Northwest Atlantic  Fisheries Organization

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Working Group on Greenland Halibut Management Strategy Evaluation (WGMSE)

Recommendations to Fisheries Commission

Recognizing that Contracting Parties agreed in 2003 to implement a fifteen-year rebuilding programme for the Greenland halibut stock in Subarea 2 + Divisions 3KLMNO,

Acknowledging the continued uncertainty of the 2009 assessment for the Greenland halibut stock in Subarea 2 + Divisions 3KLMNO,

Desirous to move forward with a risk management approach for this stock,

Desirous to achieve the objectives of the rebuilding programme,

Recalling that at the 2009 annual meeting of NAFO, the Fisheries Commission established a Working Group to develop a Management Strategy Evaluation (MSE) framework to help inform management of Greenland halibut in Subarea 2 + Divisions 3KLMNO (FC Doc 09/18)**,**

Consistent with its terms of reference, the Working Group considered alternative management strategies with their harvest control rules, selected appropriate performance indicators, defined acceptable levels of risk, and projected/evaluated outputs of the risk management framework utilizing a range of assessment models,

Noting that the Fisheries Commission will consider the report from this Working Group including any recommendations contained therein as the basis for a risk management based decision on the TAC level for 2011 and beyond,

The following recommendations will be forwarded to the Fisheries Commission.

1. Management Strategy Evaluation (MSE)

The Fisheries Commission shall implement an MSE approach for Greenland halibut stock in Subarea 2 + Divisions 3KLMNO.

2. Management Strategy (Harvest Control Rule)

A simple model-free management strategy shall be adopted consistent with NAFO SCR 09/37. The harvest control rule (HCR) will adjust the total allowable catch (TAC) from year (y) to year (y+1), according to:

$TAC_{y+1} = TAC_{y} \ (1 + \lambda \times slope)$

where :

slope = measure of the recent trend in survey biomass. The TAC is subject to constraints on a percentage change from one year to the next.

Two management strategies were put forward for consideration by Fisheries Commission based on the HCR identified above:

	Management Strategy 1	Management Strategy 2
Starting TAC Control Parameter	16, 000 t	17, 500 t
λ if slope is negative	1.25	2.00
λ if slope is positive	1.00	1.00
Constraint on the rule-generated TAC change	± 10%	± 5%

Full details of the application of the management strategies are provided in Annex 1.

Results of these applications are provided in Annex 2.

3. Implementation

The management strategy shall be implemented initially for 4 years. It shall be annually monitored by the Scientific Council to ensure that the data being input into the management strategy is consistent with the MSE process. If exceptional circumstances arise, this shall provide a scientific justification for over-riding the TAC provided by the HCR

Guidelines on how to address exceptional circumstances for adoption by Fisheries Commission in 2011 shall be developed intersessionally by WGMSE with the advice of the Scientific Council.

The Fisheries Commission shall review the progress of this management strategy in four (4) years with advice from Scientific Council.

The FC shall consider undertaking a revision of the Greenland halibut rebuilding programme to reflect the implementation of the Management Strategy.

The WGMSE will remain in place at least until 2011 to allow for further refinement of the MSE following initial implementation.

Annex 1. Application of the management strategies

The management strategy to calculate the TAC for year *y*+1 is defined by the following formulae:

$$TAC^{*}_{y+1} = Z_y\left(1+\lambda_y slope_y\right)$$

where $Z_y = \begin{cases} Z & y = 2010 \\ TAC^{*}_{y} & y \geq 2011 \end{cases}$

$$\lambda_y = \begin{cases} \lambda_u & slope_y > 0 \\ \lambda_d & slope_y \leq 0 \end{cases}$$

and where

if $TAC_{y+1} - TAC_y > TAC_y\left(1+x\%\right)$ then $TAC_{y+1} = TAC_y\left(1+x\%\right)$

if $TAC_{y+1} - TAC_y < TAC_y\left(1-y\%\right)$ then $TAC_{y+1} = TAC_y\left(1-y\%\right)$

where Z, λ_u, λ_d, x and y are control parameters to be selected.

For the MP selected the values of the control parameters are:

Z	16 000 t	or	17 500 t
λ_u	1.00	or	1.00
λ_d	1.25	or	2.00
x	0.10	or	0.05
y	0.10	or	0.05

The quantity $slope_y$ is calculated as follows:

For each survey, linearly regress $\ln I^i_y$ *vs* year *y*' for $y' = y-5$ to $y' = y-1$, to yield a regression slope value $slope^i_y$, an average of the slopes is taken to provide a composite value:

$$slope_y = \left(slope_y^{CanFall} + slope_y^{CanSpring} + slope_y^{EU(0-1400m)}\right) \Big/ 3$$

where I_y is the survey biomass result in terms of mean weight per tow of fish for all ages.

Annex 2. Performance statistics (medians) for two Management Strategies as averaged over the SCAA- and the XSA- conditioned operating models

	SCAA average		XSA average	
	MS 1 (mp01)	MS 2 (mp14 (+-5%))	MS 1 (mp01)	MS 2 (mp14 (+-5%))
$C_{2011\text{-}2015}$	13374	15766	14800	16400
$C_{2016\text{-}2020}$	13566	15827	19600	19100
$C_{2011\text{-}2030}$	14335	16195	23100	21400
$B_{2011\text{-}2015}$	91530	89361	69446	66588
$B_{2016\text{-}2020}$	107715	103211	131854	128102
$B_{2011\text{-}2030}$	117766	113381	127975	127612
$B_{2011\text{-}2015}/B_{2011}$	1.05	1.03	1.04	1.02
$B_{2016\text{-}2020}/B_{2011}$	1.26	1.20	1.98	1.98
$B_{2011\text{-}2030}/B_{2011}$	1.36	1.31	1.93	1.97