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Report of the NAFO Precautionary Approach Working Group (PA-WG)

13 May 2024, by Webex

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NAFO Precautionary Approach Working Group (PA-WG)

13 May 2024. 09:00 Halifax time

Webex

Chair: Fernando González-Costas

1. Opening.

The meeting was opened by the Chair, Fernando González-Costas (European Union), at 09:00 hours (UTC/GMT -3 hours in Halifax, Nova Scotia) on Monday, 13 May 2024.

The Chair welcomed representatives from Canada, the European Union, Japan, the Russian Federation, and the United States of America, as well as an invited expert on Precautionary Approach Framework on Fisheries Management. A full participants list is presented in Appendix I.

a) Appointment of Rapporteurs.

The NAFO Secretariat (Dayna Bell MacCallum and Jana Aker) was nominated as rapporteur of the meeting.

b) Adoption of Agenda

The agenda was adopted as circulated (Appendix II).

2. Performance Statistics for the Management Objectives

The PA-WG reviewed the management objectives as approved by the WG-RBMS at the April 2024 meeting (COM SC Doc. 24-01). Performance statistics to measure these management objectives were presented by Mariano Koen-Alonso on behalf of the technical team and discussed by the group. The PA-WG approved the performance statistics to measure the management objectives outlined in Table 1, noting that these are the starting point to carry out the testing, but the final framework and risk levels to be established will be determined in the WG-RBMS meeting in August 2024.

Table 1. The management objectives and associated performance statistics for the testing of the precautionary approach framework. In addition to standard symbols like B and F to indicate stock biomass and fishing mortality respectively, and the related reference points and/or relevant indicators like B_{lim}, $B_{trigger}$, B_{msy}, F_{lim}, F_{msy}, and MSY, some general notation used throughout this table includes t to indicate year, t=1 or t_1 to indicate the first year of the actual projection period after the burnout period, t=x or t_x to indicate the year x of the projection period, T to indicate the final year of the projection period, which is initially defined as 50 years for the generic testing and 25 years for the specific testing, and t_{Btr} to indicate the year when the biomass reaches $B_{trigger}$ $\left(B_{t_{Btr}} \geq B_{trigger}\right)$ after starting from a depleted stock state. HCR is used to indicate harvesting under a given harvest strategy from the proposed PA framework, and F=0 is used to indicate no harvesting.

Management goal	**Management Objectives from RBMS Report**	**Operational management objective by SC PAWG**	**Performance Statistics**	**Criteria**
Prevention of bad stock states arising later when the stock is in the Healthy Zone. (test runs start with non-depleted stocks)	Very low risk of stock depletion	Very low risk of stock depletion	$P(B_t < B_{lim}) \leq 0.10$	Median of the proportion of years in the projection period (t=1 to T) where the stock is below B_{lim}. A very low probability is operationalized as 10% based on the current NAFO PA. In addition to the PS itself, the distribution of these probabilities, at least for some base cases, is required to inform on the type or distribution (e.g. a wide vs narrow).
		Risk of stock falling below $B_{trigger}$	$P(B_t < B_{trigger}) \leq 0.30$	Median of the proportion of years in the projection period (t=1 to T) where the stock is below $B_{trigger}$. A low probability is operationalized as 30%. Include results for F=0 for better informing the results in terms of actual performance of the HCR vs intrinsic variability of the stock dynamics.

