

Northwest Atlantic Fisheries Organization



**Report of the NAFO Joint Fisheries Commission–Scientific Council  
Working Group on Risk-Based Management Strategies**

4-6 April 2016  
Tórshavn, Faroe Islands

NAFO  
Dartmouth, Nova Scotia, Canada  
2016

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1. Opening.....	2
2. Appointment of Rapporteur .....	2
3. Adoption of the Agenda .....	2
4. NAFO Precautionary Approach Framework (PAF) .....	2
5. Discussion on Management Strategies for priority stocks: 2+3KLMNO Greenland halibut, 3LN Redfish, and 3M Cod.....	3
6. Recommendations to forward to the Fisheries Commission and Scientific Council .....	3
7. Other Matters .....	4
Improving Efficiency of NAFO WG Process.....	4
8. Adoption of Report .....	4
9. Adjournment.....	4
Annex 1. List of Participants .....	6
Annex 2. Agenda.....	8
Annex 3. Timeline for the revision of the PA Framework.....	9
Annex 4. NAFO Fish Stocks – Status of Reference Points Estimation.....	11
Annex 5. Draft Workplan for the GHL MSE Review.....	12
Annex 6. 3LN Redfish Conservation Plan and Harvest Control Rule – Supplementary Guidance.....	15
Annex 7. 3M Cod Work schedule 2016-2018.....	18

## **Report of the NAFO Joint Fisheries Commission–Scientific Council Working Group on Risk-Based Management Strategies**

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### **1. Opening**

The Working Group (WG) Chair, Carsten Hvingel (Norway) opened the meeting at 10:00 hrs on Monday, 4 April 2016 at the Hotel Hafnia in Tórshavn, Faroe Islands. He offered apologies on behalf of the co-Chair, Kevin Anderson (Canada), who was unable to attend the meeting. Representatives from Canada, Denmark (in respect of the Faroe Islands and Greenland) (DFG), European Union, Japan, Norway, and USA were in attendance (Annex 1). Staff of the European Commission participated via Skype due to the closure of Brussels airport.

Elin Mortensen (Head of the DFG delegation to NAFO Fisheries Commission) welcomed the participants to her home city. Tom Blasdale, the newly appointed Scientific Council Coordinator at the NAFO Secretariat, was introduced by the presiding Chair.

### **2. Appointment of Rapporteur**

The Fisheries Commission (FC) and Scientific Council (SC) Coordinators of the NAFO Secretariat were appointed as co-Rapporteurs.

### **3. Adoption of the Agenda**

The WG Chair reviewed the provisional agenda that was previously circulated. He explained the expectations and deliverables of this meeting, specifically on agenda item 4 on NAFO Precautionary Approach Framework and agenda item 5 on Management Strategies for priority stocks.

Under “Other Matters”, the WG Chair proposed an item discussing the NAFO WG on Improving Efficiency of WG Process which was adopted at 2015 NAFO Annual Meeting. The provisional agenda was adopted with this addition (Annex 2).

### **4. NAFO Precautionary Approach Framework (PAF)**

The revision of the NAFO Precautionary Approach (PA) Framework (adopted in 2004) draws on the identification of the FC of the scope and priorities (FC Doc 15/19). In line with the 2015 recommendation of this WG, SC established the Precautionary Approach Framework Working Group (WG-PAF) to explore the revision.

The SC Chair reported on the progress of the WG-PAF. It had two WebEx meetings in March 2016. At these meetings, the WG-PAF:

1. reviewed existing PA,
2. reviewed Terms of Reference developed by FC (FC Doc 15/19),
3. discussed the classification of stocks managed by NAFO,
4. reviewed the PA performance in NAFO and ICES, and
5. discussed the role of Ecosystem Approach (EA) and the need to include the SC WG-Ecosystem Science and Assessment.

The WG recognized that the ongoing work to review the NAFO PA may take longer than the timeline expected for ongoing Management Strategy Evaluation (MSE) initiatives. The WG recommended to WG-PAF that the latter should give priority to review elements of the PA that are essential to advance the work of these

initiatives. It was also recommended that the WG-PAF complete a comparison of the NAFO, ICES and NAFO Coastal State PA frameworks to identify common elements and key differences.

In consideration of the above, a timeline for the WG-PAF was developed (Annex 3).

