REPORT OF STUDY GROUP ON ECOSYSTEM-BASED MANAGEMENT AND ITS APPLICATION TO THE NORTH PACIFIC

The MEQ/FIS Study Group on *Ecosystem-based management and its application to the North Pacific* (SGEBM) met on October 14, 2004. Participants introduced themselves and the missing representation from China and Japan was noted. Some of these representatives would be coming later in the week but not in time to participate in the meeting. The Russian member could not attend but several Russian scientists attended the meeting as observers (*SGEBM Endnote 1*). The SGEBM Co-Chairmen, Drs. Glen Jamieson and Chang-Ik Zhang, went over the agenda for the meeting, and it was approved as presented (*SGEBM Endnote 2*).

Meeting summary

The terms of reference for the Study Group (*SGEBM Endnote 3*) were reviewed, followed by presentations of national submissions to the SGEBM report. Dr. Jamieson summarized the submissions of China and Japan. Dr. Oleg Katugin presented the Russian contribution. It was noted that the SGEBM report should be amended to indicate Study Group members who were responsible for preparing the national contributions so that questions could be directed to those individuals.

In reviewing the summaries of each country's approach to ecosystem-based management (EBM), it is immediately obvious that EBM challenges are different between China, Japan and Korea *vs.* Russia, Canada and the United States. The greater coastal populations in the former three countries, coupled with their much longer history of full exploitation of most harvestable renewable resources, meant that EBM is, initially at least, focused on 1) minimizing existing impacts, 2) rebuilding depleted stocks to more acceptable levels, and 3) in near-shore areas in particular, minimizing widespread impacts in the marine environment from land runoff from both industrial and urban developments. In contrast, in the latter three countries, human coastal populations and development were generally much less, with fishing impacts and offshore oil and gas development and transport identified as the major impacts. In many instances, relatively unimpacted, pristine habitat and biological communities still existed, and so the challenges there were often how to maintain them while permitting appropriate new economic activity to occur.

There was much discussion around three issues:

1) What would be an appropriate standard format to document environmental impacts and initiatives to minimize them?
2) How could the PICES region be subdivided into what the Study Group termed eco-regions? and
3) What indicators would be most appropriate to evaluate progress in achieving EBM?

While it is recognized that many human activities impact the marine environment (*e.g.*, fishing, mariculture, oil and gas exploration and development, pollution from land-based activities, disruption of freshwater discharges by urbanisation, *etc*.), the most comprehensive databases (*e.g.*, target species landings, bycatch and discard characteristics, habitat disruption, *etc*.) as to how these impacts are affecting marine ecosystems are related to fishing activities. Hence, much initial reporting of ecosystem impacts has been focused on documenting and addressing fishery impacts. Alternate reporting formats may need to be assessed or developed, that capture the ecosystem effects resulting from other human activities, and that describe how these ecosystem effects are being monitored. Ecosystem parameters already, or potentially, being monitored, may be capturing environmental change, without linking this change back to the specific human activity, or activities, that in fact

might be causing the change (*e.g*., increasing sea water temperature may be the result of many causes, some of which relate to human activities). In some cases, additional research may need to be undertaken to determine linkages. It was thus suggested that a standardized reporting framework that describes human activity impacts be progressively applied to all fisheries in PICES member countries, and that the adopted reporting framework be robust enough to address an increasing number of environmental and other requirements imposed by legislation, certification schemes, and consumer and community demands.

It was generally agreed that while achievement of EBM was a common objective, only through monitoring could the level of progress be actually measured. For cost-effectiveness, existing monitored parameters should be first assessed as to their utility there, but it was recognised that new parameters, many associated with non-commercial species, will also have to be monitored. Different national approaches to achieving such monitoring were briefly discussed, mostly in the context of initiatives to develop a process to determine an optimal mix of parameters to monitor.

The Study Group accepted Canada's definition of "eco-regions" as "*a part of a larger marine area (eco-province) characterized by continental shelf-scale regions that reflect regional variations in salinity, marine flora and fauna, and productivity*". Biological communities between each region are somewhat different, but within a region, they are generally similar, at least on the large scale. There would obviously be differences between habitats (*e.g*., estuarine, rocky, soft substrate, *etc*.) within an eco-region, but overall, the same mix of species could be expected to occur. EBM approaches within an eco-region should thus strive to achieve the same broad conceptual objectives of trying to preserve the natural species mix, proportions across trophic levels, water quality, and so on. Since some eco-regions transgress national boundaries, this might mean that different countries would be trying to address the same ecological objectives in their own waters within the same eco-region. The Study Group thus indicated that it would be of value to have a collective evaluation of where different eco-region boundaries are located.

It was concluded that SGEBM completed its terms of reference and prepared a report which describes current efforts and programs on EBM in PICES member countries. In finalizing the report, the following recommendations were made:

- Publish the final SGEBM report in the PICES Scientific Report Series in 2005;
- Establish a Working Group on *Ecosystem-based management and its application to the North Pacific* under the direction of the FIS and MEQ Committees, with a 3-year duration and the terms of reference as listed in *SGEBM Endnote 4*;
- Convene a 1-day MEQ/FIS Topic Session at PICES XIV on "Ecosystem indicators and models" (*SGEBM Endnote 5*).

