Serial No. N6470 NAFO FC/SC Doc. 15/02

Northwest Atlantic Fisheries Organization

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

22–24 April 2015
Halifax, Nova Scotia, Canada

NAFO
Dartmouth, Nova Scotia, Canada
2015

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

22–24 April 2015
Halifax, Nova Scotia, Canada

Report of the Fisheries Commission and Scientific Council Working Group on Risk-Based Management Strategies

22-23 April 2015
Halifax, Nova Scotia, Canada

1. Opening

The Working Group co-Chairs Carsten Hvingel (Norway) and Kevin Anderson (Canada) opened the meeting at 1000 hrs on Wednesday, 22 April 2015 at the Prince George Hotel in Halifax, Nova Scotia, Canada. Representatives from Canada, Denmark (in respect of the Faroe Islands and Greenland), European Union, Norway, the Russian Federation and USA were in attendance (Annex 1). The Scientific Council was represented by its Chair, Don Stansbury (Canada). The Chairs welcomed participants and presented a short summary of the tasks to be addressed during this meeting.

2. Appointment of Rapporteur

The Fisheries Commission and Scientific Council Coordinators, Ricardo Federizon and Neil Campbell were appointed as co-Rapporteurs.

3. Adoption of Agenda

It was noted that the report of the 2014 WG-RBMS meeting stated that the group deferred giving further consideration to the development of a management strategy for the Div. 3LNO Northern shrimp (*Pandalus borealis*) stock until after the 2014 stock assessment was available, and requested this item be retained on the agenda for a future meeting. Consequently, this item was added to the provisional agenda, and the agenda (Annex 2) was adopted.

4. Review of Status of the WG Recommendations from the February 2014 Meeting

The recommendations contained in FC-SC Doc. 14/02 were presented at the joint sessions of Fisheries Commission and Scientific Council during the 2014 Annual Meeting, and were adopted by FC and SC. The Chair of Scientific Council presented the Scientific Council responses as related to the recommendations of this group.

It was noted that Scientific Council had extensive discussions on the recommendations of the working group, and agreed a list of points which were thought to be helpful to its work. The list is presented in Annex 3. It concerns references points, limits and targets in the Precautionary Approach framework.

Discussion on the implications of this advice for NAFOs precautionary approach framework was deferred to agenda item 5.

The Scientific Council Chair then presented progress on the definition of precautionary reference points for stocks assessed by Scientific Council. To date, B_{lim} has been defined for 12 stocks, B_{msy} for 8 and F_{lim} for 9. Definitions of reference points for Div. 3LNO Thorny skate, Div. 3NO White hake and Div. 2J + 3KL Witch flounder are expected in June (Annex 4).

The Chairs thanked Scientific Council for their work so far.

5. Discussions on the revision of the NAFO Precautionary Approach Framework

The Chairs presented a summary of the current implementation of the PA framework. It was noted that in some cases the guidelines for management and for making scientific advice, as spelled out in the NAFO PA framework, are ambiguous or do not match NAFO practice.

Discussion followed on whether it was desirable and/or feasible to align the PA framework and its implementation more closely; for this, it was suggested that convergence may have to happen from both sides: from the PA framework and from its implementation side. It was however recognized that the

complexity of the technical aspects involved would be better handled by a smaller technical group (agenda item 9) and that FC should identify the scope for this work.

In the discussion of the Scientific Council response to WG-RBMS regarding reference points (agenda item 4) it was noted that the amended NAFO Convention (GC Doc. 08/03) in fact does not explicitly state that F_{msy} should be the limit reference point. In Article 3 subparagraph b it is stated that NAFO shall "*adopt measures based on the best scientific advice available to ensure that fishery resources are maintained at or restored to levels capable of producing maximum sustainable yield".* In Article 3 subparagraph c it is stated that NAFO shall "*apply the precautionary approach in accordance with Article 6 of the 1995 Agreement*". The 1995 UN Fish Stocks Agreement is not precise when it comes to the technical discussion of reference points and therefore open to interpretation. Some international organizations (e.g. ICES) have not defined F_{msy} as a limit and still consider themselves well aligned with the principles of the precautionary approach. The Working Group considers the NAFO Convention sufficiently general not to complicate possible revisions to the NAFO PA framework as long as the 1995 Agreement is honored.

