REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

The Biological Oceanography Committee (BIO) held its meeting from 14:00–18:00 h on October 27, 2010 in Portland, U.S.A. The Chairman, Dr. Michael Dagg, called the meeting to order and welcomed the participants (BIO Endnote 1). The proposed agenda was reviewed and is provided in *BIO Endnote 2*.

AGENDA ITEM 3
Reports from subsidiary bodies

Advisory Panel on *Micronekton Sampling Inter-calibration Experiment* (MIE-AP)

MIE-AP officially completed its tasks last year and submitted a Final Report in at PICES-2009 in Jeju, Korea, that was provisionally accepted, pending some minor revisions and additions. This report has been completed and was published in September 2010 as PICES Scientific Report Number 38. A brief review of MIE-AP activities was presented by Dr. Michael Seki.

Advisory Panel on *Marine Birds and Mammals*

MBM-AP is undergoing a 5-year review. A report (*BIO Endnote 3*) from Chairman, Dr. William Sydeman, was submitted to BIO on October 8 for Committee review. The report summarized activities conducted during the past 5 years including: annual business meetings; peer-reviewed publications; topic sessions; workshops; and outreach activities. BIO commented positively on these past activities and also noted that marine birds and mammals are vital and increasingly important components of PICES science. However, BIO was not supportive of the requested 5-year continuation for MBM-AP at this time. Concerns expressed included: (1) the proposed new directions were insufficiently developed to allow in-depth review by BIO; and (2) insufficient attention is given to linkages and integrations of MBM-AP activities with FUTURE. Also, (3) the proposed new Chairmen for the MBM-AP, Drs. Rolf Ream and Yutaka Watanuki, were not in attendance and therefore could not present their views and thoughts on the new directions for the MBM-AP. BIO recommends that the MBM-AP be given a 1-year extension to address these concerns, with final decision to be made at the next annual meeting of PICES in October 2011. In this regard, it was strongly suggested that the revised Terms of Reference and the proposed new directions be completed within 9 months and sent to the BIO Committee for review and possible further comment prior to the PICES Annual Meeting.

Section on *Carbon and Climate* (CC-S)

A CC-S report was submitted to BIO summarizing the past 5 years of activity and proposing new activities for the next 5 years (see *CC-S Endnotes 1, 3* and *4*). Highlights of this report were presented to BIO by one of the CC-S Co-Chairmen, Dr. James Christian. BIO commented positively on the extensive accomplishments and activities of CC-S and strongly endorsed its request for a 5-year continuation.

Working Group on *Iron Supply and its Impact on Biogeochemistry and Ecosystems in the North Pacific Ocean* (WG 22)

WG 22, chaired by Drs. Fei Chai (U.S.A.) and Shigenobu Takeda (Japan) completed its activities at this Annual Meeting and plans to submit its final report in April 2011 (*WG 22 Endnote 4*). Its final business meeting report can be found elsewhere in the PICES 2010 Annual Report.

Working Group on *Comparative Ecology of Krill in Coastal and Oceanic Waters around the Pacific Rim* (WG 23)

WG 23, chaired by Drs. William Peterson (U.S.A.) and Song Sun (China) has a 4-year term from 2007–2011. A written report of its activities during the current year was submitted to BIO on October 11 and the final business meeting report can be found elsewhere in the PICES 2010 Annual Report. A report was presented to the Committee by Dr. Peterson.

Marine Ecosystem Inter-comparison Project (MEMIP)

A summary of the activities of MEMIP of the past year was provided to BIO on October 10, and a revised and expanded version, including a workplan for the next year, was presented to the Committee by Dr. Harold Batchelder (see *BIO Endnote 4*). BIO commented positively about the progress of MEMIP and fully endorsed its plan for the next year.

AGENDA ITEM 4
Updates on Symposia and meetings endorsed by BIO

- The 5th International Zooplankton Production Symposium on "*Population connections, community dynamics and climate variability*", March 14–18, 2011, in Pucón, Chile. The BIO Chairman noted that the deadline for abstract submission has been extended until November 5, and referred all Committee members to the PICES web page for further information.
- The 2nd ESSAS Open Science Meeting on "*Comparative studies of climate effects on polar and sub-polar ocean ecosystems: progress in observation and prediction*" Seattle, U.S.A. in May 2011. Dr. George Hunt gave a short presentation about this meeting, distributed brochures, and referred the Committee members to the PICES web page for additional information.
- The 2nd International Symposium on "*Effects of climate changes on the World's oceans*" will be held in Yeosu, Korea in May 2012. Dr. Sinjae Yoo gave a short update about this meeting, noting that a steering committee was recently formed, and that sessions will be finalized and a brochure prepared in January 2011.

