the end of 2018 is close to  $B_{msy}$  and the probability of being below  $B_{lim}$  is very low (<1%). The probability of mortality in 2018 being above  $Z_{msy}$  is 36%. Recruitment is close to average.



## Reference points

$B_{lim}$  has been established as 30%  $B_{msy}$ , and  $Z_{msy}$  (fishery and cod predation) has been set as the mortality reference point (FC Doc. 04-18).  $B_{msy}$  and  $Z_{msy}$  are estimated directly from the assessment model.

## Projections

Predicted probabilities of transgressing precautionary reference points in 2019 – 2021 under eight catch options and subject to predation by a cod stock with an effective biomass of 34 Kt.

34 000 t cod Risk of:	Catch option ('000 tons)							
	80	85	90	95	100	105	110	115
falling below $B_{msy}$ end 2019 (%)	30	30	31	32	33	33	33	34
falling below $B_{msy}$ end 2020 (%)	30	30	30	33	34	35	35	37
falling below $B_{msy}$ end 2021 (%)	29	29	31	34	34	36	37	38
falling below $B_{lim}$ end 2019 (%)	0	0	0	0	0	0	0	0
falling below $B_{lim}$ end 2020 (%)	0	0	0	0	0	0	0	0
falling below $B_{lim}$ end 2021 (%)	0	0	0	0	0	0	0	0
exceeding $Z_{msy}$ in 2019 (%)	13	17	21	26	30	35	40	44
exceeding $Z_{msy}$ in 2020 (%)	13	17	22	26	31	36	41	46
exceeding $Z_{msy}$ in 2021 (%)	14	17	23	27	32	38	42	47

## Assessment

Advice is based on risk analysis coming from a quantitative model. The analytical assessment was run in 2018 with revised treatment of the input data (SCR Doc.18-56, 18-60) and with updated data series.

The next assessment is scheduled for 2019.

### Human impact

Mortality related to the fishery has been documented. Other human sources (e.g. pollution, shipping, oil-industry) are considered minor.

### Biological and Environmental Interactions

Cod is an important predator on shrimps. This assessment incorporates this interaction. Other predation is likely but not explicitly considered. Shrimps might be important predators on, for example, fish eggs and larvae.

## Fishery

Shrimps are caught in a directed trawl fishery. Bycatch of fish in the shrimp fishery is around 1% by weight. The fishery is regulated by TAC.

Recent catches and TACs (t) have been as follows:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Enacted TAC <sup>1</sup>	130 153	130 153	139 583	114 425	100 596 <sup>1</sup>	97 649 <sup>1</sup>	82 561 <sup>1</sup>	96 426 <sup>1</sup>	101 706 <sup>1</sup>	114 876 <sup>1</sup>
STATLANT 21	133 990	129 179	123 195	114 970	91 802	88 834	71 777	82 922	89 069	-
NIPAG	135 458	133 991	123 989	115 977	95 381	88 765	72 256	85 527	89 396	101 250 <sup>2</sup>

<sup>1</sup> Sum of TACs autonomously set by Canada and Greenland.

<sup>2</sup> Expected to year end

## Effects of the fishery on the ecosystem

Measures to reduce effects of the fishery on the ecosystem include area closures, moving rules and gear modifications to reduce damage to benthic communities and reduce bycatch.

**Source of Information** SCS Doc 13/04, FC Docs 04-18, SCR Docs 18-55, 56, 57, 58, 60.

## b) Northern shrimp in Denmark Strait and off East Greenland

Advice October 2018 for 2019

### Recommendation

In 2016 the stock remained at a low level, comparable to previous years, and there is no new information to indicate a change in stock status. Given the lack of current information, SC is not able to provide advice on the sustainable exploitation of this stock. As an interim measure, it is not considered appropriate that catches should exceed 2 000 t. SC advises that a survey should be carried out in future years.

### Management objectives

No explicit management plan or management objectives have been defined by the Government of Greenland.

