

REPORT OF WORKING GROUP 19 ON ECOSYSTEM-BASED MANAGEMENT SCIENCE



The Working Group on *Ecosystem-based Management Science and its Application to the North Pacific* (hereafter WG 19) held its third meeting on October 27–28, 2007, under the co-chairmanship of Drs. Glen Jamieson and Chang-Ik Zhang, and Ms. Patricia Livingston. A list of participants and meeting agenda can be found in *WG 19 Endnotes 1* and 2.

Description and implementation of a standard reporting format for EBM initiatives (Agenda Item 2)

Descriptions received from member countries were disparate and are being compiled into a summary. Still missing is a contribution from China. WG 19 discussed a conceptual spectrum of the ecosystem-based management (EBM) from single species fishery management to integrated (multi-sectoral) marine management and talked about trying to display national situations on the spectrum. Lists of government agencies involved in implementing EBM are being assembled.

Participants from each country were asked to provide Dr. David Fluharty a few paragraphs which outline where each nation is located on the Ecosystem Approach to Management (EAM) spectrum (*sensu* Sainsbury slide), including endangered species legislation, marine protected areas (MPA), or heritage site designations.

Dr. Fluharty discussed the possibility of incorporating a list of treaties dealing with transboundary stock management into the report. This document could be enhanced by adding aquaculture activities and their management. Categories in the report are expected to include: (1) definitions, (2) objectives, (3) legislation and agencies with marine management authority, (4) environmental assessment requirements in decision making, and (5) endangered species protection, marine sanctuaries, national heritage

or other MPA designation processes. Target date for completion of this chapter of the WG 19 final report is the end of December 2007.

Definitions of “eco-regions” and criteria for defining ecological boundaries relevant to PICES (Agenda Item 3)

Dr. Christopher Harvey gave an update of the “eco-region” chapter of the WG 19 final report. Currently, the discussion section needs more work and regional figures are not yet in a common format. There was discussion about the World Wildlife Fund MEOW (Marine Ecosystems of the World) initiative and how this might overlap with PICES efforts to define eco-regions. It was determined that governments of member countries are pursuing individual definitions and frameworks for eco-regions, a situation that must be highlighted. It is not clear whether MEOW’s system will be adopted, but national efforts could be compared with their regions. Some details and refinement of the discussion have to be finalized, but this chapter of the report is virtually complete, although lacking a contribution from China.

Dr. Elizabeth Fulton presented a report on the consequences of ocean management scenarios that ignore eco-region boundaries in favour of national boundaries. An artificial national boundary was generated between States in an existing model of southeast Australian waters, creating two artificial Exclusive Economic Zones (EEZs). Different management scenarios (loosely based on the range of management methods existing in the PICES region) were implemented, with contrasting options within these two EEZs. This meant that there were two management regions that spanned parts of a single eco-region – with some but not all species moving across the border between the two quasi-nations. Results for a range of indicators (drawn from the list constructed by Perry *et al.*) were

presented. This gave insight into the state of the system overall and the relative performance of the management methods. Results included:

- different levels of production with different management approaches (although this result might not occur in regions with a dominant signal from upwelling);
- less biomass in forage groups if target species were managed sustainably and higher trophic levels were conserved;
- any kind of management helps maintain target species biomass (*vs.* an unconstrained baseline scenario);
- for species with even moderate degrees of mobility (or more), effective management in one “nation” subsidizes catches and biomass taken by the other, but is still beneficial as it also raises overall system state;
- top predators benefit from more prey but this signal can be diffused by large scale (including seasonal) movements following rich prey sources/locations;
- cephalopods dropped in biomass slightly because of increase in top predators;
- habitat has the potential to benefit from management, but success is not a given (it is sensitive to the magnitude and specific implementation and types of management);
- from an EBM perspective, management in one region is helpful but perhaps not as effective as if management was coordinated across the regions.

One question that has not been addressed in this modeling work to date is whether the benefits seen from implementing effective management in one nation’s waters, even if the neighbouring country is not being as efficient, are cost-effective. This research will be targeted for publication by Drs. Fulton and Harvey in the peer reviewed literature, however, some illustrative examples and results will be incorporated in the WG 19 final report to highlight ecosystem issues arising from differential management across boundaries.