Management goal	Management Objectives from RBMS Report	Operational management objective by SC PAWG	Performance Statistics	Criteria
	Maintain stocks above B_{msy} more often than not	Maintain stocks above B_{msy} more often than not	$P(B_t/B_{msy} > 1) \geq 0.75$	Median of the proportion of years where $\frac{B_t}{B_{msy}}$ is greater than 1 over the projection period (t=1 to T). Since 50% is neutral, the idea of "more often than not" essentially covers the 51-99% range, so it has been operationalized here as the middle of that range (75%) until a value can be agreed upon at the PAWG and RBMS.
	Low risk of overfishing	Low risk of overfishing	$P(F_t/F_{msy} < 1) \geq 0.70$	Median of the proportion of years where $\frac{F_t}{F_{msy}}$ is less than 1 over the projection period (t=1 to T). A low probability is operationalized as 30% based on the recent NAFO MSEs.
Recovery to a good stock state when the stock is in the Critical or Cautious Zone. (test runs start with depleted stocks)	Rebuild stocks to B_{msy}	Rebuild stocks to the vicinity of B_{msy}	$P(\bar{\mu}(B_{T-10:T}) > B_{trigger}) \geq 0.80$	Proportion of scenario runs where the average biomass ($\bar{\mu}$) in the last 10 years of the projection period (T-10 to T) is greater than $B_{trigger}$. A low probability [of not rebuilding to the vicinity of B_{msy}] is operationalized as 20% based on the current NAFO PA.
	Good stock recovery performance	Monitor short term growth	$P(B_{t=5} > B_{t=1}) \geq 0.75$	Proportion of scenario runs where $B_{t=5} > B_{t=1}$ Since 50% is neutral, the idea of "more often than not" has been operationalized as 75%.
		Monitor med term growth	$P(B_{t=15} > B_{t=1}) \geq 0.75$	Proportion of scenario runs where $B_{t=15} > B_{t=1}$ Since 50% is neutral, the idea of "more often than not" has been operationalized as 75%.
		Monitor long term growth	$P(B_{t=25} > B_{t=1}) \geq 0.75$	Proportion of scenario runs where $B_{t=25} > B_{t=1}$ Since 50% is neutral, the idea of "more often than not" has been operationalized as 75%.

Management goal	Management Objectives from RBMS Report	Operational management objective by SC PAWG	Performance Statistics	Criteria
		Time to recovery (absolute)	$Count\ (t_1 : t_{Btr})$	Median of the number of years (t_{Btr}) to reach $B_{trigger}$ This metric has no fixed success criterion as it depends on the specific stock life-history.
		Time to recovery (relative)	$Ratio\left(\frac{Count_{\square}^{F=HCR}(t_1 : t_{Btr})}{Count_{\square}^{F=0}(t_1 : t_{Btr})}\right) \leq 1.2$	Median of the ratio between the number of years (t_{Btr}) to reach $B_{trigger}$ under the HCR vs under F=0. This metric has no fixed success criterion; it has been arbitrarily set here as 20% or less from F=0 until a value can be agreed upon at PAWG/RBMS.
		Time to recovery (additional years)	$t_{extra} = Count_{\square}^{F=HCR}(t_1 : t_{Btr}) - Count_{\square}^{F=0}(t_1 : t_{Btr})$	Median of the number of additional years (t_{extra}) to reach $B_{trigger}$ under the HCR vs under F=0. This metric has no fixed success criterion.
Sufficiently acceptable fishery performance across stock states within the Cautious and Healthy zones. (test runs start with depleted stocks)	Maintain approximately MSY catches in the long-term	Maintain approximately MSY catches in the long-term	$\mathrm{P}\left(0.8 \geq \frac{Median(C_{T-10:T})}{\mathrm{MSY}} < 1.2\right) \geq 0.80$	Proportion of the scenario runs where the ratio between the median catch in the last 10 years of the projection and MSY is within the 0.8MSY-1.2MSY range. A low probability [of not maintaining catches approximately to MSY] is operationalized as 20% based on the current NAFO PA.
	Good fishery performance	Measure the inter-annual TAC variation	$Median\left(\frac{\lvert C_{t+1} - C_t \rvert}{C_t}\right) \leq 0.20$	Median of the medians of the absolute inter-annual variability in the TAC during the entire projection period. The value of 20% is being set based on recent NAFO MSE practice.