Regarding the development of precautionary reference points for all fish stocks in the NAFO Convention Area, a progress report was presented by SC (Annex 4).

## **5. Discussion on Management Strategies for priority stocks: 2+3KLMNO Greenland halibut, 3LN Redfish, and 3M Cod.**

### **a) 2+3KLMNO GHJ**

The WG noted the following constraints to complete the MSE review within the established timeframe (2017): a) timely availability of catch data (total and catch at age); b) capacity and expertise to provide Statistical Catch At Age Analysis (SCAA) assessment model, and c) potential revision of the PA Framework.

In the development of the work plan (Annex 5) for a comprehensive review of the MSE of this stock scheduled for completion in 2017, the constraints mentioned above were considered.

Regarding the SCAA assessment model mentioned in Step II of the work plan, the WG noted the possible availability of expertise from Japan and the US that may be helpful in updating an SCAA type model (e.g. Age Structured Assessment Program or ASAP) as an alternative to the SCAA reviewed in the previous MSE. Following the June meeting of the Scientific Council, the Working group agreed that further WebEx discussion of the workplan would be required to possibly refine timelines for Step II and Step III and develop timelines for Steps IV to VI.

The WG was made aware that there are issues with some of the sampling data required to complete the assessment in June. Recognizing the possibility that the stock assessment may not occur as scheduled, the WG asked the SC Chair to discuss possible options within the Scientific Council to advance the assessment intersessionally to enable completion by the 2017 target.

The WG agreed to a more detailed discussion of Step III at its next intersessional meeting.

### **b) 3LN Redfish**

The conservation plan for this stock has been under implementation since 2015. It was recognized that the stock would continue to be monitored and if it did not perform as expected, additional measures may be required. To this end, supplementary guidance was recommended for adoption by FC (Annex 6).

### **c) 3M Cod**

The WG developed a detailed work plan for full benchmark assessment of this stock (Annex 7).

It was noted that the work plan was developed in alignment with the 2015 FC Report which states "*the results of the benchmark review will be considered in setting the TAC for 2018 in light of the new stock assessment in 2017*". It was also noted that the work plan was designed to interrelate the different processes affecting management of this stock: the MSE, the FC Request to SC to organize a full benchmark assessment and to revise the Flim value, and the PA Framework revision which is currently under discussion.

The WG encouraged all CPs to contribute to the benchmark assessment with all the national data at their disposal before the end of 2016.

## **6. Recommendations to forward to the Fisheries Commission and Scientific Council**

The Working Group **recommends** that:

### **On the Precautionary Approach (PA) Framework:**

- 1. Scientific Council, through its WG-PAF, adopt the timeline for the revision of the NAFO PA framework as outlined in Annex 3.**

Report of the FC-SC WG-RBMS,  
4-6 April 2016

**On 2+3KMNO Greenland Halibut:**

- 2. Fisheries Commission and Scientific Council adopt the MSE work plan as outlined in Annex 5.**

The Working Group noted the following constraints and/or considerations to complete the MSE review within the established time frame: a) timely availability of catch data (total and catch-at-age); b) capacity/expertise to provide SCAA assessment models; and c) potential revision of the PAF.

**For points a) and b):**

- 3. Scientific Council use 2015 catch estimate developed by the Catch Data Advisory Group (CDAG) of the FC-SC WG on Catch Reporting in MSE review/formulation.**
- 4. Scientific Council consider how to incorporate the uncertainty associated with the 2011-2014 catch into the MSE review/formulation.**
- 5. Contracting Parties and/or Scientific Council seek out expertise to facilitate integration of an SCAA-type model into the MSE review/formulation. This should be done, if possible, before June 2016 to allow timely progress.**

**On 3LN Redfish:**

- 6. Fisheries Commission adopt supplementary guidance to the 3LN Redfish conservation plan and Harvest Control Rule (HCR) as presented in Annex 6. It is further recommended that the HCR (Annex 6.1) be incorporated into the NAFO Conservation and Enforcement Measures.**

**On 3M Cod:**

- 7. Fisheries Commission and Scientific Council adopt the timeline for the 3M Cod Benchmark Assessment and MSE, as outlined in Annex 7.**

**7. Other Matters**

**Improving Efficiency of NAFO WG Process**

The WG noted that there were several working groups in FC and SC created in the past few years. Three of them are joint FC-SC WGs. Determination of meeting dates for the WGs has proven to be a challenge for all concerned. Some meetings for instance have to occur at particular time of the year relative to the SC June Meeting and the NAFO September Meeting. The WG also acknowledged that an *ad hoc* WG was created with a mandate of identifying ways of improving efficiency of the WG processes.

