

## REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

The meeting of the Marine Environmental Quality Committee (MEQ) was held at Jeju Island, Korea from 14:00–16:00 hours on October 28, 2009. The Chairman, Dr. Glen S. Jamieson, called the meeting to order and welcomed the participants and observers (*MEQ Endnote 1*). The Committee reviewed the draft agenda (*MEQ Endnote 2*) and it was adopted. Dr. Steve Rumrill (U.S.A.) served as rapporteur.

### AGENDA ITEM 3

#### **Implementation of PICES XVII decisions**

There were no pressing issues for the Committee pending from last year's meeting, PICES XVII, in Dalian, China. The Chairman did not summarize the report of the inter-sessional Science Board meeting (April 28, 2009, Qingdao, China) as issues relative to it were largely focused on FUTURE, which was covered later in the agenda.

### AGENDA ITEMS 4–7

#### **Progress reports of MEQ subsidiary bodies**

##### *Section on Ecology of Harmful Algal Blooms in the North Pacific (HAB-S)*

Dr. Hak-Gyoon Kim, HAB Section Co-Chairman, reported on the results of their workshop and laboratory demonstrations (W6) on “*Cyst-forming HAB species*”; MEQ Topic Session (S4) on “*Mitigation of harmful algal blooms*”, and HAB-S business meeting convened at PICES-2009. Summaries of the workshop and session can be found in the Session Summaries chapter of this Annual Report.

HAB-S requested the following members be considered for replacement due to a lack of contribution and activity: Dr. Jennifer Martin (Canada) and Drs. Gennady Kantakov and Nina Klochkova (Russia). Potential alternatives for delegates to consider adding, based on their valuable contributions are: Drs. Hao Guo and Jinhui Wang (China). HAB-S requests that Canada provide an additional expert to the Section who can report on Canadian HAB data. HAB-S requests *ex-officio* membership for: Dr. Takafumi Yoshida (NOWPAP/CEARAC) and an ICES HAB Working Group member. The full report of HAB-S plans and activities can be found in the Report of the Section on *Ecology of Harmful Algal Blooms in the North Pacific* elsewhere in the PICES 2009 Annual Report.

##### *Working Group on Ecosystem-based Management Science and its Application to the North Pacific (WG 19)*

Dr. Glen Jamieson, WG 19 Co-Chairman, reported on the activities of the Working Group, and stated that the final report had been completed and had been sent to all MEQ and FIS Committee members for their evaluation. The Committee was asked to approve it, which it did unanimously. It was pointed out that WG members plan to produce a brochure of their report, which will be done with input from members from the FUTURE Advisory Panel, SOFE.

##### *Working Group on Non-indigenous Aquatic Species (WG 21)*

Ms. Darlene Smith, WG 21 Chairman, reported on the fourth meeting of the WG 21. As part of the MAFF project, WG 21 held a 4-day Rapid Assessment Survey (RAS) from October 19–22, with participation from Canada, Japan, Korea, Russia and United States, ICES WGITMO, and IOC WESTPAC. Collections analysed were taken from four locations (Busan, Ulsan, Masan and Jang Mok). There was also field sampling in Jeju Port and at Seongsan Beach, with laboratory analysis conducted at the Jeju Biodiversity Institute. The analysis is being finalized and will be entered into the NIS database. Special thanks are given to the local organizers and collaborators at KORDI, especially Dr. Junghoon Kang and Dr. Kyoungsoon Shin.

## MEQ-2009

There were also presentations on surveys undertaken by Dr. Li Zheng in Qingdong and Qingdao, China, and by Dr. Hiroshi Kawai in Osaka Bay, Japan (note: collectors were also put out by Canada and United States but their analysis was not yet completed). Collector surveys are planned for 2010 in Japan, China, United States, and possibly other countries.

Two alternative locations (Tokyo Bay or Osaka Bay) were proposed by Dr. Kawai for a RAS demonstration workshop to be held in July 2010. WG 21 selected the Osaka Bay proposal based on considerations of cost, biodiversity, facilities and logistics.

Upgrades to the Nonindigenous Species Database included: ability to add images, ability to add pdf files, ability to output maps to a pdf file or to a printer, a bulk import utility, and a utility to produce spreadsheets of information by species. Development is planned to be concluded by March 2010.