The Chairs thanked Scientific Council for their work in responding to the recommendations of the working group.

6. Discussions on the development of Div. 3NO witch flounder RBMS

At the 2014 Annual Meeting, the Fisheries Commission instructed the Working Group to undertake, at its meeting in 2015, the development of a risk-based management strategy for this stock (see FC Doc. 14/11 and FC Doc. 14/35). Further development of the assessment model for this stock is ongoing and will be presented to the Scientific Council in June. The Chairs thanked Scientific Council for their work on this topic. It was noted that the development of a management plan for this stock remains a priority and it is expected that more progress toward a management strategy for this stock would be possible after the June Scientific Council meeting.

7. Discussions on the finalization of Div. 3M cod RBMS

According to the workplan for the development of a harvest control rule (HCR) for Div. 3M cod, this Working Group was requested to offer feedback on the results of the work to date, before the 2015 June Scientific Council meeting (SCS Doc. 14/17 Revised, page 28).

The Div. 3M Cod management strategy evaluation (MSE) is described in another document (SCR Doc 14/44) based on the proposals of the Fisheries Commission and this Working Group reached in February 2014 (FC-SC Doc 14/02).

The management objectives set out for this harvest control rule are:

1. **Very low risk of breaching B_{lim}.** The probability of a spawning stock biomass under B_{lim} at 10% or lower.
2. **Low risk of overfishing**. For the model-free HCR only: The probability of F exceeding F_{msy} during the evaluation period should be kept at 30% or lower.
3. **Low risk of steep decline.** The probability of the decline of 25% or more of spawning stock biomass from year 0 to year 5 is kept at 10% or lower.
4. **Maximum averages catch over the period**. The average TAC over the period should be maximized.
5. **Limited annual catch variation.**

The general aim of the Div. 3M Cod MSE is to maintain the SSB in the safe zone as defined by the NAFO precautionary approach framework and to assure the optimum utilization, rational management and conservation of the Div. 3M cod stock. On this basis, the five performance objectives were tested via five different Performance Statistics. Six different operating models (OM) and two HCRs with three different F_{target} values were tested. A 20% constraint of annual variation of TAC was set. Based on this, a total of 24 scenarios were tested and results projected for the period 2014-2033.

Differences in the results come mainly from the assumed spawning stock recruitment relationship (SSR) and in a much lesser extent of assumed M (natural mortality) and the different F_{target} levels tested. The SSB have an increasing trend in all cases reaching a level well above B_{lim} at the end of the projected period (2033).

There are two main trends in yields, one for the scenarios with the model-based HCR and another for the scenarios with the model-free HCR. In the first case, landings decrease to 6 500 t in 2020, and after that increase until 2033 reaching values between 20 500 and 38 500 t, depending on the SRR assumed. In the case of the model-free HCR, catches decrease until 2020 and then remain between 6 000 and 9 000 t .

None of the tested HCR achieved all established performance objectives in the 2015-2023 period. Most performance targets were reached in the period 2024-2033.

The Working Group concluded that based on the analyses it could not recommend any of the HCRs tested for cod in Div. 3M. The failure to meet some of the management objectives in the 2015-2023 period is caused primarily by the high initial F and catch levels, in conjunction with the 20% stability constraint of maximum year-to-year changes in TACs. The Working Group noted in particular that it would not be possible to achieve simultaneously the stability requirement and the adopted level of risks (very low risk of breaching B_{lim}, low risk of steep decline). The Working Group also agreed that the level of risks adopted in the study arose from the PA framework and were open to interpretation It was noted that the element of risk interpretation, along with the starting point and the stability constraint could be examined further in the future work.

In addition some technical questions were brought to the table which the Working Group after some discussions proposed to defer to Scientific Council (agenda item 9).

Recognizing the scale of the work proposed here, and to ensure that the results of these analyses and alternative scenarios are examined, the Working Group requested that the Div. 3M cod RBMS be retained on the agenda for future meetings.

8. Development of a management strategy for Div. 3LNO Northern shrimp (*Pandalus borealis*)

At the 2014 WG-RBMS meeting, the group deferred giving further consideration to the development of a management strategy for the Div. 3LNO Northern shrimp (*Pandalus borealis*) stock until after the 2014 stock assessment was available, and requested this item be retained on the agenda for a future meeting. This assessment concluded that the stock was below B_{lim}, recruitment had been poor and recommended there be no directed fishery. The group recommended that the status of the stock continue to be monitored prior to further consideration of the development of a management strategy.

