

The new PICES Working Group on *Ecosystem-based management*

Glen Jamieson
Pacific Biological Station
Fisheries & Oceans Canada
Hammond Bay Road, Nanaimo, B.C.,
Canada. V8T 6N7
E-mail: JamiesonG@pac.dfo-mpo.gc.ca

Dr. Glen Jamieson is a research scientist at the Pacific Biological Station (Fisheries & Oceans Canada) who has 18 years' experience in shellfish stock assessment. His research and provision of scientific advice is currently centered in four general areas: 1) research in support of the establishment of marine protected areas (MPAs) and ecosystem-based management in British Columbia; 2) development of appropriate steward-ship and monitoring protocols; 3) evaluation of the population dynamics and responses of selected species, focusing on relatively sedentary species such as benthic invertebrates, rockfish, and lingcod; and 4) investigation and monitoring of the presence and impacts of exotic species. Glen is a member of the PICES MEQ Committee and the Chairman of the Study Group on Ecosystem-based management science and its application to the North Pacific.



Since the industrial revolution, man's impact on the oceans has increased dramatically, this being especially true in recent years. In near-shore coastal areas, human population growth has led to increasing pollution and habitat modification. Fishing effects have become increasingly severe, with many, if not most, traditionally harvested populations now either fully exploited or over-fished (Garcia and Moreno, 2003). Thus far, management of these activities has been primarily sector-focused. For instance, fisheries have generally been managed in isolation of the effects of other influencing factors, and have targeted commercially important species, without explicit consideration of non-commercial species and broader ecosystem impacts. However, there is now an increasing international awareness of the cumulative impacts of sector-based activities on the ecosystem (Jennings and Kaiser, 1998; Kaiser and De Groot, 2000), and the need to take a more holistic or ecosystem-based management (EBM) approach (Anon., 1999; Kabuta and Laane, 2003; Link, 2002) to ensure the sustainability of marine ecosystems. Globally, there is an emerging paradigm shift in our approach to ocean management and usage (Sinclair and Valdimarsson, 2003).

In response to the increasing awareness to look at cumulative environmental impacts, in October 2003, the PICES Science Board established, under the direction of the Fishery Science (FIS) and Marine Environmental Quality (MEQ) Committees, the Study Group on *Ecosystem-based management science and its application to the North Pacific*, with the following terms of reference:

- 1) Review and describe existing and anticipated ecosystem-based management initiatives in PICES member nations and the scientific bases for them;
- 2) Identify emerging scientific issues related to the implementation of ecosystem-based management; and

- 3) Develop recommendations for a Working Group to focus on one or more of the issues identified.

The first Study Group task was to reach a common understanding of what the terms ecosystem and ecosystem-based management meant. The following definitions were agreed to:

Ecosystem: The spatial unit and its organisms and natural processes (and cycles) that is being studied or managed.

Ecosystem-based management: A strategic approach to managing human activities that seeks to ensure through collaborative stewardship the coexistence of healthy, fully functioning ecosystems and human communities [towards maintaining long-term system sustainability] by integrating ecological, economic, social, institutional and technological considerations.

Representatives from each country then submitted a summary of their country's approach to EBM, and it became immediately obvious that challenges were 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 was, initially at least, focused on 1) minimising existing impacts, 2) rebuilding depleted stocks to more acceptable levels, and 3) in near-shore areas in particular, minimising 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 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.

When the Study Group met at PICES XIII (Honolulu, October 2004), there was much discussion around three issues:

- 1) What would be an appropriate standard format to document environmental impacts and initiatives to minimise 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 recognised 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 is likely to be 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 capture 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 then be required to determine linkages. It was thus proposed by the Study Group that a standardised 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.

Eco-regions have been defined by Canada 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 might 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 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 here, 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.

In finalising its report, the Study Group made the recommendation to its two parent Committees, FIS and MEQ, to establish a Working Group on *Ecosystem-based management*, with a 3-year duration and the following terms of reference:

- Describe and implement a standard reporting format for EBM initiatives (including more than fishery management) in each PICES country, including a listing of the ecosystem-based management objectives of each country;
- 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;
- Evaluate the indicators from the 2004 Symposium on “Quantitative Ecosystem Indicators for Fisheries Management” for usefulness and application to the North Pacific;
- Review existing definitions of “eco-regions” and identify criteria that could be used for defining ecological boundaries relevant to PICES;
- Hold an inter-sessional workshop 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; and
- Recommend to PICES further issues and activities that address the achievement of EBM in the Pacific.

The parent Committees and Science Board accepted these recommendations, and the proposed Working Group on *Ecosystem-based management science and its application to the North Pacific* was established in October 2004. The Science Board also suggested that the full report of the Study Group be published as soon as possible in the PICES Scientific Report Series.