Finally, with respect to the summary of the marine bioinvasions in the North Pacific database, data entry is going slower than planned. The long-term plan is to produce an atlas of species with distribution maps and ecological characteristics as a PICES publication; a brochure with a CD and a pdf on the PICES website.

This was the fourth annual meeting of WG 21. There was participation by WG members from all PICES countries, including guests from IOC WESTPAC, ICES WGITMO, WG-24, and Oregon State University.

Concerning PICES-ICES collaboration, there was a joint meeting held in August with exchange of information on programs.

There is a possibility to present the WG 21 NIS database at a meeting at the WGBOSV meeting in Hamburg, Germany in March 2010. It is proposed that a third joint meeting be held in 2011, following a planned 7<sup>th</sup> Marine Bioinvasions Conference in Barcelona, Spain.

The Working Group is planning to hold a 4-day Rapid Assessment Survey prior to the next PICES Annual Meeting in Portland, U.S.A., and a 4- to 5-day demonstration RAS workshop in July in Japan.

A full report of WG 21 plans and activities can be found in its own report elsewhere in the PICES 2009 Annual Report.

### Working Group on *Environmental Interactions of Marine Aquaculture (EIMA)* (WG 24)

At its inaugural meeting, all members present were in agreement that, at this time, the Terms of Reference are appropriate for the Working Group. They agreed that standardization of risk analysis methods was not what is desired. Understanding how different methods are used, and how they compare with each other is a more important goal. The Working Group requested a 1½-day meeting to be held in advance of PICES-2010. WG 24 requested another Japanese member to support Activity 3 (Aquatic Animal Health).

Discussions by WG 24 are summarised in its own report, which was also presented to the FIS Committee.

## AGENDA ITEM 8

### **FUTURE: Roles for MEQ and respective member countries**

The Committee again had a good discussion of the structure of the next PICES integrative science program. Members believe that the direction of FUTURE is aligned well with the objectives of MEQ. Objectives of the three new FUTURE Advisory Panels, AICE, COVE and SOFE, were described by Dr. Jamieson, who served as the Interim Chair of AICE. Scientists associated with MEQ by virtue of their being committee members or by serving on expert groups associated with MEQ were appointed, one to each Advisory Panel. Dr. Tom Therreault (Canada, WG 21) is the AICE member, Dr. Jung-Hoon Kang (Korea, MEQ Committee) is the

COVE member, and Dr. Chang-Ik Zhang (Korea, WG 19) is the SOFE member. There is a potential conflict with the last appointment as WG 19 has been disbanded and Prof. Zhang is a FIS Committee member. To achieve a balance of committee and national representation on all Advisory Panels, the above nominations were agreed to. These MEQ representatives to FUTURE Advisory Panels have been asked to report their Panel's activities at future MEQ Committee meetings.

Discussions were held on the planned scope of activities and the identification of expert groups relative to each Advisory Panel. AICE-AP is most relevant to MEQ, and Chairmen of all three Advisory Panels will be on the PICES Science Board. AICE-AP can make recommendations on its own as to desired research, expert groups, *etc.*, but all three Advisory Panels are expected to recommend specific activities for consideration by the Committees.

Dr. John Stein (U.S.A.) summarized the differences between FUTURE and the previous science program, CCCC (Climate Change and Carrying Capacity). PICES Science Board is the scientific steering committee for FUTURE (unlike the CCCC Program which had its own Science Steering Committee).

#### AGENDA ITEM 9

##### **MEQ proposals for new subsidiary bodies**

Dr. Mitsutaku Makino gave a presentation on a proposal for a study group focusing on human dimensions. Its initial focus was to be ecosystem-based fisheries management, with additional foci anticipated on other sectors (*i.e.*, transportation, tourism, *etc.*) at a later date. The Committee supported establishment of a PICES Study Group on *Indicators of Human Well-Being: Benefits and Health*.

