

Northwest Atlantic Fisheries Organization



**Report of the NAFO Joint Commission-Scientific Council Working Group on
Risk-Based Management Strategies (WG-RBMS) Meeting**

17-20 July 2023
Edinburgh, United Kingdom

NAFO
Halifax, Nova Scotia, Canada
2023

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1. Opening by co-Chairs, Fernando Gonzalez-Costas (European Union) and Ray Walsh (Canada)

The meeting was opened by the co-Chairs Fernando González-Costas (European Union) and Ray Walsh (Canada) at 09:00 hours (UTC/GMT +1 hours in Edinburgh, United Kingdom) on Monday, 17 July 2023.

The co-Chairs welcomed participants attending in person and virtually. This included representatives from Canada, European Union, France (on behalf of St. Pierre et Miquelon), Japan, Norway, Russian Federation, United Kingdom, and United States of America, as well as the NAFO Scientific Council (SC) Chair and invited experts on Precautionary Approach Framework on Fisheries Management (Annex 1).

2. Appointment of Rapporteurs

The NAFO Secretariat was appointed as Rapporteur.

3. Adoption of Agenda

The co-Chairs highlighted that a small revision was made to the provisional agenda that was circulated on 10 July 2023. Canada requested to include an item on the WG-RBMS work plan and future priorities under other business (agenda item 10). Additionally, the working group discussed the matter of meeting formats and participation under other business.

The adopted agenda is outlined in Annex 2.

4. Application of the 2+3KLMNO Greenland halibut Management Strategy

The Chair of the Scientific Council, Karen Dwyer (Canada), presented the Scientific Council response to Commission Request #2 (from COM Doc. 22-20) relating to exceptional circumstances and application of the harvest control rule (HCR) for Greenland halibut. The Scientific Council chair noted that exceptional circumstances are occurring as a result of several missing survey values over the last five years from both high and low weighted surveys. However, following sensitivity testing, the Scientific Council concluded that the agreed management procedure, with the exclusion of the Canada 3LNO Spring series, can still be used for the total allowable catch (TAC) calculation.

The WG-RBMS thanked the Scientific Council Chair for the presentation, and the Scientific Council for their work. Consistent with the Scientific Council advice, WG-RBMS agreed to recommend to the Commission that the agreed Management Procedure be applied to set the TAC for 2024.

5. Continue progress on the MSE process for 2+3KLMNO Greenland halibut

Paul Regular (Canada), and Doug Butterworth (Japan) provided an update on the Scientific Council's progress for the management strategy evaluation (MSE) process for Greenland halibut in NAFO Subarea 2 and Divisions 3KLMNO in COM-SC RBMS-WP 23-18 and COM-SC RBMS-WP 23-14. Doug presented the statistical catch-at-age (SCAA) assessment model results (SCR Doc, 23-044) and Paul presented the results for the state space stock assessment model (SSM) in an online dashboard. The working group thanked Paul and Doug for the updates and commented that the online dashboard was a useful tool to store the results and could facilitate future traceability.

It was noted that the Scientific Council, at the June 2023 meeting and subsequent work in July, proposed to use the four primary operating models (OMs) from the previous MSE of this stock, with the addition of further robustness tests using different survey series and life history options, bringing the total number to 15 model formulations to be implemented under both SCAA and SSM. The WG-RBMS agreed to move forward with the expanded OMs, with the exception of the OM model that only uses EU data as the scenario was seen as very unlikely. It was recognized that the MSE technical team may need to make adjustments to the OMs as work continues.

The working group also reflected on the performance statistics that were agreed at the previous meeting in COM-SC RBMS-WP 23-08 (Revised), noting that some refinements were required to finalize them, particularly in relation to the statistic for low risk of exceeding F_{msy} . The objective of “*Low risk of exceeding FMSY*” was considered as desirable secondary objectives and an additional statistic assessing the risk of exceeding F_{msy} when B is below B_{msy} was added. The working group agreed to the management objectives and performance statistics outlined in COM-SC RBMS-WP 23-08 (Rev. 2) (Annex 3).

