v) *Development of MSE workplan for cod in Div. 3M (Item 8)*

The Fisheries Commission requests the Scientific Council to develop a work plan to perform a Management Strategy Evaluation for Div. 3M cod, to explore operating models that could be used and report back through the Working Group on Risk-Based Management Strategies.

NAFO Scientific Council reviewed the Div. 3M cod MSE proposed by the NAFO Fisheries Commission and Scientific Council Joint Working Group on Risk-Based Management Strategies (FC/SC RBMS). Scientific Council suggests some changes in the proposed MSE to reduce the high number of scenarios, and agreed a plan of work.

The Scientific Council discussed the way to carry out the simulations in the Div. 3M cod MSE. Scientific Council decided that the most appropriate data to implement the Div. 3M cod MSE should be the data used in the 2014 approved assessment. Scientific Council defined six different Operating Models (OM) based in different assumptions in the Stock/Recruitment relationship and different assumptions about Natural mortality (M) as the most appropriated for this case.

Scientific Council proposed some changes in the MSE proposed by the FC/SC RBMS to reduce this high number of scenarios and also proposed a Div. 3M cod MSE workplan.

Scientific Council decided that the most appropriated data to implement the Div. 3M cod MSE should be the data used in the 2014 approved assessment. Scientific Council defined six different Operating Models (OM) based in different assumptions in the Stock/Recruitment relationship and different assumptions about Natural mortality (M) as the most appropriated for this case. These OM are the following:

1. *M* constant, estimated by the model for all ages and for all years with the followings S/R functions:

    i. Recruitment independent of SSB.
    ii. Segmented Regression with Beta=Approved B_{lim}.
    iii. Segmented Regression fit with the assessment results.

2. *M* different, variable by time periods and age ranges with the followings S/R functions:

    i. Recruitment independent of SSB.
    ii. Segmented Regression with Beta=Approved B_{lim}.
    iii. Segmented Regression fit with the assessment results.

The model free HCR is a simple TAC adjustment strategy that uses the change in perceived status of the stock from research surveys to adjust the TAC accordingly. In the Div. 3M cod case we need to decide the survey indices, the age and the period to estimate the slope of the survey indices as well as the value for λ. The EU Flemish Cap Survey is the only research survey available to implement this HCR in the Div. 3M cod case. Scientific Council proposes to use the EU Flemish Cap Survey 3+ biomass index to implement the Model free HCR and to estimate the slope using the most recent 4 years. Scientific Council also recommended that the final values of the λ parameter will be chosen after made deterministic projections to understand how different λ values perform.

Scientific Council decided that $F_{30\%}$ (% Spawner Per Recruit (SPR) relative to SPR at F=0) is the best F_{msy} proxy at this moment to apply to the model HCR proposed.

Scientific Council recommends that the simulations period could be 20 years and that some of the Performance Objectives proposed by the FC/SC RBMS could be measure in a medium (5 years) and long term period (20 years).

In the Div. 3M cod MSE there are 6 OMs that cover part of the M and S/R uncertainty but due to the different requirements in the proposed HCRs 90 scenarios should be analyzed. This number of scenarios makes very difficult to present in a clear way the results and probably will difficult the choice of the best HCR. Scientific Council proposes, in priority order, the following changes to reduce this high number of scenarios:

To remove the TAC 10% and 15% constraints of the HCR in a first stage and measure its importance creating a new PS and PT. This new PS will measure in the medium and long term the number of times that $TAC(y) > TAC(y-1) + \%TAC(y-1)$ and $TAC(y) < TAC(y-1) - \%TAC(y-1)$. The percentage levels that should be measured will be 10%, 15%. This PS would allow us to know the importance to impose a TAC constraint less than 20%. After analyze the results of this new PS we can decide the better constraint level to be tested. If this proposal is accepted the number scenarios to analyze will be reduced to 30.

The working group proposal for the model based HCR read, "Ftarget is defined as four different levels of F_{msy}, corresponding to probabilities of 20%, 30%, 40% and 50% of exceeding F_{msy}. If F_{msy} is not available, an appropriate proxy should be used". Scientific Council proposed three different probability levels to be tested: 20%, 35% and 50%. With this proposal we reduce 6 scenarios and the final scenarios to be tested will be 24.

Taking into account the meetings schedule of the Scientific Council, the Fisheries Commission and the European Union project "Provision of advice on the development of a multiannual management plan and the evaluation of a management strategy for cod in NAFO Division 3M (SAFEwaters-2) Specific Contract No 2 (SI2.681887)" calendar, the Scientific Council proposes the following Div. 3M cod MSE workplan:

1. NAFO SC reviewed, during its 2014 June meeting, the Div. 3M cod MSE proposed by the NAFO Fisheries Commission and Scientific Council Joint Working Group on Risk-Based Management Strategies (FCSC RBMS). SC decided what will be the most appropriated data, Reference Points, Operating Models (OP) and Performance Statistics (PS) to carry out the proposed 3M cod MSE.

2. After the review and adoption of the MSE Inputs the SAFEwaters-2 project will carry out the quantitative simulations to evaluate the sustainability of the social and economic management objectives based on the MSE inputs agreed taking into account ecosystem interactions and the different fisheries. The results of these simulations will be available in March 2015.

3. FC/SC WGRBMS would be requested to review and comment on the results in its 2015 meeting before the 2015 SC June meeting and it can make a final proposal for the Div. 3M cod MSE.

4. NAFO SC will review during its 2015 June meeting the Div. 3M cod MSE final proposal of the FC/SC.

5. The final Div 3M cod MSE will be presented to NAFO Fisheries Commission at its 2015 September meeting, to provide the TAC for 2016 based on the MSE.