Objective	Status	Comment/consideration
Apply Precautionary Approach	●	$B_{lim}$ is defined. No fishing mortality reference point defined

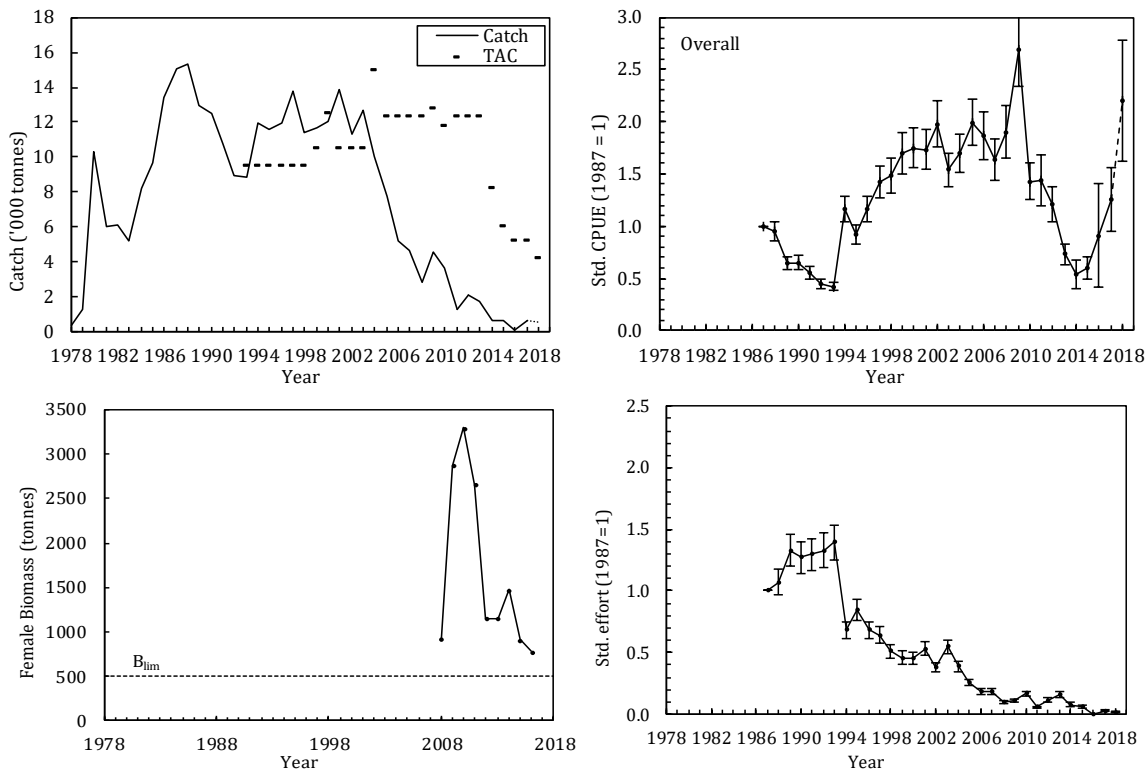
● Intermediate

### Management unit

The shrimp stock is distributed off East Greenland in ICES Div. XIVb and Va and is assessed as a single population.

### Stock status

The stock size remained at a very low level (relatively close to  $B_{lim}$ ) in 2016 despite several years of very low exploitation rates. There is no new information to indicate a change in stock status.



### Reference points

Scientific Council considers that a female survey biomass index of 15% of its maximum observed level provides a proxy for  $B_{lim}$  (SCS Doc. 04-12).

## Projections

Quantitative assessment of risk at various catch options is not possible for this stock at this time.

## Assessment

Advice is based on qualitative evaluation of biomass indices in relation to historic levels.

