

**PART A: SCIENTIFIC COUNCIL MEETING MARCH-APRIL 2010**

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**REPORT OF SCIENTIFIC COUNCIL MEETING****15 March – 15 April 2010**

Chair: Ricardo Alpoim

Rapporteur: Anthony Thompson

**I. PLENARY SESSION**

The Scientific Council met by correspondence via sharepoint and WebEx video conference during 15 March–15 April 2010 to discuss the Fisheries Commission request on the use of Statistical Catch at Age (SCAA) as an operating model in Management Strategy Evaluation (MSE). Representatives and participants attended from Canada, European Union (EU, France, Portugal and Spain), Japan, Norway and USA. The Scientific Council Coordinator was in attendance.

The Executive Committee met by WebEx video conference on 15 March 2010 to discuss the provisional agenda and plan of work.

The provisional agenda was circulated to Contracting Parties by email on 16 March 2010 and posted on the sharepoint site. This meeting of Scientific Council specifically addresses the request. The report for this meeting was developed throughout the course of the meeting and was available on the sharepoint report area for comment. The Chair noted the urgency of the request and wished that meeting be concluded at the WebEx video conference before mid-April. The report would then be circulated to Representatives for adoption within seven days of the close of the meeting.

The sharepoint site for this meeting was opened on 16 March 2010. Access to the sharepoint site, and hence participants to the meeting, was given to members of Scientific Council Executive, Representatives of Contracting Parties, and other participants nominated by Contracting Parties. The Chair asked Representatives to post any comments on the agenda by 22 March. Participants were also asked to upload relevant documents to the sharepoint site on or before 22 March and to discuss these documents on the sharepoint discussion area. The opening session of the WebEx meeting of Council was called to order on at 0920 ADT on 15 April 2010.

The Chair welcomed all Representatives and participants to this meeting by correspondence. It is the first time that NAFO Scientific Council has met by correspondence. This meeting of Scientific Council was called to answer an urgent request from Fisheries Commission regarding Management Strategy Evaluations (MSE) operating models. Scientific Council has agreed to waive the 60-day requirement for advanced notice for a Scientific Council meeting.

The Provisional Agenda was adopted with the addition of the section on the adoption of the report. The Council appointed Anthony Thompson, the Scientific Council Coordinator, as rapporteur.

No applications were received from observers to attend this meeting.

The Council met via correspondence on the sharepoint to address the Fisheries Commission request. The final session was called to order via a WebEx video conference meeting at 0920 ADT on 15 April 2010. The Scientific Council discussed matter arising on the sharepoint site and at this video conference, and considered its report of this meeting. The WebEx meeting was adjourned at 1120 ADT on 15 April 2010. The report was then circulated to Representatives of all Contracting Parties and was adopted on 29 April 2010.

The Agenda, List of Research (SCR) and Summary (SCS) Documents, and the List of Representatives, Advisers and Experts, are given in Part E, this volume.

**II. REVIEW OF PREVIOUS DISCUSSION HELD BY SCIENTIFIC COUNCIL**

In June 2009, Scientific Council carried out an evaluation of alternate models for the Greenland halibut stock in SA 2 + Div. 3KLMNO. This evaluation enabled the determination of the robustness of the assessment model (XSA) currently used. Council noted that "the uncertainties with the present assessment may stem primarily from the structure of the input data and the underlying dynamics of the stock". Scientific Council also noted that "all of the models applied could broadly reproduce the trends when run with similar or the same data sets, and continued use of the XSA model is not considered to be invalidated by this exercise." (SC June 2009 meeting, agenda item VII.1.d.vi., *NAFO Sci. Coun. Rep. 2009*, p. 40-43).

Council here notes that the current request relates to the choice of operating models used in the Management Strategy Evaluation (MSE) and that this is a very different question to evaluating robustness of the model to be used for assessment. Therefore many of the previous discussions held by Council are not directly relevant to this request. Council wishes to focus on two aspects of the Statistical Catch as Age model (SCAA) that will be useful in arriving at a decision on its use in an MSE. First, that the SCAA model can describe the Greenland halibut population in a management strategy evaluation context, and second, that the influence of parameter choice is understood.

### III. FORMULATION OF ADVICE

#### 1. Request from Fisheries Commission

##### a) SCAA as an MSE Operating Model

With respect to Greenland halibut in SA 2 + Div. 3KLMNO, Fisheries Commission requests Scientific Council, to:

*review and comment on the set of plausible operating models to be used in the evaluation of harvest control rules for Greenland halibut in Subarea 2 + Div. 3KLMNO by the FC WG. Two assessment methods are under consideration for conditioning operating models, SCAA and XSA. The operating models conditioned on SCAA should be reviewed by SC to determine their plausibility. A set of operating models conditioned on XSA have already been agreed by SC as plausible representations of the real system (NAFO SCR 09/37). If there are any changes or additions to these XSA-based operating models, SC should also review these.*

*All the operating models will be based on the same input data as the current base XSA model (CAV – current assessment view).*

*The use of SCAA in the MSE should be reviewed by the SC. The run referenced as “SCAA w. XSA data” in Figure 7 of SCR [sic SCS] Doc 09/25 which used almost identical inputs to the current base XSA model, and the associated documents provide all specifications of the approach. For review purposes, these documents together with two further variants of the SCAA2 run will be provided. Both these variants will use exactly the same inputs to the current base XSA model, with one estimating the slope of selectivity at large age and the other setting this slope to be flat. Requests for possible further analyses regarding SCAA will be developed, if necessary, at the May meeting of the Working Group.*