WG 19 recommended establishment of an expert group (section or task team, to be titled PULSE (PICES Understanding, Linking and Synthesis of Ecosystems)) to keep abreast of developments in EBM in PICES member countries. The relationship of PULSE (see MEQ *Endnote 3*) to other potential expert groups that may be established by FUTURE, and to the proposed Study Group, above, was discussed. WG 19 thought that a study group on human dimensions should be able to address some of the issues of concern to PULSE. The establishment of PULSE could be deferred for a year to await the study group's report. The MEQ Committee recommended that a Study Group on *Human Dimensions* be established with the understanding that it consider how best to achieve a longer-term EBM monitoring program as a component of FUTURE.

#### AGENDA ITEM 10

##### **MEQ Best Presentation and Poster Awards**

The MEQ Best Presentation award for 2009 was given to I Nyoman Radiarta for the paper entitled "*The impact of climate change on the development of marine aquaculture: A case study on Japanese scallop aquaculture in Funka Bay, Hokkaido, Japan*" (MEQ Topic Session S5).

The MEQ Best Poster award was given to Sang Rul Park for the paper entitled "Growth and photosynthetic characteristics of three *Zostera* spp. (*Z. japonica*, *Z. marina* and *Z. caespitosa*) along vertical gradient: Implications for seagrass zonation" (S5).

#### AGENDA ITEM 11

##### **Proposals for Topic Sessions and workshops at PICES-2010**

The Committee proposes that the following Topic Sessions, meetings and workshops to be convened at PICES-2010:

- a ½-day MEQ Topic Session on "*Conceptual and numerical models of HAB dynamics*" (MEQ *Endnote 4*);
- a 1-day MEQ workshop on "*New technologies and methods in HAB research and monitoring. I. HAB*

## MEQ-2009

- *species detection*” (MEQ Endnote 4 footnote);
- a ½-day MEQ Topic Session on “*Join the club: Integrating non-indigenous species with other anthropogenic influences on coastal ecosystems*” [later renamed as “*Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function*”] (MEQ Endnote 5);
- a ½-day MEQ/FIS Topic Session on “*New and emerging technologies: Applications of genomics for marine ecosystem studies*” (MEQ Endnote 6);
- a ½-day MEQ/FIS Topic Session on “*Identifying vulnerable marine ecosystems in the North Pacific*” (MEQ Endnote 7);
- a ½-day POC/MEQ/FUTURE Topic Session on “*Marine renewable energy development in coastal and estuarine environments around the North Pacific*” (MEQ Endnote 8);
- a 1-day FIS/MEQ Topic Session on “*Economic relation between marine aquaculture and wild capture fisheries*” (MEQ Endnote 9);
- a ½-day MEQ/FUTURE Topic Session on “*Characterization, understanding, and forecasting the influence of multiple stressors in coastal ecosystems*” (MEQ Endnote 10);
- a 1-day HAB-S business meeting;
- a 2-day WG 21 business meeting;
- a 1½ -day WG 24 business meeting.

### AGENDA ITEM 12

#### **Relations with other international programs and organizations**

HAB-S requested MEQ to recommend to Science Board for *ex-officio* membership for Dr. Takafumi Yoshida (NOWPAP CEARAC) and a HAB working group representative from ICES to attend PICES Annual Meetings. A member of this group was represented by Dr. Donald Anderson at PICES-2009.

MEQ proposed that one HAB-S member should attend ICES Annual Science Conferences (and *visa versa*).

### AGENDA ITEM 13

#### **Items with financial implications**

##### *Proposed inter-sessional meetings for 2010 and beyond*

- WG 21 proposed a third joint meeting with ICES in 2011 following the 7<sup>th</sup> Marine Bioinvasions Conference that is currently being planned in Barcelona, Spain.

##### *Proposed publications*

The following publications, repeated from last year, are still proposed:

- final WG 19 report in the PICES Scientific Report series (2010);
- a WG 19 brochure on ecosystem-based management (2010 or 2011) in a format similar to the FERRRS Advisory Report.

### AGENDA ITEM 14

#### **Membership and chairmanship of MEQ**

There continues to be an overall issue of having full participation in MEQ by all PICES member countries. At PICES-2009, China was not present, and only 60% of MEQ members were in attendance.