For more efficiency, it was realized that more coordination among the WGs is needed in scheduling meetings. Some meetings might not have to be face-to-face, depending on the agenda. In this case, available technology, such as document sharing and video tele-conferencing software should be utilized to a fuller extent. The WG can always work intermittently via SharePoint and when a meeting is necessary, it could easily be decided to have a meeting via WebEx. Correspondence among members can be continuous through the document sharing site and its discussion forum feature, which could be enhanced by means of automatic e-mail notification of uploads or comments.

**8. Adoption of Report**

This report will be adopted by correspondence after the adjournment.

**9. Adjournment**

The meeting was adjourned at 15:30 hrs on 6 April. The WG thanked DFG for the hospitality and for providing a well-equipped meeting venue. The participants thanked the presiding Chair for his leadership.

## **Annex 1. List of Participants**

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## **Annex 2. Agenda**

1. Opening
2. Appointment of Rapporteur
3. Adoption of Agenda
4. NAFO Precautionary Approach Framework (PAF)
5. Discussion of Management Strategies for priority stocks: 2+ 3KLMNO Greenland halibut, 3LN redfish, and 3M cod
6. Recommendations to forward to the Fisheries Commission and Scientific Council
7. Other matters
8. Adoption of Report
9. Adjournment

### **Annex 3. Timeline for the revision of the PA Framework** (FC-SC RBMS-WP 16/03 (Rev. 3))

*Noting that the RBMS Working Group determined that the current application of the PA is not aligned with the PA;*

*Noting that the FC developed the following terms of reference:*

1. To clarify the following elements:
  - a. To confirm/review the NAFO PA reference points definition in page 3 of FC Doc. 04/18.
  - b. To confirm/review the NAFO Management strategies and courses of action, including risk levels, on page 3 of FC Doc. 04/18
  - c. Distinction between MSY and limit/target related reference points.
  - d. Analysis in support of the development of other reference points (e.g. targets, buffers).
  - e. To review the methods for the calculation and interpretation of risk and the quantification and qualification of uncertainties related to them.
  - f. For stocks where risk analyses are not possible, provide options on how to establish buffer reference points on a stock by stock basis.
  - g. Determine the conditions for when/if reference points should change and / or be re-evaluated.
2. Consider how a revised PA can fit within an Ecosystem Approach.
3. In reviewing the NAFO PAF the WG will also take into consideration other Precautionary Approach Frameworks with a focus in the North Atlantic.

*Noting that the FC recommended that the SC convene a technical Working Group to address these ToRs*