Evaluation of indicators and summary of monitoring efforts (Agenda Items 4 and 5)

An overview of the indicators chapter of the WG 19 final report was provided, and discussion points were outlined and agreed upon. The next

step was for each member country to suggest whether the indicators listed in Table 2 of the chapter had been calculated yet for a particular region in each nation and whether there are data available to do so. Dr. Perry will coordinate this effort. Tables from some countries were finished at the meeting, but others will need input from national experts. Most indicators were related to effects of fishing and not to the broader types of impacts from other marine sectors. The participants expanded the third recommendation in the chapter to explore the development and use of socio-economic indicators. There was discussion about social indicators such as the spatial distribution and numbers of jobs. Those data are difficult to obtain in some countries. ICES examples in that regard can be found in the 2006 Report of the Ecosystem Effects of Fishing (Sections 4.2–4.4, pp. 92–106, Tables 4.2.4, 4.4.3). Indicator availability tables from each country will be completed by the end of December 2007 and will be added to this chapter of the report.

FIS/MEQ workshop at PICES XVI (Agenda Item 6)

A full report of the FIS/MEQ workshop on “*Comparative analysis of frameworks to develop ecosystem-based approach to management and research needed for implementation*” (W3) can be found in the *Session Summaries* chapter of this Annual Report. The workshop made progress in highlighting issues related to the implementation of EBM in PICES member countries. It was clear from the presentations that member countries are in different stages of EBM implementation. Some are still working on incorporating an ecosystem approach to fisheries management, while others have national legislation that provides a mechanism for implementing cross-sectoral approaches to the management of marine activities to ensure environmental protection. The degree of advancement might be related partly to the nature of the different human pressures being exerted on the marine environment. Even some of the countries that appeared to be more advanced in their implementation mentioned problems in actually making cross-sectoral management work in marine ecosystems.

Overarching legislation that requires action may be needed. It was clear that more than one agency was involved in EBM activities in each country, and a challenge is to get agencies to work together in implementation. It was noted that the legislation that typically led to cross-sectoral implementation was some form of endangered species legislation.

Data requirements for EBM were discussed. The Australian experience demonstrated that implementation could involve both highly quantitative approaches and models if data are available, but could also include methods to evaluate ecosystem status and potential impacts in qualitative ways. The ICES experience exhibited how highly-evolved data gathering for EBM advice could be, although it was noted that highly-evolved advice did not necessarily translate into the political will to follow such advice. MONITOR outlined some of the data requirements that would necessitate its involvement and that of all of the PICES Committees. The workshop noted particularly the lack of socio-economic data to assist in decision-making in an EBM context.

Analytical tools are being developed to aid in EBM, and these include the highly structured risk assessment framework of Australia that allows for both quantitative and qualitative evaluation of risks, and determinations of when action is needed. The MODEL Task Team described a suite of modeling tools that might be used to understand impacts of climate variability on marine ecosystems. Models such as ATLANTIS can help in the evaluation of management strategies, and these seem to be important tools to further decision-making.

Communicating the results of EBM activities is ongoing in member countries. Some are using highly-structured reporting instruments such as ecosystem assessment documents. The ICES advisory structure communicates EBM advice in a tactical way that is highly evolved, although its success in implementing EBM might not be so advanced. Reporting of ecosystem status is crucial but it was recognized that identification and reporting of ecosystem pressures and ecosystem responses to management are

significant pieces in conveying EBM progress. Communicating measures of human health was noted to be essential in this regard. The role of PICES in communicating EBM was seen to be more of a strategic one. There is a variety of potential scales useful in reporting results.

A major outstanding research gap is the need for social science indicators and information. The advancement of risk assessment frameworks and tools seemed particularly important. Perhaps Working Groups on *Human Dimensions of Implementing EBM* or *Evaluation of Risk Assessment Tools and Frameworks* might be worthwhile to consider in the future.

WG 19 final report and 2008 inter-sessional meeting planning (Agenda Item 7)

National submissions of the above material are due to January 1, 2008, after which the lead authors and Co-Chairmen will begin merging the data into a final report. A major gap is a lack of Chinese submissions and lack of participation from this country to date. Options relating to finalization of the WG 19 report are thus:

- Get Chinese participation in an inter-sessional meeting in February 2008 (options Seattle or China);
- Extend the Working Group for one more year and meet with Chinese scientists at the next PICES Annual Meeting in Dalian;
- Finalize the report without Chinese input.

WG 19 hopes to have a draft of the final report by late January to send to the Chinese prior to the inter-sessional meeting, so they can see what contribution is desired from them.

After the meeting adjourned, it was realized that WG 19 originally intended to publish a brochure on EBM in 2008 but this topic was not discussed at the meeting. In hindsight, such a publication would have been premature as the final report has yet to be written. WG 19 still plans to produce a brochure (the concept was approved by Science Board last year), but after the final report is complete. Its contents would be a subset of information compiled in the final report. Discussion of contents of the brochure will be conducted either via email, at the inter-

sessional meeting, or at next year's Annual Meeting.