Additionally, Paul presented an alternative conceptual candidate management procedure (CMP) for consideration, noting the general steps of the probability-based rule are to calculate the probability that the stock is above target levels, calculate the probability that the stock is growing, and use both probabilities to adjust the TAC each year. The working group agreed to move forward with testing the alternative CMP starting with the SSM assessment model. Once the results of initial testing are reviewed, testing may continue with the SCAA model.

6. Progress on the MSE process for 3LN redfish

Andrea Perreault (Canada) provided a detailed presentation on the MSE for redfish in NAFO Divisions 3LN in COM-SC RBMS-WP 23-16. The presentation provided updates on the impacts of the loss of the Canadian spring survey, Canadian efforts to develop conversion factors, progress on development of OMs and performance statistics, and an initial discussion of the CMPs. Andrea noted that in general, the 3LN Redfish MSE process is on track to follow the timelines outlined in the workplan (COM-SC RBMS-WP 23-06 Rev. 3) (Annex 4). The working group thanked Andrea for the updates.

7. Next steps in the MSE processes

The working group reviewed the work plan for the Greenland halibut and redfish MSE processes that had been updated at the last meeting in COM-SC RBMS-WP 23-06 (Rev. 2). A minor revision was made related to planned Scientific Council discussions on the exceptional circumstances protocol for Greenland halibut scheduled for January 2024. It was noted that the Scientific Council will not be able to complete this item until the management procedure has been selected. The working group agreed to forward the work plan for 2024 outlined in COM-SC RBMS-WP 23-06 (Rev. 3) (Annex 4) to the Commission and the Scientific Council for endorsement.

8. Precautionary Approach Review progress

a. Update from the Scientific Council and Discussion

The co-Chair of the Precautionary Approach Working Group (PA-WG), Fernando González-Costas (European Union), presented the Scientific Council response to Commission request #7 (from COM Doc. 22-20) relating to the review of the precautionary approach framework in COM-SC RBMS-WP 23-17. It was noted that in its 14 July 2023 meeting (SCS Doc. 23-17), the Scientific Council agreed to add a case study for 3NO witch flounder, in addition to those for 3M cod, 3LNO yellowtail flounder, and 3M redfish, as only one of the initial three stocks was in the ‘danger/recovery zone’ (since agreed to as “Cautious Zone”). The presentation also highlighted three possible frameworks for consideration with Option 1 having one intermediate biomass reference point: B_{buffer} ; Option 2 having one intermediate biomass reference point: $B_{trigger}$; and Option 3 having two intermediate biomass reference points: B_{buffer} and $B_{trigger}$.

The Scientific Council agreed with the proposed zone names that were put forward by the WG-RBMS during the meeting in April 2023 (Healthy Zone, Cautious Zone, and Critical Zone). The working group agreed with the Scientific Council's suggestion that the fishing mortality zones should not be named.

b. Development of provisional draft framework

The working group thanked the PA-WG co-Chair and the Scientific Council for their work. Following the presentation and subsequent discussions of the advice, the working group agreed to move forward with Option 2, which includes the one intermediate biomass reference point: B_{trigger} (which it was agreed should be set between 0.7 and $0.8 \cdot B_{\text{msy}}$).

The working group proposed management actions for each zone, in particular for the cautious zone. The working group proposed a draft provisional framework that provides flexibility to managers to set exploitation levels within upper and lower limits bounds. This framework is set out in COM-SC RBMS-WP 23-20 (Revised) (Annex 5). The working group recognized that further refinement and /or revision of the draft provisional framework may be required.

Following the development of the draft provisional framework, the working group updated the work plan (COM-SC RBMS-WP 23-19 (Revised)) (Annex 6) and agreed to forward both the workplan and the draft provisional framework to the Commission for endorsement.

