5 Summary

This document expands in greater detail the progress each of the PICES member countries are making towards the implementaion of ecosystem-based management (EBM) within their EEZ. None of the countries to date have achieved full EBM, and it is readily apparent that because of differing national management objectives, EBM is being approached quite differently across the North Pacific. As discussed in the earlier Study Group report (Jamieson and Zhang, 2005), fishery management objectives in China, Japan and Korea are largely focused on maximising food production from the sea to meet the demands of their large human population's food needs, whereas in Canada and the United States, maintaining healthy populations of species in all trophic levels is recognized as the major EBM objective, even if this sometimes means closing fisheries to allow for population recovery. These different management approaches are perhaps best illustrated with respect to how invasive species are determined. There is broad agreement that invasive species are harmul to the 'desired ecosystem', and in the eastern Pacific they are defined as non-indigenous species. In the western Pacific, any species, non-indigenous or indigenous, whose abundance increases so that it becomes disruptive to existing fisheries is considered undesirable and invasive. This could therefore include significant increases in abundance of native jellyfish or harmful algal species, situations which, while also not desirable in the eastern Pacific, would not be dealt with by authorities focusing on what they define as invasive species. This difference may be subtle, but it serves to illustrate how different events or situations may be responded to differently by resource and research managers.

Through the process of documenting the diversity in EBM approaches shown by PICES member countries, it should be possible over time to discern which EBM approaches work well and which do not work under particular circumstances. This report establishes a baseline for each country against which future progress can be measured, and rate of achievment of objectives determined. We believe this is a key achievement, as it will assist in future studies, such as are being contemplated for PICES' new integrative science program on **F**orecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of North Pacific Marine **E**cosystems (FUTURE). There are three key questions that FUTURE will be addressing, namely:

1. What determines an ecosystem's intrinsic resilience and vulnerability to natural and anthropogenic forcing?
2. How do ecosystems respond to natural and anthropogenic forcing, and how might they change in the future?
3. How do human activities affect coastal ecosystems and how are societies affected by changes in these ecosystems?

They all relate to or influence the ultimate success of achieving effective EBM, so it will be interesting to document over time how either marine systems and/or management approaches of human activities change. Because of information presented in this document, it should be possible to evaluate in the future the consequences of anthropogenic influences on regional marine ecosystems.

5.1 Recommendations for Looking beyond WG 19

We discussed how the findings and work of WG 19 could best be integrated and built upon within PICES in years ahead, particularly within the context of the new PICES integrative science program on **F**orecasting and **U**nderstanding **T**rends, **U**ncertainty and **R**esponses of North Pacific Marine **E**cosystems (FUTURE); please see http://pices.int/members/scientific_programs/FUTURE/FUTURE-main.aspx). Development of ecosystem-based management is still very much in its early stages in each of the PICES member countries, and so we recommend that PICES continue to actively monitor progress into the foreseeable future. To provide a long-term forum for this process, we concluded that the issues addressed by WG 19 might justify the establishment of a new group, with emphasis on developing an integrative, science-based, ecosystem-scale understanding of the human dimension (across a diversity of sectors). This group will be closely associated with FUTURE as an Advisory Panel on *Anthropogenic Influences in Coastal Ecosystems* (AICE). We suggest that this new group's emphasis be on developing an integrative, science-based, ecosystem-scale understanding of the human dimension (across a diversity of sectors) in FUTURE, and suggest it be called *"PICES Understanding, Linking and Synthesis of Ecosystems"* (PULSE). A draft proposal for this proposed body with an objective, terms of reference and membership is:

Objective

To monitor and synthesize regional and basin-wide ecosystem-based management (EBM) studies and initiatives (ecosystem health) and to provide a forum for the integration of FUTURE-related EBM practices and their implementation.

Draft Terms of Reference

1. PULSE (*PICES Understanding, Linking and Synthesis of Ecosystems*) is the scientific body responsible for the promotion, coordination, integration and synthesis of research activities related to the implementation of EBM among PICES member nations. This goal would be accomplished by convening meetings, periodic scientific symposia or workshops, or by distributing information designed to foster cooperation and integration among existing or developing PICES programs, and possibly between and/or within member nations;
2. PULSE will provide the scientific body to identify and improve indicators to measure progress in the achievement of EBM. It will provide the forum to discuss the needs, impacts and responses of coastal communities in a changing marine environment, and to enhance the use of this information by governments and society at large. It will also provide a forum for the connection of ecosystem monitoring and status reporting of both environmental and social indicators (through linkage with MONITOR), and the subsequent implementation and adaptation of EBM;
3. Scientific collaboration and coordination with other international agencies, bodies and societies that are engaged in either EBM or human activities that are relevant to the achievement of EBM will be undertaken. This will engage expertise not previously active in PICES, such as social-scientists and policy makers;
4. PULSE will encourage establishment of other component activities, such as developing the basis for coupled human science-natural science models, and emerging approaches as needed to facilitate synthesis of the FUTURE Program.

Membership

We recommend a membership that will ensure core connection with PICES Committees, key expertise from the various disciplines involved in studying ecosystem approaches to management, and national representation. We advocate a nomination process that will closely connect this group to PICES Scientific Committees, such as ensuring that a member or designate from each Committee and perhaps from the current Study Group on *PICES Communications* in PULSE. There is also merit in having member participation from different sectors besides fishing (*e.g.*, mariculture) and ecoregions.

5.1.1 Advice on the Structure and Content of Future North Pacific Ecosystem Status Reports

The Working Group also considered advice on the structure and content of future North Pacific Ecosystem Status Reports (NPESRs), and specifically the inclusion of EBM-related topics in status reports. An incremental improvement version of NPESR is being recommended by Science Board, and we recommend that enhanced information on pollution and socioeconomics be considered for inclusion. We discussed the need to identify key pressures in each region, and on how indicators on status and trends describing human well-being should be determined, and concluded that further review on these topics is needed. Establishment of a PICES Study Group on *Indicators of Human Well-Being: Benefits and Health* is recommended to assist in this effort.

Criteria for selection of membership should include biophysical and social scientists, including in the latter those with strong economic, sociological and anthropologic expertise, with understanding of natural science, particularly marine science, and who are working on questions relating to marine ecosystem approaches and management issues. Terms of reference for such a group might include:

1. Identify potential indicators of human-well being and human impacts in relation to the PICES report on marine ecosystem status and trends; evaluate the Millennium Ecosystem Report indicators for their appropriateness.
2. Review how these measures might be quantified and standardized across member countries, and if the data are available to quantify these.
3. Review how these measures can 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.*).

Criteria for selection of membership should include natural and social scientists, including in the latter those with strong economic, sociological and anthropologic expertise who are working on questions relating to marine ecosystem approaches and management issues.

5.2 Ecosystem-based Management in International Waters

In the above, all details and discussion presented have been focused on initiatives being undertaken within the Exclusive Economic Zones of PICES member countries. While significant progress is being made in these regions to address issues relates to EBM, the reality is that many species have spatial distributions in the Pacific Ocean that extend well beyond national jurisdictions. For these species, effective EBM can only be realized if national efforts to achieve EBM are harmonized with similar multinational efforts in international waters. To this end, many of the initiatives to determine appropriate EBM steps in national waters, such as identifying ecoregions (spatial areas with a basically similar mix of species and environment) and within them, ecologically and biologically significant areas and species need to be undertaken in offshore international waters of the PICES region.

5.3 Bibliography

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