NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

ORGANISATION POUR LA CONSERVATION DU SAUMON DE L'ATLANTIQUE NORD

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For information

Council

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Report of the Joint Meeting with NPAFC and IBSFC on Causes of Marine Mortality of Salmon

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Introduction

1. The increased marine mortality of some salmon stocks in recent years is a concern in both the North Pacific and North Atlantic Oceans and in the Baltic Sea. Last year the Council agreed to hold a meeting with the North Pacific Anadromous Fish Commission (NPAFC) and the International Baltic Sea Fishery Commission (IBSFC). This meeting was held in Vancouver, Canada during 14-15 March 2002 under the Co-Chairmanship of Dr Yukimasa Ishida (Japan) and Dr Malcolm Windsor. The objectives of the meeting were to:

   - improve understanding of the mechanisms resulting in the increased marine mortality of salmon;
   - identify research priorities;
   - stimulate enhanced cooperation and information exchange in the future.

2. The meeting, which was co-sponsored by NPAFC, NASCO, IBSFC, PICES and ICES, was the first of its kind to bring together five inter-governmental organizations to review information on salmon in the three areas. Almost 150 delegates attended. Sessions were held on the status of salmon stocks and fisheries and the possible factors associated with increased marine mortality, which were considered under three groupings - climate and oceanography, human-induced effects and ecological factors. In addition there was a synthesis and general discussion session. The main points arising from these sessions are briefly summarised below.

Status of Stocks and Fisheries

3. On the basis of the information presented on status of stocks and fisheries, it is clear that there is concern about the low marine survival of some salmon stocks in all three areas, that in response to these concerns there have been major reductions in marine fisheries and that for some stocks these restrictive measures have not yet resulted in improvements in status. Particular concern was expressed about the status of stocks at the southern limit of the range, inevitably raising concerns about the possible effects of global warming. For example, some US stocks of both Pacific and Atlantic salmon have been designated under the Endangered Species Act. For North American origin Atlantic salmon it has been suggested, on the basis of reconstructed climate cycles that the present abundance is the lowest it has been for 300 years and that there are increasing anthropogenic influences on these stocks.

Factors affecting marine mortality

4. Research on salmon at sea has, until recently, been given relatively low priority and, as a result, the factors affecting survival at sea are poorly understood but appear to be driving abundance. If the key to good management is knowledge, then it is important that there is a clearer understanding of this phase of the salmon's life-cycle. The joint

meeting provided an opportunity to review new information on the factors affecting survival of salmon at sea. The following points emerged:

Climate and oceanography

- correlations suggest the importance of environmental variability, such as sea surface temperature, to salmon survival at sea, and provide a basis for the provision of management advice;
- decadal-scale climate regimes lead to major changes in marine ecosystems, affect salmon production, and can have a profound effect on the population structure and diversity of salmon;
- links between the Pacific and North Atlantic climate regimes have resulted in common responses in salmon stocks;
- while the precise factors affecting mortality at sea remain unclear, and may differ within and between ecosystems, changes in early marine growth of post-smolt salmon appear to be important;
- the effects of even small shifts in climate can exceed, in a short period of time, the effects of long-term management actions.

Human- induced effects

- exposure to sub-lethal concentrations of contaminants in fresh water, such as pesticides and endocrine-disrupting chemicals, may delay or inhibit smolt migration, affect adaptation to marine conditions or lead to poor growth;
- other factors in fresh water (e.g. water temperature, acidification) may subsequently affect survival at sea and appropriate targeting of management action will require better identification of the relevance of these factors;
- there is concern about the impacts from aquaculture in all three areas. In Norway it has been estimated that, although there is great temporal and spatial variation in infection levels, sea lice from salmon farming may result in up to 95% mortality of wild Atlantic salmon, despite target lice levels in farms conforming to regulatory requirements;
- human-induced changes in genetic diversity may reduce the resilience of salmon to environmental changes in both freshwater and marine environments. Maintenance of genetic diversity should be one of the key goals of salmon management.

Ecological factors

- there are concerns about the impact of predation on salmon stocks in all three areas;
- in recent years the populations of salmon predators, a number of which are protected by legislation, are known to have increased while salmon abundance has declined;
- there is little quantitative information on the impact of predators on salmon fisheries and stocks, particularly at sea, but the impact of some species is thought to be significant;
- the intensity of predation is variable and may be related to climate change and availability of other prey. For example, a significant cold-water event in the early 1990s led to a shift in diet of gannets off Newfoundland and an increase by an

order of magnitude in the proportion of salmon post-smolts in the diet. While the proportion of post-smolts remained low (2.5%) in most years, this further increased to 20% in 2001.

5. During the discussion period a number of points emerged as follows:

- the meeting had provided a valuable exchange of information and efforts should be made to continue the dialogue, to enhance coordination of the work being undertaken in the three areas and to improve cooperation in the development of new technologies for studying salmon at sea;
- it was suggested that an expanded international symposium might be held in the near future to facilitate improved coordination, cooperation and exchange of ideas, and to communicate findings to the public in order to achieve support for research on salmon at sea;
- it is likely that a variety of factors are influencing mortality at sea and that a clearer understanding of these will require a multi-disciplinary research effort;
- a priority of research is to improve understanding of migration patterns and distribution of salmon at sea;
- a serious problem in understanding the marine phase of the salmon's life-cycle is related to the scale, and therefore the cost, of the research. There is a need to build on the progress being made and a number of suggestions as to the way forward were proposed, including analysis of historical scale collections, use of electronic tags, and international cooperative research focusing on specific areas of the migratory range;
- salmon are highly prestigious species, in which there is much public interest and there is a need for effective communication so as to gain public support for scientific research on salmon at sea.

Conclusion

6. This meeting was a unique opportunity to bring together knowledge on wild salmon from three different areas. Feedback from the participants suggested that it was well received and very useful. A report of the meeting is being published as an NPAFC Technical Bulletin and copies will be made available to all NASCO delegates. The views of the meeting with regard to research priorities and the way forward appeared generally consistent with the approach being adopted by NASCO's International Cooperative Salmon Research Board.

Secretary
Edinburgh
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