9. Review of the Terms of Reference for WG-RBMS

The working group reviewed the Terms of Reference (FC Doc. 13-18) and reflected on the discussions from the April 2023 meeting relating to the flow of information between the working group and the Scientific Council. The working group noted that its current Terms of Reference allow for the flow of information between the working group and the Scientific Council as its current work is already provided for by a Commission-approved work plan. The co-Chair of the WG-EAFFM, Elizabethann Mencher (United States of America) noted that WG-EAFFM would also be reviewing proposed edits to its Terms of Reference in the meeting scheduled for 20-22 July 2023. WG-RBMS agreed that further review of its Terms of Reference could be considered at the NAFO Annual Meeting, taking into consideration any proposed revisions to the Terms of Reference for the WG-EAFFM.

During the discussions, Scientific Council members noted that there may be a need to review its current practices within the SC related to peer review of ongoing work / input associated with multi-step initiatives. It was noted that the Scientific Council process for peer reviewed information can take a considerable amount of time, and that the Scientific Council may reflect on this at the 2023 Annual Meeting.

10. Other Business

a. Work plan and future priorities

Canada noted that, separate from the work planning on ongoing MSE processes for Greenland halibut and 3LN redbfish, WG-RBMS should reflect on its future work to develop management strategies for other NAFO-managed stocks in the next 3 to 5 years. Canada expressed the view that 3NO witch flounder and 3LNO yellowtail flounder should be the next priority stocks for WG-RBMS and that establishing management strategies for these stocks would support NAFO's primary objective of ensuring the long-term conservation and sustainable use of the fisheries resources in the Convention Area. Canada noted that it would also be in the interest of all Contracting Parties that have a desire to meet both emerging requirements of NAFO's future Precautionary Approach Framework (PAF), as well as requirements of the newest version of the Marine Stewardship Council (MSC) Standard.

With respect to timing, Canada stated that given current workplans for NAFO's reviews of the PAF and the two MSEs, initial planning of MSE processes and timelines for 3NO witch flounder and 3LNO yellowtail flounder could begin as early as the August 2024 meeting of WG-RBMS without adding to SC and WG-RBMS workload.

Canada flagged its intention to explore the possibility of a simplified version of the MSE approach (as opposed to full simulation testing), in large part to reduce demands on the Scientific Council and will report back to WG-RBMS on any outcomes of these discussions.

The working group thanked Canada for initiating the discussions on the future work of WG-RBMS and expressed interest in the results of Canada's exploration of the simplified MSE approach for 3NO witch flounder and 3LNO yellowtail flounder.

b. Meeting formats and participation

The working group discussed the new hybrid meeting format that had become standard practice following the COVID-19 pandemic. It was noted that in person participation is ideal as it better facilitates the meeting dialogue and allows better opportunities for networking and additional discussions on the margins of meetings, but that some Contracting Parties are facing travel constraints. The working group agreed to request the Commission and Scientific Council to reflect on meeting formats (in-person, hybrid, virtual) and Contracting Party participation.

11. Recommendations

The WG-RBMS agreed to the following conclusions and recommendations.

In relation to the application of the 2+3KLMNO Greenland halibut Management Strategy (agenda item 4), WG-RBMS:

1. recommends that the existing management procedure be used to set the total allowable catch for 2024.

In relation to the progress on the MSE process for 2+3KLMNO Greenland halibut (agenda item 5), WG-RBMS:

2. agrees to the management objectives and performance statistics outlined in COM-SC RBMS-WP 23-08 (Rev. 2) (Annex 3).
3. agrees to a second Candidate Management Procedure to be tested in the MP revision process.

In relation to the in the MSE processes (agenda item 7), WG-RBMS:

4. recommends that the 2024 MSE workplan outlined in COM-SC RBMS-WP 23-06 (Rev. 3) (Annex 4) be forwarded to the Commission for endorsement.