**The WG suggests the following timeline to address each ToR:**



### Annex 4. NAFO Fish Stocks – Status of Reference Points Estimation

Stocks in the Convention area that have been requested for NAFO Scientific Council advice								
	fishery dependent data (1)	fishery independent data (2)	Type of assessment	Blim (3)	Bmsy (3)	Flim = Fmsy (3)	HCR / MSE	objective for assessment
<b>Advice requested by Coastal States</b>								
SA 0 + 1B-F Greenland halibut	CaL, CPUE	3 surveys (2 halted)		Proxies based on survey				
SA 1A inshore Greenland halibut	CaL, CPUE	6 surveys (2 halted)						
SA 0+1 Roundnose grenadier	Catch only	1 survey						
SA 1 Redfish	Catch only	3 surveys						
SA 0+1 Shrimp	Catch, CPUE	1 survey						
SA 1 Wolffish		2 surveys						
SA 1 American plaice		2 surveys						
<b>Advice requested by Fisheries Commission</b>								
3M Cod (4)	CaL, CaA	2 surveys (not overlapping in time, stock area coverage ok) + 1 survey not used	XSA in a Bayesian framework	Blim (2008)		Flim=F30%SPR (2014)	Under development	Age-based assessment (as now)
3M Redfish	CaL	1 survey	Age based assessment	Not accepted (planned June 2017)				
3M American plaice	CaL	1 survey	Not a quantitative assessment	Planned June 2017				
3M Shrimp	No information on Catch	1 survey						
3NO Cod	CaL, CaA, CPUE	4 surveys (2 halted)						
3LN Redfish	CaL	10 surveys (7 halted)						
3LNO American plaice	CaL, CaA	5 surveys (1 halted)						
3LNO Yellowtail flounder	CaL	3 surveys						
3NO Witch flounder	CaL, CPUE	3 surveys	Developed in 2014 based on survey					
3NO Capelin	No information on Catch	1 survey (halted in 2006)						
3O Redfish	CaL, CaA, CPUE	4 surveys (2 halted)						
3LNOPs Thorny skate	CaL	4 surveys		Adopted June 2015				
3NOPs White hake	CaL	3 surveys						
3LNO Shrimp	CaL, CPUE	4 surveys						
SA 2+3 Roundnose grenadier	CaL							
2J+3KL Witch flounder	CaL	1 survey		Proxy derived from survey indices		June 2015		
SA 2+3 Greenland halibut	CaL, CaA, CPUE	9 surveys (6 halted)	No assessment					
SA 3+4 Squid	Catch only	5 surveys (2 halted)	TACs based on low vs high productivity levels					
<b>Scientific Advice from Council on its own Accord</b>								
SA 2+3 Roughead grenadier	CaL	8 surveys (scattered in time and all halted)	Not a quantitative assessment					
(1) from NAFO SCS Doc. 15/16		<u>Abbreviations used for Fishery dependent data.</u>		<u>Legend:</u>				
(2) from NAFO SCS Doc. 14/22		CaL: Catch at Length		Green: Reference Points Available				
(3) from NAFO SCS Doc. 15/12		CaA : Catch at Age		Yellow: Reference points in progress				
(4) validated by the DE during WGRBMS (Faroes, April		CPUE : Catch Per Unit Effort		Red: No deadline set for definition of Reference Points				

## **Annex 5. Draft Workplan for the GHM MSE Review**

(FC-SC RBMS-WP 16/05 Rev. 2)

At the 2015 NAFO Annual Meeting, the Fisheries Commission instructed the *Joint FC-SC Working Group of Risk Based Management Strategies* to undertake discussions on finalizing an approach and work plan to enable the comprehensive review of the 2+3KLMNO Greenland halibut MSE scheduled for 2017.

Below is an overview of the proposed key steps to be undertaken in completing this review. It should be noted that the steps are not considered prescriptive and there is possible flexibility in their sequencing (i.e. it is not necessary that Step I be completed before work can commence on the subsequent phases).

Where agreed upon, timelines have been identified, though adjustments may be necessary. Timelines for the remaining tasks (Step IV to VI) will require discussion of the FC-SC WG-RBMS to occur after the June 2016 SC meeting.

### **Step I – April 2016**

#### **FC-SC WG-RBMS**

1. General discussion on MSE process with specific reference to NAFO GHM framework
2. Develop Draft Workplan for GHM MSE Review – i.e. scope, process & timelines
3. Seek an update from SC on specific timelines associated with the review (assessment and MSE)
4. Consideration of additional questions and/ or guidance to SC

### **Step II – June 2016**

#### **Scientific Council**

1. Greenland halibut stock assessment (using both XSA and SCAA<sup>1</sup> – FC Doc 15/17 Revised).
2. Feedback on performance of existing management strategy, including identification of possible deficiencies / areas for improvement (i.e. lessons learned)
3. Consideration of operating models and input data to be applied in the MSE

### **Step III-FC-SC WG-RBMS during 2016**

1. Review / Discussion of elements which were the basis of current MSE (e.g. management objectives, performance statistics, HCR including constraints, etc.) [see Annexes 5.I and 5.II]
2. Development of some candidate HCRs for initial testing

### **Step IV**

#### **Scientific Council**

1. Testing of performance of candidate HCRs.

### **Step V**

#### **FC-SC WG-RBMS**

1. Review results of initial MSE testing
2. Consider possible refinements to management objectives, performance statistics, and/ or HCR formulations

***Steps IV and V – Repeated as necessary to refine HCR***

### **Step VI**

#### **FC-SC WG-RBMS**

1. Recommendation to FC on Adoption/ Updates to GHM HCR

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<sup>1</sup> Possible issues with capacity and/or availability of expertise