Evaluation of stock status is based upon interpretation of commercial fishery and research survey data. The trends in the survey and the standardized CPUE have been similar since the start of the survey, however they diverged in 2016, the last year for which there are survey data available. Since 2015, this has been an opportunistic fishery with vessels stopping off on route between other fishing grounds. Therefore CPUE may no longer be a reliable indicator of the stock status. No survey was carried out in 2017 and 2018.

### *Human impact*

Mainly fishery related mortality has been documented. Other sources (e.g. pollution, shipping, oil-industry) are considered minor.

### *Biological and Environmental Interactions*

Cod is an important predator on shrimp. The cod stock has generally been increasing in East Greenland waters since 2008.

## Fishery

Shrimp is caught in a directed trawl fishery. The fishery is regulated by TAC and bycatch reduction measures include move-on rules and Nordmøre grates.

Recent catches (tonnes) were as follows:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Enacted TAC	12835	11835	12400	12400	12400	8300	6100	5300	5300	4300
SC Recommended TAC	12400	12400	12400	12400	12400	2000	2000	2000	2000	2000
NIPAG	4555	3602	1199	2109	1717	622	576	49	561	545 <sup>1</sup>

<sup>1</sup> To July 2018

## Effects of the fishery on the ecosystem

Measures to reduce effects of the fishery on the ecosystem include move-on rules to protect sponges and corals.

## Source of Information

SCR Doc. 18-059



### c) Distributions of 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.*

Scientific Council responded:

From 1993 to 2010 the Greenlandic survey in the Canadian area (SFA1) was conducted annually. In this period average biomass, in that area, was 2% of the total biomass estimated in Subarea 1 and Div. 0A. From 2011, due to ice cover, there has only been sporadic information from the Greenlandic survey in the Canadian area (SFA1). The area was surveyed only in 2013 and 2017. In 2013, the biomass in that area (SFA1) was less than 1% of the total estimated biomass in in Subarea 1 and Div. 0A and about 2% in 2017.

## V. OTHER MATTERS

### 1. Scheduling of Future Meetings

#### a) Scientific Council Meetings

##### *i) Scientific Council (in conjunction with NIPAG), September 2019*

This meeting will be convened prior to the NAFO annual meeting to provide advice on shrimp in 3M and 3LNO for 2020 as requested by the Commission (COM Doc. 18-20). Meeting dates and location are to be decided

##### *ii) Scientific Council (in conjunction with NIPAG), November 2019*

The 2019 SC shrimp meeting will be held in Tromsø, Norway 8 to 13 November 2018

#### b) NAFO/ICES Joint Working Groups

##### *i) NIPAG, 08 - 13 November 2019*

This meeting will be held in Tromsø, Norway 8 to 13 November 2018.

### 2. Topics for Future Special Sessions

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.

### 3. Other Business

#### a) Future of NIPAG and timing of future meetings

NIPAG discussed the future of the working group and timing of future meetings. A full account of this discussion is given in the NIPAG report.

Due to differences in the timing of advice requirements and in the availability of survey and/or logbook data, there is no ideal date which is suitable for all stocks. ICES have requested that advice for the Norwegian Deep/Skagerrak stock in March to include the latest survey data, whereas NAFO Commission have requested advice for the 3M stock prior to the September meeting to include data from the July survey. A September meeting would not be suitable for either Greenland or Barents Sea stocks due to survey data availability: for these stocks, the ideal timing would be later in the year.

Consequently it has been decided that:

- the assessment for the Norwegian Deep/Skagerrak stock will take place outside the main NIPAG meeting in a separate meeting in March.
- the next NIPAG meeting will take place in November 2019
- ICES scientists will continue to participate in the NIPAG meeting as much as possible although no advice will be produced for the Norwegian Deep/Skagerrak stock. NIPAG was informed that the incoming ICES Co-chair for NIPAG would be Ole Ritzau (EU-Denmark).
- an additional NIPAG/NAFO SC WebEx meeting will be held in September to produce advice on 3M and 3LNO stocks.

