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**SCIENTIFIC COUNCIL MEETING – JUNE 2001**

**Fisheries Commission's Request for Scientific Advice  
on Management in 2002 of Certain Stocks in Sub-areas 3 and 4,  
including supplementary questions on Division 3M Shrimp for 2001**

1. The Fisheries Commission with the concurrence of the Coastal State as regards the stocks below which occur within its jurisdiction, requests that the Scientific Council, at a meeting in advance of the 2001 Annual Meeting, provide advice on the scientific basis for the management of the following fish and invertebrate stocks or groups of stocks in 2002:

Redfish (Div. 3M)  
Yellowtail flounder (Div. 3LNO)  
Squid (Sub-areas 3 and 4)  
Shrimp (Div. 3M, 3LNO)  
Greenland halibut (Sub-areas 2 and 3KLMNO)  
Capelin (Div. 3NO)

2. The Fisheries Commission with the concurrence of the Coastal State as regards the stocks below which occur within its jurisdiction, requests that the Scientific Council, at a meeting in advance of the 2001 Annual Meeting, provide advice on the scientific basis for the management of the following fish stocks on an alternating year basis:

Cod (Div. 3NO; Div. 3M)  
Redfish (Div. 3LN)  
American plaice (Div. 3LNO; Div. 3M)  
Witch flounder (Div. 3NO)

To implement this system of assessments in alternating years, all stocks were assessed in 1999 but advice pertained to different time periods to allow the introduction of the new scheme over time. Consequently:

- In 2000, advice was provided for 2001 and 2002 for cod in 3M, American plaice in 3M and witch flounder in 3NO. These stocks will then next be assessed in 2002.
- In 2001, advice will be provided for 2002 and 2003 for American plaice in 3LNO, cod in 3NO and redfish in 3LN. The next assessment of these stocks will thus be conducted in 2003.

The Fisheries Commission requests the Scientific Council to continue to monitor the status of these stocks annually and, should a significant change be observed in stock status (e.g. from surveys) or in by-catches in other fisheries, provide updated advice as appropriate.

3. The Commission and the Coastal State request the Scientific Council to consider the following in assessing and projecting future stock levels for those stocks listed above:
  - a) The preferred tool for the presentation of a synthetic view of the past dynamics of an exploited stock and its future development is a stock assessment model, whether age-based or age-aggregated.

- b) For those stocks subject to analytical-type assessments, the status of the stocks should be reviewed and management options evaluated in terms of their implications for fishable stock size in both the short and long term. As general reference points, the implications of fishing at  $F_{0.1}$  and  $F_{2000}$  in 2002 and subsequent years should be evaluated. The present stock size and spawning stock size should be described in relation to those observed historically and those expected in the longer term under this range of options.
- c) For those stocks subject to general production-type assessments, the time series of data should be updated, the status of the stock should be reviewed and management options evaluated in the way described above to the extent possible. In this case, the general reference points should be the level of fishing effort or fishing mortality (F) which is calculated to be required to take the MSY catch in the long term and two-thirds of that effort level.
- d) For those resources for which only general biological and/or catch data are available, few standard criteria exist on which to base advice. The stock status should be evaluated in the context of management requirements for long-term sustainability and the advice provided should be consistent with the precautionary approach.
- e) Spawning stock biomass levels considered necessary for maintenance of sustained recruitment should be recommended for each stock. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing reproductive potential of the stock, management options should be offered that specifically respond to such concerns.
- f) Information should be provided on stock size, spawning stock sizes, recruitment prospects, fishing mortality, catch rates and TACs implied by these management strategies for the short and the long term in the following format:
  - I. For stocks for which analytical-type assessments are possible, graphs of all of the following for the longest time-period possible:
    - historical yield and fishing mortality;
    - spawning stock biomass and recruitment levels;
    - catch options for the year 2002 and subsequent years over a range of fishing mortality rates (F) at least from  $F_{0.1}$  to  $F_{max}$ ;
    - spawning stock biomass corresponding to each catch option;
    - yield-per-recruit and spawning stock per recruit values for a range of fishing mortalities.
  - II. For stocks for which advice is based on general production models, the relevant graph of production as a function of fishing mortality rate or fishing effort. Age-aggregated assessments should also provide graphs of all of the following for the longest time-period possible:
    - exploitable biomass (both absolute and relative to  $B_{MSY}$ )
    - yield/biomass ratio as proxy for fishing mortality (both absolute and relative to  $F_{MSY}$ )
    - estimates of recruitment from surveys, if available.
  - III. Where analytical methods are not attempted, the following graphs should be presented, for one or several surveys, for the longest time-period possible:
    - time trends of survey abundance estimates, over:
      - an age or size range chosen to represent the spawning population
      - an age or size-range chosen to represent the exploited population
    - recruitment proxy or index for an age or size-range chosen to represent the recruiting population.
    - fishing mortality proxy, such as the ratio of reported commercial catches to a measure of the exploited population.