**Annex 5.I – Overview of Key Inputs from Initial GHJ MSE formulation**

**Management Objective** – ‘An exploitable biomass of 5+ year classes of 140 000 tonnes on average ...’ [NCEMs Article 10.2]

**Milestone** - Average exploitable biomass for the period 1985-1999 with associated timeline of 2031

**Performance Statistics**

1. The probability of the decline of 25% or more in terms of exploitable biomass from 2011 to 2016 is kept at 10% or lower (with the caveat that should the risk tolerance level of 10% unduly constrain the tuning of the Harvest Control Rule such that a rule cannot be developed to satisfy this or other constraints, then flexibility is provided to consider a risk tolerance level of up to 25%);
2. a) The probability of annual TAC variation of greater than 15% be kept at 25% or lower and b) The probability of variation of TAC more than 25% over any period of 3 years should be kept at 25% or lower. If the conditions a) and b) are not met, then an alternate performance target should be considered as follows: c) The TAC should not be below 10 000 t for the period 2011-2015 in any one year with a probability of 25% on a year by year basis;
3. The magnitude of the average TAC in the short, medium and long term should be maximized;
4. The probability of failure to meet or exceed a milestone within a prescribed period of time should be kept at 25% or lower.

**Annex 5.II – Adopted Harvest Control Rule (2010-17)**

$$\text{TAC}_{y+1} = \text{TAC}_y (1 + \lambda \times \text{slope})$$

where:

slope = is based on the average trend in biomass from three survey indices (the Canadian Autumn Div. 2J3K index (“F2J3K”), the Canadian Spring Div. 3LNO index (“S3LNO”), and the EU Flemish Cap index covering depths from 0-1400m (“EU1400”)) over the previous five years.

$\lambda$  = is an adjustment variable for the relative change in TAC to the perceived change in stock size. The value of  $\lambda$  is 2 if the average slope is negative, and 1 when the slope is positive.

**Annex 6. 3LN Redfish Conservation Plan and Harvest Control Rule –  
Supplementary Guidance**  
(FC-SC RBMS-WP 16/02 Rev.2)

*Noting that a Harvest Control Rule for 3LN Redfish was adopted by NAFO in 2014 that reflected the advice of the Scientific Council for this stock;*

*Recognizing at the time the Harvest Control Rule was developed the biomass was estimated to be greater than Bmsy, and evaluated against a range of conservation focused performance statistics;*

*Noting that a full review and evaluation of the HCR will occur on or before 2020 and that in the interim, NAFO will continue to monitor trends in the survey indices for this stock, as well as, conduct periodic assessments (beginning in 2016);*

*Recognizing that the long-term objective of this Conservation Plan is to maintain the biomass in the ‘safe zone’, as defined by the NAFO Precautionary Approach framework, and at or near Bmsy;*

*Recalling that at the 2015 Annual Meeting the Working Group on Risk-based Management Strategies was tasked with the development of supplementary guidance for Fisheries Commission to respond to any unforeseen performance in the stock (FC WP 15/16);*

*Consistent with the structure and key principles of the Framework on the General Framework on Risk-based Management Strategies, as adopted by NAFO in 2014;*

*Consistent with the parameters agreed upon by Fisheries Commission for development of the harvest strategy;*

It is proposed that following supplementary guidance be adopted as an addendum to the existing Risk-Based Management Strategy for 3LN Redfish (Annex I):

The context, objectives and performance statistics for this Risk-Based Management Strategy remain as stated Annex 3 to the 2014 Annual Meeting Report of the Fisheries Commission (FC-SC RBMS WP 14/4 Rev 3).

**1. Objectives:**

The long-term objective of the Redfish 3LN Conservation Plan is to maintain the biomass in the ‘safe zone’, as defined by the NAFO Precautionary Approach framework.