SGEBM Endnote 1

Participation List

Members

Christopher Harvey (U.S.A.)
Glen Jamieson (Canada, Co-Chairman)
Jae Bong Lee (Korea)
Patricia Livingston (U.S.A.)
Inja Yeon (Korea)
Chang Ik Zhang (Korea, Co-Chairman)

Observers

Elena P. Dulepova (Russia)
Oleg Katugin (Russia)
Suam Kim (Korea, CCCC-IP Co-Chairman)
Olga Lukyanova (Russia)
John E. Stein (U.S.A., MEQ Chairman)
Hao Wei (China)
Oleg Zolotov (Russia)

SGEBM Endnote 2

SGEBM Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. Discussion of SGEBM terms of reference
4. Presentation of national EBM reports
5. Discussion and identification of emerging scientific issues related to the implementation of ecosystem-based management
6. Discussion and development of recommendations for a Working Group to focus on one or more issues identified
7. Finalization of report and recommendations to Science Board

SGEBM Endnote 3

Terms of Reference for the Study Group on *Ecosystem-based management and its application to the North Pacific*

1. To review and describe existing and anticipated ecosystem-based management initiatives in PICES member nations and the scientific bases for them;
2. To identify emerging scientific issues related to the implementation of ecosystem-based management;
3. To develop recommendations for a Working Group to focus on one or more issues identified in (2) above;
4. To report the results to Science Board at PICES XIII.

SGEBM Endnote 4

Proposed Terms of Reference (with additional information) and membership for the Working Group on *Ecosystem-based management and its application to the North Pacific*

1. Describe and implement a standard reporting format for ecosystem-base (EBM) initiatives (including more than fishery management) in each PICES country, plus a listing of the ecosystem-based management objectives of each country.

Review and describe in detail existing and anticipated ecosystem-based management objectives and initiatives in PICES member countries and elsewhere globally, and the scientific bases for them (this will be in more detail than is summarized in this report of the Study Group). Common elements, gaps and critical issues will be identified, particularly for areas such as monitoring, in which concerted international (*e.g.,* PICES) efforts might help in the achievement of progress. A standard reporting format, such as the Australian outline, would be developed for summarising the approach each country has adopted for all human impacts affecting the marine environment, including fishing.

2. Describe relevant national marine ecosystem monitoring approaches, and plans and types of models for predicting human and environmental influences on ecosystems. Identify key information gaps and research and implementation challenges.

The most important emerging scientific issues related to EBM appear to be the identification of sensitive ecosystem indicators and development of predictive models that can tell managers how ecosystem state might change in response to human or climate forcing. A major challenge in the achievement of EBM is determining what are the most relevant and cost-effective ecosystem parameters to measure in the monitoring of whether EBM is actually being effectively achieved. The details of such

parameters can be expected to be ecosystem-specific, but evaluation is required of whether there are underlying basic parameters that need to be monitored in all systems. Within PICES member countries, efforts would be described that explore science evaluation of potential components of ecosystem monitoring (measurements, indicators). Another key aspect of EBM to be examined would be national efforts to develop predictive models that incorporate human and climate effects and important ecosystem processes (such as predator-prey dynamics). The Working Group could then comment on key gaps in the ecosystem monitoring system of the North Pacific and recommend development of additional models for decision-making.

3. Evaluate the indicators from the 2004 Symposium on "Quantitative Ecosystem Indicators for Fisheries Management" for usefulness and application to the North Pacific.

4. Review existing definitions of "eco-regions" and identify criteria that could be used for defining ecological boundaries relevant to PICES.

The FAO Technical Guidelines for Responsible Fisheries recognize that for ecosystems to be a functional management unit, they need to be geographically-based with ecologically meaningful boundaries. Eco-regions are defined by jurisdictions differently, but are used here with Canada's definition*: "a part of a larger marine area (eco-province) characterized by continental shelf-scale regions that reflect regional variations in salinity, marine flora and fauna, and productivity."* Such ecosystem features often cross national boundaries. The product envisaged here is the listing of criteria for identifying ecological boundaries. Ecologically relevant boundaries are needed to allow scientific evaluation of how EBM objective achievement can be assessed, and to determine what potential components in an ecosystem monitoring and prediction program are most appropriate for the ecosystem being considered. It is important to have a standardized set of terms and vocabulary for defining spatial scales of interest.

5. Hold an inter-sessional workshop in Year 2 or 3 of the WG's mandate, that addresses the status and progress of EBM science efforts in the PICES region, with the deliverable being either a special journal issue or a review article.

6. Recommend to PICES further issues and activities that address the achievement of EBM in the Pacific.

The following scientists are suggested as members of the Working Group based on their experience, qualifications and active participation to date (key participants are italicised; recommended Co-Chairman is marked by *):

Canada:
*Glen Jamieson**, Robert O'Boyle, Ian Perry,

Japan:
Tokio Wada

People's Republic of China:
Xian-Shi Jin, Hao Wei

Republic of Korea:
Jae-Bong Lee, Inja Yeon, *Chang-Ik Zhang**

Russia:
Vladimir Radchenko

U.S.A:
Christopher Harvey, *Patricia Livingston**

SGEBM Endnote 5

Proposal for a 1-day MEQ/FIS Topic Session at PICES XIV on "Ecosystem indicators and models"

Ecosystem-based management (EBM) of resources will require ways to monitor current conditions and predict future states. Ecosystem indicators are single variables that reflect the status of broad suites of management activities or environmental conditions, and their assessment is key to monitoring the achievement of EBM. Predictive ecosystem models can be used to hypothesize the responses of an ecosystem to management actions, to assess the sensitivities of indicators, and to highlight gaps in current knowledge. This session will bring experts together to identify criteria for suitable indicators and the utilities of predictive models, and to present candidates of indicators and models that are actively in use in PICES areas.

Recommended co-convenors: Glen Jamieson (Canada), Tokio Wada (Japan), Xian-Shi Jin (People's Republic of China), Chang-Ik Zhang (Republic of Korea), Vladimir Radchenko (Russia) and Patricia Livingston (U.S.A.).