9. Recommendations to forward to the Fisheries Commission and Scientific Council

The Working Group **recommends that**:

1. **Scientific Council convenes a technical working group which could explore the revision of the precautionary approach.**
2. **Fisheries Commission identifies scope and priorities for such a review.**
3. **Scientific Council gives a high priority to development of reference points for all stocks which lack them.**
4. **Scientific Council performs a review of the Div. 3M cod MSE.**
5. **Scientific Council discusses the following HCR options for Div. 3M cod:**
    a. **Starting points**
        i. **$F_{status\ quo}$**
        ii. **40% reduction**

b. An HCR which meets management objectives 1 (very low risk of breaching B_{lim}) and 2 (low risk of overfishing) within five years, and within ten years, with:

i. risk calculated for each year in the time series

ii. risk calculated for the end of the periods (final year)

iii. risk averaged over the periods

The recommendations will be presented to Scientific Council and Fisheries Commission at the 2015 June Scientific Council and Annual Meeting for consideration and adoption.

10. Other matters

There were no other matters.

11. Adoption of the report

Having edited the recommendations in a plenary session, it was agreed that at the close of the meeting the substance of the last version of the report available in the SharePoint website would be considered final, that the report would be formatted thereafter by the rapporteurs, and that this would be circulated to participants for adoption via correspondence

12. Adjournment

The closing session of the meeting was called to order at 1400 hrs on 23 April 2015. The Chairs thanked participants for their positive approach to dialogue, the Secretariat for their support and the Rapporteurs for fulfilling their duties. The Chairs wished participants a safe journey home and the meeting was adjourned at 1435 hrs.

Annex 1. List of Participants

WORKING GROUP CO-CHAIRS

Anderson, Kevin, Regional Director, Fish Management, Fisheries and Oceans Canada, P. O. Box 5667, St. John's, Newfoundland A1C 5X1
Tel: +709 772 4543 – Fax: +709 772 2046 – Email: kevin.anderson@dfo-mpo.gc.ca

Hvingel, Carsten, Institute of Marine Research, P. O. Box 6404, N-9294 Tromsø, Norway
Tel: +47 77 60 97 50 – Fax: +47 77 60 9701 – Email: carsten.hvingel@imr.no

CANADA

Chapman, Bruce, Executive Director, Groundfish Enterprise Allocation Council, 1362 Revell Drive, Manotick, Ontario K4M 1K8
Tel: +1 613 692 8249 – Fax: +613 692 8250 – Email: bchapman@sympatico.ca

Day, Robert, Director, International Fisheries Management Bureau, Fisheries and Oceans Canada, 200 Kent St., Ottawa, ON K1A 0E6
Tel: +613 991 61 35 – Fax: +613 990 9574 – Email: robert.day@dfo-mpo.gc.ca

Fagan, Robert, Fisheries Management, Fisheries and Oceans Canada, P.O. Box 5667, St. John's, NL A1C 5X1
Tel: +709 772 2920 – Email: robert.fagan@dfo-mpo.gc.ca

Gilchrist, Brett, Senior International Fisheries Officer, International Fisheries Management Bureau, Fisheries and Oceans Canada, 200 Kent St., Ottawa, ON K1A 0E6
Tel: +1 613 991 0218 – Fax: +1 613 990 9574 – Email: brett.gilchrist@dfo-mpo.gc.ca

Martin, Patrick, Baffin Fisheries Coalition, P.O. Box 6008, Iqaluit, Nunavut, Canada, X0A 0H0
Tel: +1 (709) 726-6328 – Email: pmartin@bfcoalition.ca

Power, Don, Science Br., Fisheries and Oceans Canada, P.O. Box 5667, St. John's, NL. A1C 5X1
Tel: +709-772-4935 – Email: don.power@dfo-mpo.gc.ca

Shelton, Peter, Fisheries and Oceans Canada, P.O. Box 5667, St. John's, NL. A1C 5X1
Tel: +709-772-4935 – Email: peter.shelton@dfo-mpo.gc.ca