In relation to the Precautionary Approach (agenda item 8), WG-RBMS:

5. recommends that the NAFO Commission endorse the Provisional Draft Precautionary Approach (PA) framework (COM-SC RBMS-WP 23-20 (Revised) (Annex 5).
6. recommends that the updated PA workplan outlined in COM-SC RBMS-WP 23-19 (Revised) (Annex 6) be forwarded to the Commission for endorsement.

In relation to meeting participation (agenda item 10.b), WG-RBMS:

7. requests the Commission and Scientific Council reflect on meeting formats (in-person, hybrid, virtual) and Contracting Party participation with a goal of ensuring that meetings are both efficient and effective.

12. Adoption of report

The report was adopted via correspondence following the end of the meeting.

13. Adjournment

The meeting adjourned early at 15:23 hours (UTC/GMT +1 hours in Edinburgh, United Kingdom) on Wednesday, 19 July 2023.

The co-Chairs thanked meeting participants for their cooperation and input. The participants likewise expressed their thanks and appreciation to the co-Chairs for their leadership. The working group also expressed their gratitude to the United Kingdom for hosting the meeting, and the NAFO Secretariat for their support.

Annex 1. List of Participants

| | |
|--|--|
| CO-CHAIRS | In-person González-Costas, Fernando (European Union) Walsh, Ray (Canada) |
| SC CHAIR | Virtual Dwyer, Karen |
| CANADA | In-person Burns, Adam Chapman, Bruce Johnson, Kate Koen Alonso, Mariano Regular, Paul Simpson, Mark Virtual Dennis, Olivia Diamond, Julie Fagan, Robert Hatefi, Fatemeh Her, Natalie Krohn, Martha Perreault, Andrea Lebeau, Amy Lee, Robyn Rayner, Gemma Schleit, Katie |
| EUROPEAN UNION | In-person Alpoim, Ricardo Belmonte Gonzalez, Luis Cortina Burgueño, Angela González-Troncoso, Diana Teixeira, Isabel Virtual Blazkiewicz, Bernard Garrido, Irene Gonçalves, Patrícia Granell, Ignacio Jansone, Santa Lopes, Luis Mancebo, C. Margarita Merino Buisac, Adolfo Tuvi, Aare |
| FRANCE (IN RESPECT OF ST. PIERRE ET MIQUELON) | Virtual Larrat, Clémence |
| JAPAN | In-person Taki, Kenji Virtual Akiyama, Masahiro Butterworth, Doug Rademeyer, Rebecca Takehara, Toya |

| | |
|---------------------------------|---|
| NORWAY | Virtual Hvingel, Carsten |
| RUSSIAN FEDERATION | Virtual Fomin, Konstantin Tairov, Temur |
| UNITED KINGDOM | In-person De Oliveira, Jose Francis, Will Ryan, Jack Virtual Hutchinson, Nikki Readdy, Lisa |
| UNITED STATES OF AMERICA | In-person Kelly, Moira Mencher, Elizabethann Warner-Kramer, Deirdre Yanoff, Callan Virtual Jaburek, Shannah Sosebee, Kathy |
| INVITED EXPERTS | In-person Howell, Daniel Virtual Cadrin, Steven Horbowy, Jan |
| NAFO SECRETARIAT | In-person Benediktsdóttir, Brynhildur Aker, Jana Blasdale, Tom LeFort, Lisa |

Annex 2. Agenda

1. Opening by co-Chairs, Fernando Gonzalez-Costas (European Union) and Ray Walsh (Canada)
2. Appointment of Rapporteurs
3. Adoption of Agenda
4. Application of the 2+3KLMNO Greenland halibut Management Strategy
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7. Next steps in the MSE processes
8. Precautionary Approach Review progress
 - a. Update from the Scientific Council and Discussion
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 - b. Meeting formats and participation
11. Recommendations
12. Adoption of report
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**Annex 3. Provisional management objectives and the performance statistics for the
Greenland halibut MSE**
(COM-SC RBMS-WP 23-08 (Rev. 2))

Table 1: Provisional management objectives and the performance statistics for the Greenland halibut MSE. Objectives in bold have been identified as the primary required objectives and the remaining are desirable secondary objectives.