Terms of the MEQ Chairman and Vice-chairman expired following PICES-2009. Dr. Jamieson was renominated as MEQ Chairman by Dr. Rumrill, but declined to serve because he had retired from his Canadian government position. As a consequence, it would be difficult to receive travel support from Canada. Dr. Steven

Rumrill was then nominated by Darlene Smith. During the election, Dr. Rumrill was unanimously voted in as MEQ Chairman. Dr. Jamieson then nominated Dr. Mitsutaku Makino as Vice-Chairman, and this was also approved unanimously. Both Drs. Jamieson and Hak-Gyoon Kim were thanked for their efforts in chairing the MEQ Committee.

#### AGENDA ITEM 15

##### **Other business**

A 10 minute presentation was given by Dr. Peter Kershaw, representing the Group of Experts on Scientific Aspects of Marine Pollution (GESAMP).

The names of early career participants in MEQ activities were suggested as MEQ nominations for PICES Steering Committee representatives for the 2012 ICES/PICES Conference for Early Career Scientists that is being planned.

#### AGENDA ITEM 16

##### **Suggested theme for PICES-2011**

1. "FUTURE is now: Identification of ecosystem trends and responses to changing resilience in the North Pacific".
2. "Connections between the land and sea: Physical, biotic, and social-science links between and among coastal watersheds and North Pacific ecosystems"

#### **MEQ Endnote 1**

##### **MEQ participation list**

##### Members

Ik-Kyo Chung (Korea)  
 Glen Jamieson (Canada, Chairman)  
 Hak-Gyoon Kim (Korea)  
 Kunio Kohata (Japan)  
 Olga Lukyanova (Russia)  
 Mitsutaku Makino (Japan)  
 Darlene Smith (Canada)  
 Steve Rumrill (U.S.A.)  
 John Stein (U.S.A.)

##### Observers

Katsuyuki Abo (Japan)  
 Edward Black (Canada)  
 David Fluharty (U.S.A.)  
 Graham Gillespie (Canada)  
 Yoichiro Ishibashi (Japan)  
 Peter Kershaw (GESAMP)  
 Tsuyoshi Kitamoto (Japan)  
 Tatyana Semenova (Russia)  
 Peter Ross (Canada)  
 Gongke Tan (China)  
 Thomas Therriault (Canada)  
 Yasunori Watanabe (Japan)

MEQ Endnote 2

MEQ meeting agenda

1. Welcome and introductions
2. Approval of agenda
3. Implementation of PICES XVII decisions
4. Progress report of the MEQ Section on Ecology of Harmful Algal Blooms in the North Pacific and HAB activities related to “Development of the prevention system for harmful organisms’ expansion in the Pacific Rim” supported by a special fund from the Government of Japan” (Trainer)
5. Progress report of MEQ/FIS WG 19 on *Ecosystem-based Management Science and its Application to the North Pacific* (Jamieson)
6. Progress report of MEQ WG 21 on *Non-indigenous Aquatic Species* and NIS activities related to “Development of the prevention system for harmful organism’s expansion in the Pacific Rim” supported by a special fund from the Government of Japan” (Smith)
7. Progress report of MEQ WG 24 on “*Environmental Interactions of Marine Aquaculture*” (WGEIMA) (Amos)
8. Discussion of the next major PICES integrative scientific program, FUTURE: Roles for MEQ and respective member countries (Jamieson)
  - Brief Advisory Panel (AICE, COVE and SOFE) presentations by each of the three potential AP Chairs (20 min each)
9. Proposals for new subsidiary bodies (*e.g.*, Working Groups, *etc.*; requires Terms of Reference and list of potential members)
10. 2009 MEQ Best Presentation and Poster Awards
11. Proposals for Topic Sessions and workshops at PICES-2010 in Portland, U.S.A.
12. Relations with other international organizations/programs
13. Items with financial implications
  - a) Proposed inter-sessional meetings for 2010 and beyond
  - b) Proposed publications for 2010 and beyond
  - c) Travel support requests
  - d) Other items
14. Election of MEQ Chair and Vice-Chair
15. Other business
  - 10 min presentation by Dr. Peter Kershaw (representing the Group of Experts on Scientific Aspects of Marine Pollution)
  - Nomination for a PICES Steering Committee representative for a 2012 ICES/PICES Conference for Young Scientists (<35 y old)
16. Suggestions for the theme for PICES-2011 in Russia.
17. Adjourn at 18:00

**MEQ Endnote 3**

**Proposal for a MEQ/FIS Task Team on  
 “PICES Understanding, Linking and Synthesis of Ecosystems” (PULSE)**

**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, and by distributing information designed to foster cooperation and integration among existing or developing PICES programs, and possibly between and/or within member nations. 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 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;
2. 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. 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.