Vascotto, Kris, Marine Resource Advisor, Department of Fisheries and Aquaculture, Government of Nova Scotia, 173 Haida Street, Cornwallis, Nova Scotia, B0S 1H0
Tel: (902) 247-1054 – Email: vascotkd@gov.ns.ca

Walsh, Ray, Regional Manager, Fisheries Management, Fisheries and Oceans Canada, P.O. Box 5667, St. John's, NL A1C 5X1
Tel: +709 772 4472 – Fax: +709 772 3628 – Email: ray.walsh@dfo-mpo.gc.ca

DENMARK (IN RESPECT OF THE FAROE ISLANDS AND GREENLAND)

Mortensen, Elin, Adviser, Prime Minister's Office, The Foreign Service, Tinganes, FO-100 Torshavn, Faroe Islands
Tel: +298 30 6142 – Email: elinm@tinganes.fo

EUROPEAN UNION

Carmona-Yebra, Manuel, International Affairs, Law of the Sea and Regional Fisheries Organizations, European Commission, Directorate General for Fisheries and Maritime Affairs (DG MARE.B.1), Rue Joseph II, 99, 1000 Brussels, Belgium
Email: Manuel.CARMONA-YEBRA@ec.europa.eu

González-Troncoso, Diana, Instituto Español de Oceanografía (IEO), Aptdo 1552, E-36280 Vigo, Spain
Tel: +34 986 49 21 11 - Fax: +34 986 498 626 - Email: diana.gonzalez@vi.ieo.es

González-Costas, Fernando, Instituto Español de Oceanografía (IEO), Aptdo 1552, E-36280 Vigo, Spain
Tel: +34 986 49 22 39 – Email: fernando.gonzalez@vi.ieo.es

Rodriguez-Alfaro, Sebastian, Scientific Officer, International Affairs, Law of the Sea and Regional Fisheries Organizations, European Commission, Directorate General for Fisheries and Maritime Affairs (DG MARE.B.1), Rue Joseph II, 99, 1000 Brussels, Belgium
Tel: +32 2 29 570 43 – Email: Sebastian.RODRIGUEZ-ALFARO@ec.europa.eu

Schuller, Herbert, Directorate General for Fisheries and Maritime Affairs Rue Joseph II, 99, 1049 Brussels, Belgium
Tel: +32 2 29 538 92 – Fax: +32 2 229 55700 - Email: herbert.schuller@ec.europa.eu

Sepúlveda, Pedro, Secretaria General de Pesca, Velazquez 144, 28006 Madrid, Spain
Tel: +34 913 476 137– Email: psepulve@magrama.es

Tuvi, Aare, Counsellor, Fishery Department, Ministry of the Environment, Ravala 8, 10143 Tallinn, Estonia
Tel: + (372) 6604 544 – Email: aare.tuvi@envir.ee

USA

Sosebee, Katherine, National Marine Fisheries Service, NEFSC, 166 Water Street, Woods Hole, MA 02543
Tel: +508 495 2372 – Fax: - +508 495 2393 - Email: katherine.sosebee@noaa.gov

RUSSIAN FEDERATION

Savchenko, Igor, Representative of the Federal Agency for Fisheries of the Russian Federation in Canada, 5885 Cunard Street, Apt. 1206, Halifax, NS, B3K 1E3
Tel: +1 902 999 1615 – Email: pr-canada@fishcom.ru

SC CHAIR

Stansbury, Don, Science Branch, NL Region, Fisheries and Oceans Canada, P. O. Box 5667, St. John's, NL A1C 5X1
Tel: +709 772 0559 – Email: don.stansbury@dfo-mpo.gc.ca

NAFO SECRETARIAT

2 Morris Drive, Suite 100, Dartmouth, Nova Scotia, Canada – Tel: +1 902 468-5590

Kingston, Fred, Executive Secretary	fkingston@nafo.int
Aker, Jana, Fisheries Information Administrator	jaker@nafo.int
Bell, Dayna, Scientific Information Administrator	dbell@nafo.int
Burton, Sarah, Office Administrator	sburton@nafo.int
Campbell, Neil, Scientific Council Coordinator	ncampbell@nafo.int
Federizon, Ricardo, Senior Fisheries Commission Coordinator	rfederizon@nafo.int
LeFort, Lisa, Executive Assistant to the Executive Secretary	llefort@nafo.int