Management goal	Management Objectives from RBMS Report	Operational management objective by SC PAWG	Performance Statistics	Criteria
		Catch during the maximum recovery window	$\frac{\sum_{1:t_{max}} C_y}{t_{max}}$	Median of the average catch during the period of time associated with the maximum recovery time window. Maximum recovery time window (t_{max}) is the longest period of time observed across HCR scenarios (e.g. upper edge, middle, and lower edge of the NAFO HCR leaf) to recover the stock to $B_{trigger}$.

3. Specific Testing Cod 3M

Rajeev Kumar and Nick Gullage (Canada) presented an update of the progress made on the PA framework specific testing for the cod Div. 3M. The presentation included information on the iterations run time, as well as preliminary results based on the run of 350 threads for each of the linear, upper-leaf and lower-leaf, with the assumptions made on different parameters and following reference points: B_{lim}: 14546.33 –SSB of 2007; B_{msy}: 48487 –B_{lim}/0.3; $B_{trigger}$: 36365 –B_{msy}*0.75, noting that the final options will be discussed later.

a) Mitigation of the iterations run time report progress

With the latest improvements adopted, the run time has been reduced to 12-24 hours from 1-2 years. This makes it possible to simulate the different approved scenarios in a reasonable amount of time.

b) How to estimate B_{msy} and $B_{trigger}$

Diana González-Troncoso (European Union) presented a working paper outlining different options for estimating the cod Div. 3M reference points: B_{msy} and $B_{trigger}$. The PA-WG discussed different options for calculating B_{msy} / $B_{trigger}$ in the specific testing for 3M cod taking in account that to be consistent this estimate should be directly related to the assumption made as to what stock-recruitment relationship will be adopted to make the projections. The final decision is to estimate $B_{trigger}$ as 0.75*B_{msy}, estimating B_{msy} assuming a Beverton - Holt (BH) stock-recruitment relationship.

c) Stock/recruitment relationship to use in the projections

The PA-WG agreed to use the Beverton-Holt (BH) stock recruitment relationship in the Operating Model (OM) projections. Because the recruitment estimates from the assessment do not fit the standard parametric relationships very well, it was agreed that a small technical team will work on some proposed BH curves and then meet to decide on one or two curves to carry out the OM projections.

The PA-WG also discussed other assumptions that need to be included in the 3M Cod specific PA testing and agreed on the following:

- The Operating model would be based on the most recent assessment, conducted in 2023
- The TACs for 2023 and 2024 were 6100 tons and 11708 tons, respectively
- Natural mortality at age would be assumed to be the same for simulation years as calculated in the last assessment approved
- F_{bar} would be the avg F for ages 3 to 5
- Catch weight, stock weight, and maturity would be the average of last 3 years

4. Specific Testing Witch flounder 3NO report progress

Rajeev Kumar (Canada) also provided an update on the status of the specific testing for 3NO witch flounder, noting that the work is on track as per the workplan agreed previously.

5. Other matters

Mariano Koen-Alonso informed that the generic testing tasks are also being carried out according to the approved schedule.

6. Adjournment

The Chair and the PA-WG thanked the technical teams for all of their hard work on both the specific and generic testing.

The meeting adjourned at 12:15 hours.

APPENDIX I. LIST OF PARTICIPANTS

CHAIR	
González-Costas, Fernando	Instituto Español de Oceanografia - E-mail: fernando.gonzalez@ieo.csic.es
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APPENDIX II. MEETING AGENDA

NAFO Precautionary Approach Working Group (PA-WG)

May 13, 2024 (9:00AM, UTC -3), by Webex

Chair: Fernando González-Costas

Draft Agenda

1. Opening.
    a) Appointment of Rapporteurs.
    b) Adoption of Agenda
2. Performance Statistics for the Management Objectives.
3. Specific Testing Cod 3M
    a) Mitigation of the iterations run time report progress
    b) How to estimate B_{msy} and $B_{trigger}$.
    c) Stock/recruitment relationship to use in the projections.
4. Specific Testing Witch flounder 3NO report progress
5. Other matters.
6. Adjournment