**Suggested members**

We recommend a structure that will ensure core connection with the 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 PULSE to PICES Scientific Committees, such as ensuring that a member or designate from each of the Committees and perhaps from the current Communication Study Group is in PULSE. There is also merit in having member participation from different sectors besides fishing (*e.g.*, mariculture, *etc.*) and ecoregions.

**MEQ Endnote 4**

**Proposal for a ½-day MEQ Topic Session at PICES-2010 on  
 “Conceptual and numerical models of HAB dynamics”**

Each PICES member country has conceptual models of harmful algal bloom dynamics that link the physics, chemistry and biological aspects of bloom development and decay. The biology gives us information on ecosystem structure but also describes elements contributing to success of a particular species. The chemistry focuses on nutrient dynamics, ratios and preferences among species. Physical processes detail cell and nutrient delivery to the coast. While conceptual models are descriptions of HAB dynamics without numbers, numerical models include rate estimates. In theory, each of these would be supported with the same physical, chemical and ecological foundation, overlain with the unique considerations of different water types and second order ecosystem structure. However, these models vary widely between species and among countries. There has been no comprehensive intercomparisons among these conceptual and numerical models to identify their

similarities and differences. The focus of this session will be to seek commonalities among models and identify the unique second order aspects needed to describe the distribution and dynamics of HAB in different PICES regions. We encourage modelers and non-modelers alike to submit their papers.

Co-Conveners: Shigeru Itakura (Japan) and William Cochlan (U.S.A.)

Invited Speakers: Selected by co-conveners from the following: Donald Anderson, Patrick Gentien, Wolfgang Fennel, Robin Raine (conceptual model), Tamiji Yamamoto (numerical model on nutrient dynamics and *Alexandrium tamarense*)

\* Plus a 1-day lab demonstration on “*New technologies and methods in HAB research and monitoring. I. HAB species detection*”. This series will continue in the future with demonstrations on: automated nutrient samplers, modeling, remote sensing, etc. (see *HAB-S Endnote 3*)

### MEQ Endnote 5

#### **Proposal for a ½-day MEQ Topic Session at PICES-2010 on “*Join the club: Integrating non-indigenous species with other anthropogenic influences on coastal ecosystems*”**

[later renamed as “*Anthropogenic forcing in North Pacific coastal ecosystems: Understanding changes in ecosystem structure and function*”]

When people think of anthropogenic forcing in coastal marine ecosystems, commercial fishing, aquaculture, pollution and urbanization usually come to mind. Another type of anthropogenic forcing, typically not classified as such, is the presence of non-indigenous species (NIS). While the occurrence and subsequent impacts of NIS in coastal ecosystems are usually not classified as anthropogenic, the mechanisms of their introductions are by definition anthropogenic.

The Anthropogenic Influences on Coastal Ecosystems (AICE) advisory panel under the auspices of FUTURE, identified NIS as an exemplary anthropogenic impact on coastal marine systems. Further, in order to begin addressing the three key questions identified as priorities for FUTURE research activities, AICE and COVE Advisory Panels made it a priority to either establish new PICES expert groups or build on and extend existing activities in PICES. Working Group 21 (Non-indigenous Aquatic Species) was one of the existing groups that were specifically suggested to “form an association with AICE”. Therefore, we propose a PICES topic session dedicated to NIS as an anthropogenic influence on coastal ecosystems, which would facilitate the priorities set forth by the aforementioned advisory panels

If we wish to integrate NIS with other anthropogenic influences, we need a better understanding of ecosystem or regional impacts of NIS. Many if not most studies on the impacts of NIS in marine systems are done at small spatiotemporal scales, i.e., typically over small areas (1 m<sup>2</sup>) or under controlled circumstances with single species interactions. Conclusions from these studies are often scaled up and extrapolated to entire ecosystems or regions, but the extrapolations are limited by the fact that NIS consequences for whole ecosystems are not limited to single species interactions within homogeneous habitats. The dynamics of NIS impacts vary over space and time. Processes occurring over seasonal, annual and decadal time horizons interact in complex ways with habitat type, condition and availability, native species assemblages, trophic interactions, and food web dynamics. Understanding these complexities requires restructuring how we think about NIS invasions and their impacts on the health of coastal systems. Including and integrating NIS invasions with other anthropogenic influences would help advance our objective of getting a better understanding of the ecosystem and regional impacts of NIS introductions.