For age-structured assessments, yield-per-recruit graphs and associated estimates of yield-per-recruit based reference points should be provided. In particular, the three reference points, actual F,  $F_{0.1}$  and  $F_{max}$  should be shown.

- g) For squid (*Illex*) in Sub-areas 3 and 4, the Scientific Council is requested to advise on the level of TAC in high abundance years and on the criteria which could be reliably used to forecast changes in productivity under an annual management regime. Scientists are encouraged to further analyze available data toward developing other possible indicators that could be used under an in-season management regime for squid, recognizing that the practical use of such indicators would require that they be available as early in the season as possible.
- h) For shrimp in 3M, the Fisheries Commission notes that information to date from the commercial fishery in 2000 is showing relatively high catch rates. In light of this apparent change in stock status, the Scientific Council is requested to review information from the 2000 fishery at its November 2000 meeting and to evaluate the impact on this resource of removals in year 2001 and 2002 corresponding to 25,000 t, 30,000 t, 35,000 t and 40,000 t respectively. Furthermore, the Scientific Council is requested at its November 2000 meeting to evaluate, on the basis of the best data available, whether the provision for a Div. 3M shrimp closure in FC Working Paper 99/16 (Rev.) would be a precautionary approach-based measure and, if so, whether proposed area and timing of the closure are appropriate.
4. The results described in Section 3 should include information about the reliability of the results. To this end, the following information should be included in a synoptic form:
- Parameter uncertainty in assessments, possibly as confidence intervals
  - Robustness of assessments to alternative assumptions or data series
  - Illustration of conflicts in data series
- This information may be accompanied by quality statements giving the opinion of the Scientific Council about the reliability of the various data series for particular purposes.
5. Noting the progress made by the Scientific Council on the development of a framework for implementation of the Precautionary Approach, the Fisheries Commission requests that the Scientific Council provide the following information for the 2001 Annual Meeting of the Fisheries Commission for stocks under its responsibility requiring advice for 2002, or 2002 and 2003:
- a) the limit and target precautionary reference points described in Annex II of the UN Fisheries Agreement indicating areas of uncertainty (when precautionary reference points cannot be determined directly, proxies should be provided);
  - b) information including medium term considerations and associated risk or probabilities which will assist the Commission to develop the management strategies described in paragraphs 4 and 5 of Annex II in the Agreement;
  - c) information on the research and monitoring required to evaluate and refine the reference points described in paragraphs 1 and 3 of Annex II of the Agreement; these research requirements should be set out in the order of priority considered appropriate by the Scientific Council;
  - d) any other aspect of Article 6 and Annex II of the Agreement which the Scientific Council considers useful for implementation of the Agreement's provisions regarding the precautionary approach to capture fisheries;
  - e) propose criteria and harvest strategies for re-opening of fisheries and for new and developing fisheries; and
  - f) to work toward the harmonization of the terminology and application of the precautionary approach within relevant advisory bodies.
6. In addition, the following elements should be taken into account by the Scientific Council when considering the precautionary approach:
- a) Many of the stocks in the NAFO Regulatory Area are well below any appreciable level of  $B_{lim}$  or  $B_{buf}$ . For these stocks, the most important task for the Scientific Council is to inform on how to rebuild the stocks. In this context and building on previous work of the Scientific Council in this area, the Scientific Council is requested to evaluate various scenarios corresponding to recovery plans with timeframes of 5 to 10 years, or longer as appropriate. This evaluation should provide the information necessary for the Fisheries Commission to consider the balance between risks and yield levels, including information on the consequences and risks of no action at all.

References to “risk” and to “risk analyses” should refer to estimated probabilities of stock population parameters falling outside biological reference points.