Structure and content of North Pacific Ecosystem Status Report and EBM-related topics for inclusion (Agenda Item 8)

An incremental improvement version of the 2004 pilot report is being recommended by Science Board (*SG-ESR Endnote 2*). WG 19 suggests enhancing the next report with information on pollution and socio-economics. The discussion focused on the need to identify key pressures in each region, and on how should indicators on status and trends describing human well-being be determined. Further discussion on these topics will be required.

Establishing a PICES Study Group on *Indicators of Human Well-being: Benefits, Health* is recommended to assist in this effort. Terms of reference for this group might include:

1. Identify potential indicators of human well-being and human impacts in relation to PICES marine ecosystem status and trends. Evaluate the Millennium Ecosystem Report Indicators for their appropriateness.
2. How might these measures be quantified and standardized across member countries? Are the data available to quantify these?
3. How can these measures be used in ecosystem models and management strategy evaluation frameworks?
4. Identify longer-term issues that might be covered by a Working Group on this topic (governance structures for implementation, *etc.*).

Membership for this Study Group should consist of qualified social scientists, primarily those with strong economics background, with an understanding of natural sciences, particularly marine science, who are working on questions relating to marine ecosystem approaches and management issues.

Comments on FUTURE (Agenda Item 9)

The participants evaluated a draft Science Plan for a new PICES integrative scientific program on *Forecasting and Understanding Trends, Uncertainties and Responses of North Pacific Marine Ecosystems* (FUTURE) in the context of advancing science and communication in support of EBM. The communications aspect of this program is very important and should be discussed and outlined more clearly with a strategic view of identifying the audiences and appropriate methods of communication. The status and trends information is newsworthy and needs communication.

Models are important to project future ecosystem states, and the program has a heavy emphasis on that aspect. WG 19 members thought that the deliverables for the program also have to include status and trend indicators and an improved, coordinated monitoring system to support indicator data requirements. Society needs to hear about human health, food security, role of climate, and potential for unanticipated ecosystem change.

WG 19 Endnote 1**Participation list**Members

Elena Dulepova (Russia)
 David Fluharty (U.S.A.)
 Christopher Harvey (U.S.A.)
 Glen Jamieson (Canada, Co-Chairman)
 Jae Bong Lee (Korea)
 Patricia Livingston (U.S.A, Co-Chairman.)
 Mitsutaku Makino (Japan)
 R. Ian Perry (Canada)
 Vladimir Radchenko (Russia)
 In-Ja Yeon (Korea)
 Chang-Ik Zhang (Korea)

Observers

Elizabeth Fulton (Australia)
 Xuewu Guo (PICES Secretariat)
 Woo-Seok Gwak (Korea)
 Oleg Katugin (Russia)
 Kenji Konishi (Japan)
 Skip McKinnell (PICES Secretariat)
 Thomas Okey (Canada)
 Jake Rice (Canada)
 John Stein (U.S.A.)
 Mikhail Stepanenko (Russia)
 Zhaohui Xhang (China)
 Mingyuan Zhu (China)

WG 19 Endnote 2**WG 19 meeting agenda**

October 27, 2007

1. Welcome and introductions
2. National definitions of EBM, making sure to expand beyond EBFM and list agencies that are involved in broader sectors, other than fisheries. Brief description of each country's ocean management report contents
3. National reports: Review national definitions of "eco-regions" and identify criteria that could be used for defining ecological boundaries relevant to PICES
4. Evaluation of the indicators from the 2004 Symposium on "*Quantitative ecosystem indicators for fisheries management*" for usefulness and application to EBM in the North Pacific, but broaden the terms of reference to encompass not just Paris symposium, but also NPRB indicators project and the types of indicators summarized by Elizabeth Fulton
5. National reports on monitoring efforts that address the types of indicators described in

item 4 above, as well as identify gaps. Member countries will focus on an eco-region that is most representative of their EBM efforts

October 28, 2007

6. Discuss content of FIS/MEQ Workshop on "*Comparative analysis of frameworks to develop an ecosystem-based approach to management and research needed for implementation*" (W3) at PICES XVI and incorporate into the report
7. Initiate discussion of structure of final report, deliverables and time frames; Planning for a 2008 inter-sessional meeting
8. Advice on structure and content of the North Pacific Ecosystem Status Report; suggest EBM-related topics for inclusion in the report
9. Discuss next major PICES scientific program, FUTURE, and provide comments