The main NIPAG meeting will be in November. This meeting will continue to produce advice for the two Greenland stocks and the Barents sea stock and provisional advice for 3M and 3LNO according to the NAFO advice schedule. The 2019 NIPAG meeting will be held in Tromsø, 8 to 13 November.

If required, NAFO will hold an additional meeting by WebEx immediately before the NAFO annual meeting in September. The report will be included as an appendix to the NIPAG report following review by the November NIPAG meeting.

This scheduling will be re-evaluated in the NIPAG meeting in 2020.

## **VI. ADOPTION OF SCIENTIFIC COUNCIL AND NIPAG REPORTS**

The Council at its session on 21 October 2018 considered and adopted Sections III.1-4 of the “Report of the NAFO/ICES *Pandalus* Assessment Group” (NAFO SCS Doc. 18-21 and ICES CM 2018/ACOM:08). The Council then considered and adopted its own report of the October 2018 meeting subject to editorial changes after the meeting.

## **VII. ADJOURNMENT**

NIPAG meeting was adjourned at 1500 hours on 22 October 2018, 1 day ahead of the scheduled finish. The Chairs thanked all participants, especially the designated experts, for their hard work. The Chair thanked the NAFO and ICES Secretariats for all of their logistical support. The report was adopted at the close of the meeting, subject to a two week period for editorial changes.

**APPENDIX I. PROVISIONAL AGENDA – SCIENTIFIC COUNCIL MEETING**

NAFO Secretariat, Dartmouth Nova Scotia  
17-23 October 2018

- I. Opening (Chair: Brian Healey)
  1. Appointment of Rapporteur
  2. Adoption of Agenda
  3. Attendance of Observers
  4. Plan of Work
- II. Review of Recommendations in 2017
- III. NAFO/ICES *Pandalus* Assessment Group (Co-chairs Brian Healey and Guldborg Søvik)
- IV. Formulation of Advice (see Annexes 1–3 of Appendix I)
  1. Request for Advice on TACs and Other Management Measures (Item 1, Annex I)
    - a) Northern shrimp in Div. 3LNO (interim monitoring report)
    - b) Northern shrimp in Div. 3M (full assessment)
  2. Requests from Coastal States (Items 5 and 6 of Annex II, item 2 of Annex III)
    - a) Northern shrimp (Subareas 0 and 1)
    - b) Northern shrimp (in Denmark Strait and off East Greenland)
    - c) Distribution of Northern Shrimp in Subarea 0 and 1 (Denmark request #6)
- V. Other Matters
  1. Scheduling of Future Meetings
  2. Topics for Future Special Sessions
  3. Other Business
- VI. Adoption of Scientific Council and NIPAG Reports
- VII. 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. 18/02]

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).

<u>Yearly basis</u>	<u>Two-year basis</u>	<u>Three-year basis</u>
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

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

F in 2017 and following years*	Yield 2018 (50%)	Yield 2019 (50%)	Yield 2020 (50%)	P(F>F <sub>lim</sub> )			P(B<B <sub>lim</sub> )			P(F>F <sub>msy</sub> )			P(B<B <sub>msy</sub> )			P(B <sub>2020</sub> > B <sub>2016</sub> )
				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	%	%	%	%	%	%	%	%	%	%	%	%	%
$0.75 \times F_{2017}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$F_{2017}$	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
$1.25 \times F_{2017}$	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 <sub>lim</sub> )			P(B<B <sub>lim</sub> )			P(F>F <sub>0.1</sub> )			P(F>F <sub>max</sub> )			P(B <sub>2020</sub> > B <sub>2016</sub> )
F in 2017 and following years*	Yield 2018	Yield 2019	Yield 2020	2018 2019 2020			2018 2019 2020			2018 2019 2020			2018 2019 2020			
				2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020	
F <sub>0.1</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
66% F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
75% F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
85% F <sub>max</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
0.75 X F <sub>2017</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
F <sub>2017</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%
1.25 X F <sub>2017</sub>	t	t	t	%	%	%	%	%	%	%	%	%	%	%	%	%



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

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

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

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

And any information the Scientific Council deems appropriate.