Problems arising from the existence of NIS in coastal systems should be addressed using an ecosystem based approach. Continuing to study and manage NIS invasions as single species problems must be replaced by examining NIS within the context of the systems in which they invade. For example, global climate change is expected to have clear consequences with regard to future NIS introductions, establishment, and range

expansion of currently established populations. Ignoring this complex interaction will only hinder efforts to control established populations and prevent new introductions. Integrating NIS invasions with existing anthropogenic stressors will facilitate a holistic approach to addressing the challenges facing our coastal marine ecosystems.

We believe that the PICES-2010 annual meeting in Portland is particularly well suited for this proposed topic session. First, since much of the research on the impacts of NIS on coastal marine systems occurs in North America, Portland would serve as a convenient hub for this special session. Second, The Center for Lakes and Reservoirs (CLR) at Portland State University (PSU) is an internationally renowned Center that focuses on NIS research and serves as a conduit for much of the NIS research that occurs on the West Coast of the United States.

Confirmed Convenors: Blake Feist (U.S.A.) and Hiroshi Kawai (Japan)

Suggested Invited Speakers: John J. Stachowicz, Department of Evolution and Ecology, University of California, Davis (tentative): Topic: “Ecosystem and regional consequences of marine NIS invasions in coastal systems”; Toshiyuki Yamaguchi, Department of Earth Science, Chiba University, Japan (tentative): Topic: “*Biogeography and impacts of recently introduced non-indigenous barnacles in Japan*”.

#### MEQ Endnote 6

##### **Proposal for a ½-day MEQ/FIS Topic Session at PICES-2010 on “*New and emerging technologies: Applications of genomics for marine ecosystem studies*”**

The use of genomics, proteomics and metabolomics, either alone or in combination with each other and/or with more traditional methods, is rapidly transforming many areas of biological and biomedical research. Genomics is the study of all genes within an organism, and can be applied at the sequence (DNA) level, or the transcribed (RNA) level. Proteomics and metabolomics are studies of all proteins or metabolites, respectively, within an organism, organ, cell, or system, at any given time, under selected conditions. These technologies have enabled the transition from sequential studies of single genes, proteins or metabolites by enabling the simultaneous study of many components and their interactions with the environment (from pathways, through cell tissues to whole organisms and communities). These technologies are now being used to address fundamental questions in areas such as ecology, biodiversity and evolution primarily in the terrestrial setting. With the exception of genomic and proteomic studies designed to address questions about the diversity and ecology of marine microbial and phytoplankton and fish communities to date, these technologies have not been broadly applied in marine ecosystems or fisheries research. The goal of this session will be to provide an introduction to these technologies, including information on how they have been applied, or could be applied to address questions of importance to marine and fisheries scientists and policy makers. Contributors will be invited to explore topics such as: the scientific value of these technologies to ecological and fisheries research; the factors that have limited their application; the importance of these technologies to our understanding of complex issues such as monitoring, managing and setting policy for marine biodiversity; and what is needed for marine and fisheries scientists to take advantage of these technologies? This session will stimulate discussion within the PICES and broader research community: encourage interactions between marine and fisheries scientists with research groups that routinely use these technologies in their fields of research; and start the process of development of multidisciplinary research teams that are so crucial for obtaining funding for large-scale marine-base research programs that utilize and, more importantly, integrate these fields.

Suggested Co-Convenors: Laura Brown (Canada) and TBD

Suggested Invited Speaker: Salvatore Aricò, Division of Ecological Sciences, UNESCO, Paris. Approximate cost: \$3000, or Brian Bowen, Hawaii Institute of Marine Biology, University of Hawaii; research area: Phylogeography and conservation genetics of marine vertebrates. Approximate cost: \$2500.

