

REPORT OF WORKING GROUP 19 ON ECOSYSTEM-BASED MANAGEMENT SCIENCE

The Working Group (WG 19) on *Ecosystem-based management science and its application to the North Pacific* held its second meeting from October 13–14, 2006, under the co-chairmanship of Drs. Glen Jamieson and Chang-Ik Zhang, and Ms. Patricia Livingston. Dr. Christopher Harvey served as rapporteur. A list of participants and the meeting agenda can be found in *WG 19 Endnotes 1* and *2*.

Review of national/international approaches to establishing science-based eco-regions (Agenda Item 2)

Dr. Ian Perry reviewed the definitions of North Pacific ecosystems put forth by PICES and other researchers and institutions, the different management zones defined by member nations, and how closely ecosystem boundaries and management boundaries matched one another. He concluded that:

- Ecosystem boundaries are often difficult to define due to the lack of fixed geography and due to long-term variability in non-static boundary-forming processes;
- The Large Marine Ecosystems (LMEs) as defined by Sherman appear to be the most useful conceptualization of ecosystems for PICES member countries;
- Management boundaries are generally consistent and complementary between nations, although perhaps less so in the Bering Sea and in the western Pacific;
- It will be difficult to change existing statistical areas due to the historic value and inertia placed upon their usage, so PICES must build on historical context rather than trying to change it;
- Management areas are generally much smaller than LMEs, but the management areas can generally be aggregated to reasonably approximate LMEs.

Theoretical evaluation of the consequences of an artificial boundary (Agenda Item 3)

Drs. Harvey and Elizabeth Fulton provided an update on efforts to use Atlantis, a spatially explicit marine ecosystem modeling software, to examine how different management strategies on either side of a jurisdictional boundary (*e.g.*, a national border) affect cross-border ecosystems. Harvey and colleagues are still in the process of completing an Atlantis model of the northern California Current, and therefore have yet to finish this task. It will be done by next year's Annual Meeting, either using the northern California Current model or one of Fulton's models for Australia.

National ocean management activity reports (Agenda Item 4)

Each member country outlined the processes and frameworks they are using to implement ecosystem-based management (EBM). A common problem among member countries is that the elements of EBM are often handled by different government agencies (for example, fisheries are managed by one ministry and environmental monitoring by another), and that there is often very little communication and collaboration between those agencies.

As it was noted last year, there are different conceptual frameworks among member countries. In Canada, Russia and the United States, EBM is mainly directed at maintaining or restoring ecosystems to relatively pristine status, while in China, Japan and Korea, EBM is described in the context of resource enhancement. In addition, there is a need for greater coordination and integration of management efforts, both within individual nations and between nations for resources that inhabit multi-national waters. As within nations, different aspects of EBM are handled by

different agencies or ministries, frameworks may not exist for coordinating those activities. Across nations, all PICES member countries manage resources that move into other EEZs (Exclusive Economic Zones), and the Working Group encourages PICES to support the development of regional management plans in these multi-national areas.

Two other concerns were raised by WG 19 on this agenda item. Firstly, certain words (*e.g.*, “ecosystem”, “integrative”) have different meanings and applications among different member countries, and a glossary of terms with agreed-upon definitions should be a part of the WG 19 final report. Secondly, written volumes describing marine eco-regions and science supporting EBM are crucial and should be living, evolving documents. However, they can grow very large and thus inaccessible to readers who need the information that they contain.

National ecosystem monitoring approaches (Agenda Item 5)

WG 19 members described highlights of their national monitoring plans. Each nation has devoted considerable resources to monitoring programs; Russia and Korea, in particular, have developed long time series and broad spatial coverage of a wide range of oceanographic and biological variables. Emerging issues that different nations are encountering include:

- the need to better define ecosystem objectives, so that monitoring programs can be used most effectively in management;
- the difficulty of getting managers, who are often in different agencies or ministries, to use monitoring data in decision-making;
- maintaining funding for monitoring programs.

Summaries of recent scientific meetings on ecosystem indicators (Agenda Items 6 and 7)

Two recent scientific meetings on ecosystem indicators were reviewed. Drs. Perry and Fulton revisited the 2004 Paris Symposium on “*Quantitative ecosystem indicators for fisheries management*”, which was described at last year’s WG 19 meeting. They broadened the

discussion to include new thinking on indicators. Dr. Fulton stressed the value that several “types” of indicators have had in monitoring ecosystem change. They include: relative biomasses, biomass ratios (*e.g.*, piscivores to planktivores), size spectra, maximum fish length, total fishery removals (or some other total human impact), size at maturity, biodiversity, and biophysical variables (*e.g.*, Chl-*a*). These can be rapidly measured and do not require special expertise or modeling to quantify. She has concluded that monitoring pelagic ecosystems requires fewer total indicators, but signal detection is slow. By contrast, demersal systems require more indicators but signal detection is rapid.