**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]

1. **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.
2. **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.
3. **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.
4. **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.
5. **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.
6. **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 CF<sup>1</sup>. 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.<sup>2</sup>

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.

<sup>1</sup> 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.

<sup>2</sup> 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 10, 15 or 25%), noting that data conditions do not allow for such advice at this time.

**APPENDIX II. LIST OF RESEARCH (SCR) AND SUMMARY (SCS) DOCUMENTS**

**RESEARCH DOCUMENTS (SCR)**

SCR No.	Serial No.	Author(s)	Title
SCR Doc. 18-054	N6855	J.M. Casas Sánchez	Division 3M Northern shrimp ( <i>Pandalus borealis</i> ) – Interim Monitoring Update
SCR Doc. 18-055	N6869	Burmeister and Riget	The West Greenland trawl survey for <i>Pandalus borealis</i> , 2018, with reference to earlier results
SCR Doc. 18-056	N6870	Burmeister and Riget	A provisional Assessment of the shrimp stock off West Greenland in 2018
SCR Doc. 18-057	N6871	Burmeister and Riget	The Fishery for Northern Shrimp ( <i>Pandalus borealis</i> ) off West Greenland, 1970–2018
SCR Doc. 18-058	N6872	Burmeister and Riget	Catch Table Update for the West Greenland Shrimp Fishery
SCR Doc. 18-059	N6873	Riget and Burmeister	The Fishery for Northern Shrimp ( <i>Pandalus borealis</i> ) in Denmark Strait / off East Greenland 1978 – 2018.
SCR Doc. 18-060	N6874	Riget, Burmeister and Hvingel	Improvements of the Greenlandic shrimp model
SCR Doc. 18-061	N6875	Burmeister	Reply to the Canadian request for advice of shrimps in Subarea 0 and 1
SCR Doc. 18-062	N6879	J.M. Casas Sánchez	Northern Shrimp ( <i>Pandalus borealis</i> ) on Flemish Cap Surveys 2018
SCR Doc. 18-063	N6880	Casas, J.M., E. Román and M. Álvarez	Northern Shrimp ( <i>Pandalus borealis</i> , Krøyer) from EU-Spain Bottom Trawl Survey 2018 in NAFO Div. 3LNO
SCR Doc. 18-064	N6881	J.M. Casas Sánchez	Assessment of the International Fishery for Shrimp ( <i>Pandalus borealis</i> ) in Division 3M (Flemish Cap), 1993-2018
SCR Doc. 18-065	N6882	Carsten Hvingel and Trude H. Thangstad	The Norwegian fishery for northern shrimp ( <i>Pandalus borealis</i> ) in the Barents Sea and round Svalbard 1970-2018
SCR Doc. 18-066	N6883	Carsten Hvingel and Trude H. Thangstad	Research survey results pertaining to northern shrimp ( <i>Pandalus borealis</i> ) in the Barents Sea and Svalbard area 2004-2017
SCR Doc. 18-067	N6884	Carsten Hvingel	Shrimp ( <i>Pandalus borealis</i> ) in the Barents Sea – Stock assessment 2018
SCR Doc. 18-068	N6897	G. Søvik and T. H. Thangstad	Results of the Norwegian Bottom Trawl Survey for Northern Shrimp ( <i>Pandalus borealis</i> ) in Skagerrak and the Norwegian Deep (ICES Divisions 3.a and 4.a east) in 2018

**SUMMARY DOCUMENTS (SCS)**

<b>SCS No.</b>	<b>Serial No.</b>	<b>Author(s)</b>	<b>Title</b>
SCS Doc. 18/21	N6898	NAFO/ICES	NIPAG Report 2018
SCS Doc. 18/22	N6899	NAFO	Report of the Scientific Council- Shrimp Meeting 2018

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