**MEQ Endnote 7**

**Proposal for a ½-day MEQ/FIS Topic Session at PICES 2010 on  
“Identifying vulnerable marine ecosystems in the North Pacific”**

The FAO and the Convention on Biological Diversity (CBD) have been encouraging the sustainable use of marine living resources by the identification of vulnerable marine ecosystems (VMEs) and ecologically and biological significant areas (EBSAs), in particular but not exclusively in international waters. The broad purpose for identifying such areas is to prevent significant adverse impacts and to protect the marine biodiversity that these ecosystems provide.

To achieve these objectives, researchers and managers must be able to identify areas where VMEs are known, or are likely, to occur. Outstanding questions related to VME identification include what characteristics should be used to classify these systems, how can current information on VMEs and EBSAs be consolidated, and how can predictive models be developed and tested. PICES member countries are beginning to identify VMEs that meet a variety of biological and socio-economic objectives. However, no comprehensive comparison of the different methods or assessment of their performance against established ecological, social and economic objectives exists to provide guidance on the appropriate tools to be used. The proposed session will bring together researchers and managers engaged in ecosystem-based management to address three objectives: (1) to compare current approaches and datasets used to identify Vulnerable Marine Ecosystems/Ecologically and Biologically Sensitive Areas by different member countries in order to develop a list of appropriate tools, (2) to attempt to reach consensus on broadly acceptable criteria for the identification of VME/EBSA-type areas or potential areas in the high-seas of the Northeast Pacific Ocean, and (3) to propose the locations of such areas and ecosystems. Both benthic/demersal and pelagic systems will be considered, as they may have different criteria. Presentations and methods developed for shelf and coastal waters are welcome to the extent that they provide guidance and case studies for open ocean situations. This review of international experiences with applying criteria to identify VMEs and EBSAs will contribute to the international discussion and evaluation of these issues, and to the application of measures to protect these significant regions.

Convenors: Canada, U.S.A., Korea, others?

Invited Speaker: TBD. Approximate cost: ?

**MEQ Endnote 8**

**Proposal for a ½-day POC/MEQ/FUTURE Topic Session at PICES-2010 on “Marine renewable energy development in coastal and estuarine environments around the North Pacific”**

Renewable energy projects are increasing worldwide, and many types involve the marine environment. Those under active development are typically designed to directly extract energy from waves, tides, currents, wind, or thermal gradients or indirectly from biomass energy. These novel technologies will require new emplacements, moorings, or other structures in marine and estuarine environments with attendant intrusions upon the environment, including acoustic signals, changes to mixing, and electromagnetic fields. Marine renewable energy sources are able to provide clean energy, but their effects on the physical and biological environment are not well understood. This session will examine the technologies under development in PICES nations and address the current state of our knowledge on how they will interact with estuarine, coastal, and offshore environments.

For this session we seek contributions that deal with any topics pertinent to marine renewable energy development, including:

- Status of marine renewable energy in PICES countries;
- Economic costs and benefits of different approaches;
- Marine spatial planning for renewable energy;
- Physical effects of marine renewable energy development (current flow, energy reduction, mixing, sediment transport);
- Ecological effects (larval transport, entrainment, entanglement, behavior, habitat changes, communities) on all trophic levels.

Convenors: George Boehlert (USA), Michael Foreman (Canada, POC), Kuh Kim (Korea), Glen Jamieson (Canada, MEQ)

Suggested Invited Speaker: Henry Jeffrey (UK). Estimated cost: \$2500

### **MEQ Endnote 9**

#### **Proposal for a 1-day FIS/MEQ Topic Session at PICES-2010 on “*Economic relation between marine aquaculture and wild capture fisheries*”**

Past activities of PICES have mainly focused on physical and biological sciences, such as ecology, ecosystems, fisheries, oceanography, and biogeochemistry, *etc.* Recognizing the importance of impacts from human activities/uses upon marine living resources, we are proposing a topic session on the fisheries economics at the 2010 PICES meeting. While humans are essential parts of marine ecosystems, it is important to consider economic and social science research within PICES. Indeed, the new FUTURE science program endeavors to provide a greater role for social and economic scientists in PICES. This proposed economics session is a direct response to this objective and is intended to be a step toward enhancing research and management of marine living resources from a socio-economic perspective.