- b) Where reference points are proposed by the Scientific Council as indicators of biological risk, they should be accompanied by a description of the nature of the risk incurred if the reference point is crossed (e.g. short-term risk of recruitment overfishing, loss of long-term yield, etc.)
  - c) When a buffer reference point is proposed in order to maintain a low probability that a stock, measured to be at the buffer reference point may actually be at or beyond the limit reference point, the Scientific Council should explain the assumptions made about the uncertainty with which the stock is measured, and also the level of ‘low probability’ that is used in the calculation.
  - d) Wherever possible, short and medium term consequences should be identified for various exploitation rates (including no fishing) in terms of yield, stability in yield from year to year, and the risk or probability of moving the stock beyond  $B_{lim}$  or  $B_{buf}$ . Whenever possible, this information should be cast in terms of risk assessments relating fishing mortality rates to the risks of falling below  $B_{lim}$  and  $B_{buf}$  as well as of being above  $F_{lim}$  and  $F_{buf}$ , the risks of stock collapse and recruitment overfishing, as well as the risks of growth overfishing and the consequences in terms of both short and long term yields.
  - e) When providing risk estimates, it is very important that the **time horizon** be clearly spelled out. By way of consequence, risks should be expressed in timeframes of 5, 10 and 15 years (or more), or in terms of other appropriate year ranges depending on stock specific dynamics. Furthermore, in order to provide the Fisheries Commission with the information necessary to consider the balance between risks and yield levels, each harvesting strategy or risk scenario should include, for the selected year ranges, the risks and yields associated with various harvesting options in relation to  $B_{lim}$  ( $B_{buf}$ ) and  $B_{target}$ , and  $F_{lim}$  ( $F_{buf}$ ) and  $F_{target}$ .
7. The Fisheries Commission, with the concurrence of the Coastal State, requests that the Scientific Council review available information, including any Canadian assessment documentation on the stock status, and provide advice on catch levels for the 2J3KL witch flounder resource for 2002 and 2003. Any information pertaining to the relative distribution of the resource within the stock area, as well as changes in this distribution over time should also be provided.
  8. The Scientific Council is requested to review all available information from both research vessel surveys and commercial catches on the relative biomass and geographic distribution of the following unregulated species/stocks occurring within the NAFO Regulatory Area: monkfish (*Lophius americanus*), wolffishes (*Anarhichas lupus*, *A. minor*, *A. denticulatus*), thorny skate (*Amblyraja radiata*), black dogfish (*Centroscyllium fabricii*), eelpouts (*Lycodes spp.*), longfin hake (*Urophycis chesteri*), and orange roughy (*Hoplostethus atlanticus*).
  9. The Scientific Council is requested to evaluate the distribution of the fishable biomass of the main commercial species of fish in relation to depth (in 100-m intervals). Separate values should be provided a) for fish above and below the length of 50% maturity and b) for fish above and below the current minimum landing size.
  10. The Fisheries Commission also requests, with the concurrence of the Coastal State, that the Scientific Council evaluate the likely future medium-term development for Greenland halibut in 2+3KLMNO, Yellowtail flounder in 3LNO, American plaice in 3LNO (if possible) and cod in 3NO, under the following assumed constraints:
    - a) Closure of targeted Greenland halibut fishery in depths less than 200, 500 and 800 meters or any other depths considered appropriate. These cases, which will have to make a reasonable assumption on the redirection of effort so removed onto the remaining depth strata, should be compared with evaluation of current fishing practices.
    - b) Subject to the above, likely future medium-term consequences (5 to 10 years) for the yield, spawning biomass, exploitable biomass and recruitment, stating the relevant biological assumptions.

c) The scenarios should be explored for a range of fishing effort assumptions corresponding to:

- i) Maintaining overall fishing effort at the same levels as estimated in the last year for which good information is available.
- ii) Increases or decreases of +/- 30% in fishing effort from this value.
- iii) Additional scenarios as considered appropriate by the scientific Council.

In these scenarios, the Scientific Council should evaluate whether these fishing strategies provide adequate long-term protection to juvenile fish to allow maintenance of the spawning biomass at an appropriate level.

11. The Scientific Council is requested to review the distribution of juvenile American plaice and update the distribution of yellowtail flounder based on results from comprehensive research surveys. The Scientific Council is also requested to delineate further the areas of juvenile concentration in the Southeast Shoal area and its surroundings.
12. Regarding redfish in NAFO Division 1F, the Scientific Council is requested to review all available information on the distribution of this resource over time, as well as on the affinity of this stock to the pelagic redfish resource found in the ICES Sub-area XII, parts of SA Va and XIV or to the redfish found in NAFO Sub-areas 1-3.
13. With regard to shrimp in Divisions 3LNO, the Fisheries Commission, with the concurrence of the Coastal State, requests that the Scientific Council provide information on the geographical distribution of this resource, as well as describe the relative and seasonal distribution inside and outside the NAFO Regulatory Area.
14. The Fisheries Commission requests the Scientific Council to provide information on the long-term effects of increasing mesh size from 130 mm to 145 mm in yield-per-recruit and stock spawning biomass-per recruit for Greenland halibut in 2+3KLMNO and in reducing by-catch of other species in that fishery. The Scientific Council is also requested to evaluate the medium term consequences in terms of yield and stock size of any such changes in mesh size.
15. The Fisheries Commission requests the Scientific Council to provide advice regarding the methodology for scientific research on fish stocks under moratoria.