| Management Objectives | Performance Statistics | Criteria |
|---|---|--|
| Restore to within a prescribed period of time or maintain at B_{MSY} | $B_{2044}^{5-9}/B_{MSY}^{5-9}$ | median and 80% PI |
| | $B_{2044}^{5-9} < B_{MSY}^{5-9}$ | $P \leq 0.5$ |
| | $B_{2030}^{5-9} < 0.8B_{MSY}^{5-9}$ | $P \leq 0.25$ |
| | $B_{2044}^{5-9} < 0.8B_{MSY}^{5-9}$ | $P \leq 0.25$ |
| The risk of failure to meet the B_{msy} target and interim biomass targets within a prescribed period of time should be kept moderately low | $B_{lowest}^{5-9}/B_{MSY}^{5-9}$ | median and 80% PI |
| | $B_{2030}^{5-9} < B_{2025}^{5-9}$ | $P \leq 0.25$ |
| Low risk of exceeding F_{MSY} | $P(F_y^{5-9} > F_{MSY}^{5-9}) > 0.3$ | count; $y = 2025 - 2044$ |
| | $P(F_y^{5-9} > F_{MSY}^{5-9} \mid B_y^{5-9} < B_{MSY}^{5-9}) > 0.3^*$ | count; $y = 2025 - 2044$ |
| Very low risk of going below an established threshold | $B_{2044}^{sp}/B_{2025}^{sp}$ | median and 80% PI |
| | $B_{2044}^{5-9}/B_{2025}^{5-9}$ | median and 80% PI |
| | $P(B_y^{5-9} < 0.3B_{MSY}^{5-9}) \geq 0.1$ | count; $y = 2025 - 2044$ |
| | $B_{lowest}^{5-9}/B_{MSY}^{5-9} < 0.3$ | $P \leq 0.1$ |
| Maximize yield in the short, medium and long term | $\bar{C}_{2025-2029} = \sum_{y=2025}^{2029} C_y/5$ | median and 80% PI |
| | $\bar{C}_{2025-2034} = \sum_{y=2025}^{2034} C_y/10$ | median and 80% PI |
| | $\bar{C}_{2025-2044} = \sum_{y=2025}^{2044} C_y/20$ | median and 80% PI |
| The risk of steep decline of stock biomass should be kept moderately low | $B_{2030}^{5-9} < 0.75B_{2025}^{5-9}$ | $P \leq \begin{cases} 0.1, & B_{2025}^{5-9} < 0.8B_{MSY}^{5-9} \\ 0.25, & B_{2025}^{5-9} > 0.8B_{MSY}^{5-9} \end{cases}$ |
| Keep inter-annual TAC variation below an established threshold | $AAV_{2025-2029} = \frac{1}{5} \sum_{y=2025}^{2029} \frac{ C_y - C_{y-1} }{C_{y-1}}$ | median and 80% PI |
| | $AAV_{2025-2044} = \frac{1}{20} \sum_{y=2025}^{2044} \frac{ C_y - C_{y-1} }{C_{y-1}}$ | median and 80% PI |

* This statistic is considered a diagnostic. If it is triggered under the simulations, biomass trajectories must be checked carefully to ensure that resource recovery is not compromised in the longer term, and should be evident, where relevant, within the management period (20 years for GHL) under consideration in the MSE.

Annex 4. MSE Workplan
(COM-SC RBMS-WP 23-06 (Rev. 3))