**2. Reference Points (as identified by NAFO Scientific Council - NAFO SCS Doc. 14/17 Revised):**

- a) Limit reference point for biomass (Blim): 30% of Bmsy
- b) Limit reference point for fishing mortality (Flim): Fmsy

**3. Performance Statistics (levels of risks that apply to section 4):**

- a) Very low (< 10%) probability of biomass declining below Blim.
- b) Low (< 30%) probability of fishing mortality >Fmsy
- c) Less than 50% probability of declining below 80% Bmsy on or before 2021



**4. Supplementary Guidance to the 3LN Redfish Harvest Control Rule (Annex 1):**

- a) When biomass is below Blim:
  - i. No directed fishing
  - ii. By-catch should be restricted to unavoidable by-catch in fisheries directing for other species
- b) When biomass is between Blim and 80% of Bmsy
  - i. TAC's should be set at a level(s) to allow for growth to above 80% of Bmsy or to avoid or mitigate further decline in biomass consistent with explicit rebuilding objectives<sup>1</sup>
- c) When biomass is above 80% of Bmsy
  - i. TAC's should be set at a level(s) to maintain biomass above 80% of Bmsy or to avoid or mitigate decline below 80% of Bmsy
- d) If fishing mortality is above Fmsy
  - i. Fishing mortality should be reduced to a level below Fmsy.

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<sup>1</sup> Tolerance for short-term preventable decline is reduced as biomass approaches Blim

**Annex 6.I**  
**NAFO – Risk-Based Management Strategy for 3LN Redfish<sup>2</sup>**

**Management Strategy/Harvest Control Rule:**

A stepwise biannual catch increase reaching 18 100t by 2019-2020. (18 100t is the equilibrium yield in the 2014 assessment under the assumption of an MSY of 21 000t).

2015 TAC:	10,400t
2016:	10,400t
2017:	14,200t
2018:	14,200t
2019:	18,100t
2020:	18,100t

**Review/Monitoring:**

1. Scientific Council will monitor the performance of the HCR by examining the trends in the survey indices and by conducting a full assessment every 2-3 years and for the first time in 2016.
2. Conduct a full review/ evaluation of the management strategy at the end of the 7 year implementation period.

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<sup>2</sup> Adopted by NAFO in September 2014 for implementation effective January 1, 2015

## **Annex 7. 3M Cod Work schedule 2016-2018**

(FC-SC RBMS-WP 16/07 Rev.3)

In order to provide a tentative timeline to the NAFO 3M Cod Benchmark and the NAFO 3M Cod MSE, the following work plan was agreed by the WG-RBMS in April 2016:

### **NAFO 3M Cod Benchmark calendar**

1. The Scientific Council (SC), in **June 2016**, will approve the main assessment issues to be revised during the 3M Benchmark. Among those issues, there the FC request to the SC (request number 8, SC SCS Doc16/01) that the SC should, in 2016, *analyse whether the current Flim value for 3M cod is currently underestimated and to revise, if required, the relevant fishing mortality and biomass reference points appropriately*. The RBMS WG recognizes that the best forum to carry out the Flim review is the benchmark process, so it would be recommended to undertake this task during that process.
2. **Before the end of 2016** all data needed for the NAFO 3M Cod assessment will be reviewed and compiled.
3. **Between June 2016 and March 2017** different teams of SC scientists will be working on the issues identified in the 2016 June SC meeting.
4. **The benchmark will be carried out in April 2017**. This may involve SC and external scientists.
5. The **June 2017 SC** meeting will carry out a new assessment taking into account the Benchmark conclusions. This assessment would inform the TAC decision for 2018 because the MSE may not be finalised before September 2017 (see next section below - "NAFO 3M Cod MSE calendar").

### **NAFO 3M Cod MSE calendar**

Little progress is expected here before June 2017: this is because the results of the 3M cod benchmark and the NAFO PAF review will be required prior to the resumption of the MSE process. This would be the expected steps:

1. In **June 2017** a new 3M Cod assessment would be issued, according with the benchmark outputs as well as (ideally) the reference points arising from any revisions of the PAF, which at this stage would be tentative (not adopted by the FC).
2. **After September 2017**, if the FC adopts any relevant new elements of the PAF, the RBMS WG should revise the management objectives of the 3M cod MSE accordingly.
3. **Between September 2017 and March 2018 different HCRs** could be tested in order to see if they reach the established management objectives.
4. **By June 2018 the RBMS WG and SC** may revise the 3M Cod MSE to enable the proposal of a HCR. This HCR may be submitted for approval to FC in September, 2018.

If and as approved by the FC, this HCR will be applied to determine the TAC in 2019 and onward.