We propose the first ever PICES topic session on marine aquaculture economics, because of the growing role of marine aquaculture in both seafood production and consumption, as well as the close relationship between marine aquaculture and wild ocean capture fisheries. The proposed topic session will focus on the relationships of marine aquaculture with capture fisheries with respect to economics, such as (1) marine aquaculture products as a substitute and/or complement for wild caught products owing to consumer preference, price, and availability; (2) the synergies between aquaculture and fishing (use of fish processing trimmings, resilient coastal communities and maintaining working waterfronts, and (3) economic considerations regarding potential environmental effects (positive and negative) interactions between captured fisheries and marine aquaculture (*e.g.*, feed inputs in marine aquaculture derived from captured fisheries, aquaculture stock enhancement, aquaculture structures as fish aggregating devices, *etc.*),

We believe that the PICES 2010 annual meeting in Portland is particularly well suited for this proposed topic session for multiple reasons. First, this topic is timely owing to the ongoing activities of WG 24 and the joint interests of FIS and MEQ, particularly in light of FUTURE. Second, we have secured funding from NOAA NMFS to support travel of key Asian experts to this topic session. This funding, coupled to easy access to Portland by economic and social scientists from the U.S. and Canada, should assure a very well attended and highly successful topic session. We seek to publish accepted papers or a special issue from this session in a peer-reviewed journal such as *Aquaculture Economics and Management*, *Aquaculture*, *Reviews in Aquaculture*, or *Fishery Research*.

Suggested Convenors: Minling Pan, U.S. Economist, NOAA, Pacific Islands Fisheries Science Center (committed), Ingrid Burgetz, Canada, Senior Science Advisor, Fisheries and Oceans Canada (tentative), Qingyin Wang, China, Director, Yellow Sea Fisheries Research Institute (committed), Dohoon Kim, Korea, Economist, Office of Fisheries Economics, National Fisheries Research & Development Institute (in contact).

Proposed Invited Speakers: Michael Rubino, Manager, Aquaculture Program, NOAA, James Anderson, Professor, The Department of Environmental and Natural Resource Economics University of Rhode Island (tentative), Ping Sun Leung, Professor, Natural Resources and Environmental Management, University of Hawaii at Manoa (tentative).

**MEQ Endnote 10**

**Proposal for a ½-day MEQ/FUTURE Topic Session at PICES-2010 on  
“Characterization, understanding, and forecasting the influence of multiple stressors in coastal ecosystems”**

The North Pacific marine environment has provided a diverse and valuable series of ecosystem services to coastal communities for many thousands of years. Ocean and land-based anthropogenic activities are now widely recognized to have a strong influence on ecological processes throughout the North Pacific marine ecosystem. Anthropogenic influences are particularly strong in coastal waters where they impose a wide variety of multiple stressors that can impact fundamental ecosystem functions, critical processes, and marine biodiversity. Changes in the physical and biological environment perturb native communities, often resulting in disruption of species interactions and trophic relationships that can negatively impact productivity and diminish ecosystem resilience. For example, mariculture operations can change the physical environment while introduced species can negatively impact native biodiversity. Commercial shipping and recreational fishing activities can be a powerful vector for changes in the geographic distribution of marine and estuarine species. In addition, large scale processes such as regime shifts, ocean oscillations, and climate variability can alter nearshore processes. This session will explore the characterization, understanding, and forecasting of the influence of multiple anthropogenic stressors in North Pacific coastal ecosystems. Contributed papers will provide a higher-level overview of stressors (*e.g.*, overharvesting, urbanization, habitat loss, mariculture, HABs, pollution, introduced species, *etc.*) and the types of impacts that have been observed in northern marine ecosystems, especially those linked to changes in biodiversity and productivity (*e.g.*, extinctions, species interactions, trophic cascades). Authors of contributed papers will be encouraged to consider how larger-scale forecasts translate to lower-scale understanding. For example, determining how ocean models can be downscaled for regional predictions.

Co-conveners: Thomas Therriault (Canada, AICE), Steve Rumrill (U.S.A., MEQ)

Invited Speaker: TBD. Approximate cost: ?