Table 1. Tentative 3LN redfish and 2+3KLMNO Greenland halibut MSE

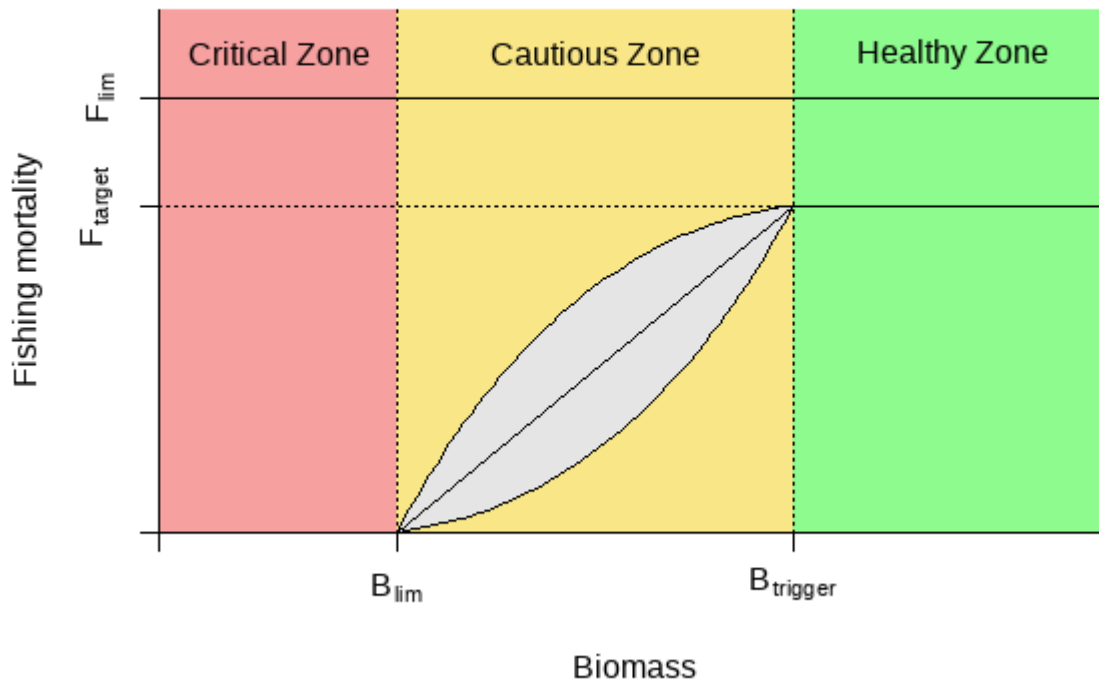
| Expected Delivery | NAFO Body | GHL MSE | 3LN REDFISH MSE |
|-------------------|--------------------|---|--|
| April 2023 | WG-RBMS | Schedule finalized and proposed to the Commission; propose conceptual initial Candidate Management Procedures (CMPs); identify management objectives/performance statistics | Schedule finalized and proposed to the Commission; initial discussion on management objectives, conceptual initial CMPs, potential OMs, and performance statistics |
| June 2023 | Scientific Council | Review and finalization of Operating Models (OMs) to be used; initial testing of the current CMP and possibly further CMPs performance against established management objectives; | Proposal and review of OMs to be used; continue discussions on performance statistics; |
| July 2023 | WG-RBMS | Review CMPs; finalize performance statistics including risk tolerances and constraints | Continued progress on OMs, development of performance statistics; initial discussion of CMPs |
| September 2023 | Commission | Update on progress on the respective MSEs and seek endorsement from the Commission on the workplan for 2024 and beyond. | |
| January 2024 | Scientific Council | Testing CMP performance against established management objectives & initial discussions on exceptional circumstances protocol | Address and review any further work on OMs, performance statistics, and CMPs stemming from RBMS |
| Spring 2024 | WG-RBMS | Discussing results of CMP testing and exceptional circumstances protocol and possible recommendation to Commission on adoption of Management Strategy, subject to progress. | Input to SC on further progress on OMs, CMPs, and finalize the performance statistics. |
| June 2024 | Scientific Council | Consider any follow up from Spring WG-RBMS | Review and finalization of OMs to be used; selection of the CMP for testing against established management objectives |
| Aug 2024 | WG-RBMS | Finalize and recommend Management Strategy to the Commission | Finalize CMPs; refinement of performance statistics including risk tolerances and constraints; Update the workplan for Redfish. |
| Sept 2024 | COM | The Commission considers adoption of proposed new Management Strategy | Update on progress |

1) Timelines are notional and subject to revision based on workload, capacity, and unanticipated problems.
2) Target for completion for the Redfish MSE will be September 2025, and the details of the workplan will be developed at the August 2024 WG-RBMS meeting.