Dr. Perry described the Bering Sea Ecosystem Indicators project, a PICES effort funded by NPRB to define objectives, a monitoring program, and effective indicators for managing the southeastern Bering Sea. The process featured pre-workshops with diverse experts and stakeholders to maximize participation. These meetings were preparatory to the PICES/NPRB Indicators workshop convened on June 1-3, 2006, in Seattle, U.S.A. The project has produced recommendations concerning ecosystem objectives, socio-economic objectives, and communication objectives for better disseminating the project’s work within PICES, to the broader scientific community, and to the public. The final report will be published as *PICES Scientific Report No. 33* by the end of this year. It will include three white papers developed for the workshop (on “*Operational objectives for the southeastern Bering Sea*” by Gordon Kruse and Diana Evans, on “*Toward ecosystem-based management of the oceans: A perspective for fisheries in the Bering Sea*” by Andrea Belgrano, Jennifer Boldt, Patricia Livingston and Jeffrey M. Napp, and on “*Ecological indicators: Software development*” by Sergei N. Rodionov) and a summary of workshop discussions and recommendations. Outcomes of the workshop have been used by NPRB in developing an integrated ecosystem research plan for the Bering Sea.

It was recommended that WG 19 should focus not on choosing specific indicators, but rather on developing a scientific process by which proper

indicators are defined for a given ecosystem, such that the process can be readily developed and implemented in an EBM framework.

Content of the WG 19 final report (Agenda Item 8)

The final WG 19 report, due prior to the 2008 PICES Annual Meeting, will include a general introduction, national definitions of EBM, and a glossary listing and defining key terms. It will then summarize activities toward meeting the WG 19 Terms of Reference (TOR). Reporting plans for TORs are detailed below:

TOR #1: Describe and implement a standard reporting format for EBM in each PICES country. The report will include: (1) national definitions of EBM; (2) national objectives for EBM; (3) descriptions of how objectives are made operational in each country; (4) reports on national ocean management activities; and (5) a synthesis that describes similarities and differences among national approaches. *The Working Group no longer feels it is practical to create a standard reporting format because it would be prohibitively labor-intensive, so this aspect of the term of reference will not be considered further.*

TOR#2: Review existing definitions of eco-regions and identify criteria used for defining ecological boundaries. The report will include national identification criteria as presented at the PICES XV MEQ/FIS workshop (W3) on “Criteria relevant to the determination of unit eco-regions for ecosystem-based management in the PICES area”, with particular attention to how national definitions compare with other ecosystem definitions (e.g., LMEs). The brief report of the workshop is included in the *Session Summaries* chapter of this Annual Report.

TOR #3: Evaluate indicators from the 2004 Symposium on “Quantitative ecosystem indicators for fisheries management”. The report will present the WG 19 recommendations for types of indicators (and not specific indicators) that have been analyzed in publications generated since the 2004 symposium. *The Working Group feels that this*

term should be broadened to include and integrate findings from the NPRB-funded PICES Bering Sea Ecosystem Indicators project into the final report.

TOR #4: Describe relevant national marine ecosystem monitoring approaches, plans, and models for predicting human and environmental influences on ecosystems. The WG is concerned that much of this Term of Reference has already been addressed, in the *PICES Scientific Report No. 18* on “Impact of climate variability on observation and prediction of ecosystem and biodiversity changes in the North Pacific” (2001). *The Working Group proposes to change this TOR to: Determine if national monitoring data currently being collected are sufficient to allow calculations of key indicators.* Each nation will summarize the monitoring approaches in one ecosystem or eco-region that are most representative of their implementation of EBM. Tentatively, those case studies will be: the Kuroshio Current (Japan), the Yellow Sea (Korea), the Okhotsk Sea (Russia), the Pacific North Coast (Canada), and the Bering Sea (U.S.A.). Key indicators will be calculated for each system and data gaps will be identified.

TOR #5: Hold an inter-sessional workshop that addresses the status and progress of EBM science efforts in the PICES region. For the purposes of the final report, we will summarize the content of a 1-day FIS/MEQ workshop on “Comparative analysis of frameworks to develop an ecosystem-based approach to management and research needed for implementation” proposed for PICES XVI in Victoria, Canada.