Annex 2. Agenda

1. Opening
2. Appointment of Rapporteur
3. Adoption of Agenda
4. Review of Status of the WG Recommendations from the February 2014 Meeting
5. Discussions on the revision of the NAFO Precautionary Approach Framework
6. Discussions on the development of Div. 3NO witch flounder RBMS
7. Discussions on the finalization of Div. 3M cod RBMS
8. Development of a management strategy for Div. 3LNO Northern shrimp (Pandalus borealis)
9. Recommendations to forward to the Fisheries Commission and Scientific Council
10. Other matters
11. Adoption of the report
12. Adjournment

Annex 3. SC Response to Recommendation 1 in FC-SC Doc. 14/02

(Extract from the SC September 2014 Meeting Report, page 15 SCS Doc. 14/20)

4. WG-RBMS Requests and the PA Framework

Scientific Council had extensive discussions and these are the points which were agreed and thought to be helpful to the work of the Working Group.

"Discuss the relevance and implications of having F_{lim} at F_{msy}":

1. F_{lim}=F_{msy} is a requirement under the NAFO Convention (GC Doc. 08/3).
2. MSY can only be obtained if uncertainty in the assessments is negligible, i.e. this implies that in general fishing is carried out at a level below MSY.
3. F_{lim}=F_{msy} means that a potential F_{target} should be lower than F_{msy}: as the uncertainty in estimation of F_{msy} grows, F_{target} must be further reduced from F_{msy} .
4. By analogy (and since F_{msy} and B_{msy} are linked in equilibrium in such a way that, if F_{msy} cannot be a target, neither can B_{msy}), B_{target} should be higher than B_{msy}. As the uncertainty in estimation of B_{msy} grows, B_{target} must be further above B_{msy}.
5. Inconsistent with current management plans that specifies B_{msy} as a target.
6. Inconsistent for some stocks where NAFO TACs imply F greater than F_{lim}.
7. F_{lim} at F_{msy} is a more conservative approach than F_{msy} as a target

"Discuss the relevance and implications of having F_{msy} as a target":

1. Not in agreement with the the NAFO Convention (GC Doc. 08/3).
2. Consistent with current management plans that specifies B_{msy} as a target
3. Consistent with advice for some stocks (e.g. Div. 3M cod) that use F_{msy} proxies as targets
4. F_{msy} as a target is a less conservative approach than F_{lim} at F_{msy}

"Consider the utility of buffers (particularly B_{buf}) in the framework and in management plans and provide advice on whether the use of buffers is considered appropriate for stocks which have B_{lim}":

1. When uncertainty can be estimated $\underline{B_{buf}}$ is not needed
2. When uncertainty cannot be quantified, the buffer can be a useful qualitative measure of uncertainty with respect to limit reference points, and may be useful to delineate stock status zones.

Scientific Council further discussed:

1. Economic optimum B is slightly larger than B_{msy}
2. In multispecies scenarios MSY is often lower than that calculated in single species analysis

Annex 4. Progress towards development of precautionary reference points.

Status of reference points and timelines for ongoing work is as follows:

Stock	B_{lim}	F_{lim}	B_{msy}	Comments
1. GHL 0+1				
2. GHL 1A				
3. RNG 0+1				
4. Redfish SA1				
5a. CAT SA1				
5b. PLA SA1				
6. COD 3M				
7. RED 3M				Age base assessment
8. PLA 3M				Not a quantitative assessment
9. COD 3NO				
10.RED 3LN				MSY constrained at 21 000 t
11. PLA 3LNO				
12. YEL 3LNO				
13. WIT 3NO				Developed in 2014 based on survey
14. CAP 3NO				
15. RED 3O				
16. SKA 3LNO	June 2015			Proxy derived from survey indices
17. HKW 3NO	June 2015			Proxy derived from survey indices
18. RHG SA2+3				Not a quantitative assessment, Short time series to derive RP
19. WIT 2J+3KL		June 2015		Proxy derived from survey indices
20. GHL 2+3				YPR ref points available, no assessment at the moment
21. SQI SA 3+4				B_{msy} not appropriate given life history. Reference points based on

	Available
'date'	In progress/deadline
	No deadline set
	Not relevant

				productivity level.
22. Shrimp 3M				
23. Shrimp 3LNO				
24. Shrimp 0+1				
25. Shrimp EG				
26. Shrimp BS				
27. Shrimp NS				