Annex 5. Provisional Draft Framework
(COM-SC RBMS-WP 23-20 (Revised))

In the Healthy Zone, F should generally be F_{target} (i.e. default at 85% of F_{msy}); however, under certain circumstances (e.g. $B > B_{\text{msy}}$, etc.) the Commission may decide to set an F at a different level. In these cases, the Commission should document the rationale for such a decision.

In the cautious zone, F should be managed as represented by the figure.



To support the Commission's decision of where within the leaf (potential harvest space depicted in grey above), F should be set, SC should endeavour to provide the Commission with a risk-based table that would indicate the risks/probability at various F levels within the span of the leaf:

- Of $B > B_{\text{trigger}}$ within e.g. 1,2,3 years (depending on the stock)
- Of $B < B_{\text{lim}}$ with e.g., 1,2,3 years (depending on the stock)
- Probability of $B_{\text{future}} > B_{\text{current}}$ ($B_{\text{future}} = 1,2,3$ years depending on stock) including indication of magnitude of this growth

To support their decision, SC would also provide:

- Current stock status and confidence intervals
- Recent trajectory of the stock

Generally, the Commission should adopt an F that achieves the following policy objectives depending on stock trajectory and relative position in the cautious zone:

| Focus of management action within Cautious Zone | | Stock status in the Cautious Zone | |
|---|------------------|--|------------------------|
| | | Low level | High level |
| Stock trajectory in the Cautious Zone | Decreasing Trend | Reduce risk of further stock decline | Mitigate stock decline |
| | Increasing Trend | Promote stock growth with high certainty | Promote stock growth |

These focal elements for management actions are intended to articulate an increasing risk avoidance in management actions as the stock gets closer to B_{lim} .

In the critical zone, F should be managed at as low a level as possible.

Annex 6. NAFO Precautionary Approach Framework Revision – Revised Workplan
(COM-SC RBMS-WP 23-19 (Revised))

The following is an update from COM-SC RBMS-WP 22-06.

- Review of and proposal for ToRs related to mapping objectives: ToRs 1a, 1c and 1g.
Deadline for results to SC: June 2021
- Present results to WG-RBMS after the June SC
- Review of and proposal for ToRs related to structural aspects and quantification of uncertainty and risk. Deadline for results to SC: ToRs 1b, 1d, 1e and 1f.
Deadline for results November 2021
- The work in the previous bullet points would need to cover the data continuum, so that the framework could be applied to all NAFO stocks (data rich and data poor).
- Consider broad associated implications for stocks managed using a Management Procedure (HCR) based on a MSE.
- Workshop - (including the group of scientists and managers and stakeholders), around March 2022, to address the entire ToR and make a proposal of revision of the NAFO PA framework (to be later reviewed by the WG-RBMS).
Note: Delayed until August 2022.
- WG-RBMS 2022, reviewed the latest SC progress report (June 2022) on the PAF, as well as, the conclusions from the 1st PAF workshop (August 2022); and, prepared a revised workplan.
- SC to prepare additional information to inform discussion at WG-RBMS in 2023.
- Time for Contracting Parties internal discussions and further work if required
- WG-RBMS July 2023, review additional information from SC and propose draft revised framework
- Provisional draft framework to be considered by the NAFO Commission in September 2023, for endorsement and request SC to initiate ~~in advance of simulation~~ testing.
- WG-RBMS Spring 2024, review progress of testing and provide feedback and /or input as required.
- SC June 2024, complete ~~simulation~~ testing
- WG-RBMS 2024, review the results of SC simulation testing and recommend revised PA Framework to Commission
- Sept 2024, Commission decision on adoption of revised PA Framework