*Recognizing the SC work schedule, SC is requested to conduct this review as soon as possible.*

**Council responded that** SCAA (Statistical Catch at Age) is a methodology for incorporating catch-at-age information into assessment models within a statistical estimation framework, which is usually of a form that facilitates maximum likelihood based estimation. The approach is widely used for assessments of national resources on the American west coast (e.g. the SS2 package) and in the Southern Hemisphere, as well as in a number of RFMOs. Its primary distinction from VPA approaches such as XSA is that it does not require catch-at-age data for every year, and also does not require those data to be (virtually) error free. Instead it admits errors in such data, and fits the assessment model by assuming that the patterns of commercial and survey fishing mortalities with age are either invariant over time, or vary in specified ways. A stock-recruitment relationship is also usually estimated within the SCAA approach.

Council reviewed the following seven formulations of SCAA (SCR Doc. 10/01):

- 1) Reference Case (RC): Beverton-Holt *steepness* ( $h$ ) = 0.9, Natural mortality ( $M$ ) = 0.2, exponential decrease in selectivity for ages 11+;
- 2) RC with flat commercial selectivity (estimated) for ages 11+;
- 3) RC with flat commercial selectivity (fixed similar to XSA value) for ages 11+;
- 4) RC with  $M = 0.1$ ;
- 5) RC with  $M = 0.2$  for ages 0-10, linear increase to  $M = 0.4$  for age 14; and constant thereafter;

6) RC with  $h = 0.6$  in the assessment, to simulate a stock that has a large maximum recruitment which has been severely recruitment-overfished;

7) RC with a modified Ricker stock-recruitment relationship.

All proposed operating models have the following features:

- Catch data from 1975-2008.
- Survey data fitted are Canadian autumn Div. 2J3K 1996-2007, EU Div. 3M 1995-2007, Canadian spring Div. 3LNO 1996-2007.
- Starting conditions (*fraction of pre-exploitation biomass* ( $\theta$ ) and average fishing proportion over the years immediately preceding *the initial year* ( $\zeta$ )) are estimated for the year 1975.
- Serial correlations: (a) Survey CAA: series specific correlation parameters for both the age and the year; and (b) Survey abundance indices: single serial correlation parameter.
- Commercial selectivity (except cases 2 and 3 above which have different commercial selectivity): (a) Estimated directly for ages 5 to 11, with an exponential decline assumed from age 12 to 20+, and (b) Selectivity variation constraint ( $\sigma_{\Omega}$ ) = 2.
- Survey selectivity: (a) Estimated directly for ages 1 to 11 for Canadian autumn and EU surveys and for ages 1 to 8 for Canadian spring survey, with an exponential decline assumed from age 12 to 20 for Canadian autumn and EU surveys and from age 9 to 20+ for Canadian spring survey, and (b) Selectivity variation constraint ( $\sigma_{\Omega}$ ) = 0.5.

For the operating models, tables of results including loglikelihood, some parameter estimates, spawner biomass in 2008, spawner biomass giving MSY and MSY were provided. In addition plots of total biomass, age 5-9 biomass, age 10+ biomass and the stock recruit relationship were provided for each operating model. Plots of residuals were generally not available. Statistical evaluation of the SCAA models depended largely on the comparison of loglikelihoods. Council noted that the overall negative loglikelihood varied from -610 to -631 among the operating models, and was lowest for the reference case.

Council noted that the maximum sustainable yield varied from 21000 to 38000 t for the different proposed operating models. The estimated SSB in 2008 ranged from 10% to 80% of the SSB giving MSY and was 2% to 16% of the SSB at virgin stock levels. Most of the operating models are therefore consistent in giving a perception of the stock as being in a depleted state, with SSB below SSB at  $B_{MSY}$  and well below virgin biomass  $B_0$ . This differs from the more optimistic views of the status and productivity of the stock indicated by some of the SCAA-based model outputs presented to the *ad hoc* Working Group of Scientific Council in June 2009. This differs from the more optimistic views of the status and productivity of the stock indicated by some of the SCAA-based model outputs presented to the *ad hoc* Working Group of Scientific Council in June 2009 for cases where earlier survey data than those included in the XSA and SCAA assessments under consideration for the MSE were also taken into account.

Council considers the reviewed operating models to be plausible in the context of Management Strategy Evaluation. Council does however note that there are a currently 14 possible operating models when one includes both XSA and SCAA conditioned models. There is some scope for decreasing the overall number of operating models within each set so long as the current assessment view using XSA is one of those operating models.

#### IV. OTHER MATTERS

##### 1. Other Business

There was no other business.

#### **V. ADOPTION OF REPORT**

The draft report of this meeting was circulated by email to Scientific Council Representatives (or Heads of Delegation for Contracting Parties without Scientific Council Representatives) on 16 April 2010 with the understanding that comments should be received within seven days. The report was adopted in full on 29 April 2010.

#### **VI. ADJOURNMENT**

The Chair thanked the participants for their hard work and cooperation, noting particularly the efforts of certain members in the presentation of the SCAA documentation for evaluation and to others who spent considerable time undertaking the reviews. The Chair thanked the Secretariat for their valuable support, and also for the provision of the sharepoint and WebEx facilities that performed well when good bandwidth, connectivity to WebEx, and audio and video facilities, were available. There being no other business the WebEx meeting was adjourned at 1120 ADT on 15 April 2010.