In addition, WG 19 will create an 8- to 10-page brochure that is essentially an Executive Summary of the final report. It will be published in 2008, with the foreseen target audience to be determined later. We hope that the brochure will be translated into the languages of all PICES member countries.

Planning for PICES XVI (Agenda Item 9)

WG 19 proposes a 1-day FIS/MEQ workshop “Comparative analysis of frameworks to develop an ecosystem-based approach to management

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and research needed for implementation” to be convened at PICES XVI (WG 19 Endnote 3).

The structure of the workshop would be:

- a keynote talk summarizing activities of the Working Group;
- invited talks from other PICES Working Groups and committees (e.g., MONITOR, TCODE, or parent committees) that describe EBM-related tools and themes developed by other groups in PICES;
- invited talks from representatives of external institutions (e.g., FAO) that describe EBM-related tools and themes developed outside of PICES;
- an invited talk on the constraints to implementation of EBM;
- an invited talk on governance issues and difficulties related to EBM;

- An invited talk on socio-economic issues related to EBM; and
- Contributed talks solicited through the general abstract submission process.

In the evening following the workshop, WG 19 would convene for 2 hours to discuss the content of the workshop and incorporate it into the final report.

The desired outcomes of this workshop are:

- to fulfill the Terms of Reference of WG 19;
- to promote general discussion on objectives, practices, and implementation of EBM in PICES member countries; and
- To generate papers for a special issue or theme section of a prominent marine science journal, such as *Marine Ecology Progress Series* or *Progress in Oceanography*.

WG 19 Endnote 1

Participation list

Members

Elena Dulepova (Russia)
David Fluharty (U.S.A.)
Christopher Harvey (U.S.A.)
Oleg Ivanov (Russia)
Glen Jamieson (Canada, Co-Chairman)
Tatsu Kishida (Japan)
Jae-Bong Lee (Korea)
Patricia Livingston (U.S.A., Co-Chairman)
R. Ian Perry (Canada)

Vladimir Radchenko (Russia)
Inja Yeon (Korea)
Chang-Ik Zhang (Korea, Co-Chairman)

Observers

Robin M. Brown (Canada)
K. Alexandra Curtis (U.S.A.)
Elizabeth Fulton (Australia)
Henry Lee (U.S.A.)
Jacob Schweigert (Canada)

WG 19 Endnote 2

WG 19 meeting agenda

October 13

1. Welcome and introductions
2. Review of national and international approaches (maps, processes used to identify area) to establishing science-based eco-regions, and compare these to existing or planned “management” regions
3. Theoretical evaluation of the consequences of an artificial boundary that splits an ecological process and how that could affect management

4. National ocean management activity reports: the process and framework that each country is using to implement an ecosystem approach to management
5. National ecosystem monitoring approaches relevant to the eco-regions considered above

October 14

6. Findings from the 2004 Paris symposium on “*Quantitative ecosystem indicators for fisheries management*”

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| 7. Findings from the NPRB-funded PICES Bering Sea Ecosystem Indicators project | 8. Content of the WG 19 final report |
| | 9. Planning for PICES XVI |

WG 19 Endnote 3

Proposal for a 1-day FIS/MEQ workshop at PICES XVI on

“Comparative analysis of frameworks to develop an ecosystem-based approach to management and research needed for implementation”

An ecosystem-based approach to management (EBM) is an integrated approach to management of land, water, and living resources that promotes conservation and sustainable use over a broad range of human activities in an ecosystem. Implementation of an EBM for marine ecosystems in the North Pacific Ocean requires a number of steps and activities. An explicit framework that outlines the objectives, legal mandates, and institutional roles and responsibilities is essential. Data requirements and analytical tools need to be developed. This workshop invites papers to: 1) highlight existing national and international frameworks for implementation of an ecosystem approach to management; 2) outline the data requirements for such an approach; 3) describe the analytical tools being developed; 4) show the progress in

communicating results of EBM activities; and 5) discuss outstanding research gaps for making progress. The workshop will be organized to allow time for keynote summaries of PICES Working Group 19 results, invited contributions from other PICES groups, insights by other organizations involved in providing integrated ecosystem advice, talks on governance issues and difficulties, socioeconomic issues, *etc.* During a discussion period, participants are welcome to advise the convenors on the desirability of publishing the results of the workshop in a leading primary scientific journal.

Recommended convenors: Glen Jamieson (Canada), Patricia Livingston (U.S.A.) and Chang-Ik Zhang (Korea).