AGENDA ITEM 5
Publications endorsed by BIO

Several important BIO-related publications were completed in the past year:
- Krill Biology and Ecology: Dedicated to Edward Brinton 1924–2010. (Guest Editors: S. Kawaguchi and W. Peterson) *Deep-Sea Research II*, 2010. Vol. 57, Issues 7–8, pp. 493–692.
- Ecosystem processes during the Oyashio spring bloom. (Guest Editors: A. Yamaguchi and C.B. Miller). *Deep-Sea Research II*, 2010, Vol. 27, Issues 17–18, pp. 1593–1742.
- SEEDS II: The Second Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study. (Guest Editors: M. Uematsu, M.L. Wells, A. Tsuda and H. Saito). *Deep-Sea Research II,* 2009. Vol. 56, Issue 26, pp. 2731–2958.
- PICES Special Publication 4. Marine Ecosystems of the North Pacific Ocean, 2003–2008. S.M. McKinnell and M.J. Dagg, (Eds.) 2010, 393 pp.
- PICES Scientific Report No 38. E. Pakhomov and O. Yamamura (Eds.) 2010. Report of the Advisory Panel on Micronekton Sampling Inter-calibration Experiment. 109 pp.

No new requests were proposed to the committee.

AGENDA ITEM 6
Topic sessions and workshops completed at PICES-2010

BIO

- S2: *Understanding the role of iron in regulating biogeochemical cycles and ecosystem structures in the North Pacific Ocean*,
- S3: *The Practical handbook at 50: A celebration of the life and career of Tim Parsons*,
- S4: *Census of Marine Life – Exploring ocean life: past, present and future*,

- BIO-P: BIO Paper session,
- W1: Marine ecosystem model inter-comparison (MEMIP) workshop.

Joint

- S6 (FIS/BIO): *Observations of ecosystem mixing under climate change*,
- S8 (FIS/POC/BIO): *Impact of climate variability on marine ecosystems: Understanding functional responses to facilitate forecasting*,
- S13 (POC/BIO/MONITOR): *Comparing the two major gyres of the subarctic North Pacific – Seasonal and interannual variability and its predictability*,
- W5 (POC/BIO): Carbon Data Synthesis Workshop.

No oral reports were given to the Committee. Written reports will be submitted by the convenors of each session and workshop. Requests for written reports were sent by email to the convenors of all BIO sessions and workshops. These will be sent separately to the PICES Secretariat.

AGENDA ITEM 7
Proposed new working groups

(a.) A working group on "Jellyfish blooms around the North Pacific Rim: Causes and Consequences"

This WG was extensively discussed one year ago at the PICES Annual Meeting in Jeju, Korea, and has now been formally proposed to BIO. Background information and Terms of Reference were circulated to all three FUTURE-Advisory Panels for their input prior to the meeting, and ToRs have been slightly modified in response to the provided feedback (see *BIO Endnote 5*). AICE-AP and SOFE-AP are supportive of this working group. COVE-AP recognized the importance of this topic but notes it is more of a coastal and social issue than an open ocean one. A presentation describing this working group was given to BIO by Dr. Ric Brodeur. BIO strongly supports the formation of this proposed working group.

(b.) A working group on "Ecosystem Responses to Multiple Stressors"

This working group was proposed by COVE-AP to sponsoring committees MEQ and BIO. BIO recognized that this working group is not as fully developed as it should be for approval but BIO is supportive because it is desirable to get FUTURE activity moving forward as quickly as possible. BIO endorses the formation of this working group.

AGENDA ITEM 8
Proposed inter-sessional workshop

A presentation was given to BIO by Dr. Thomas Therriault, Chairman of AICE-AP, requesting BIO endorsement of a workshop titled "*Indicators of status and change within North Pacific marine ecosystems: A FUTURE workshop*". For further details, see *BIO Endnote 6*. BIO supports this workshop.

AGENDA ITEM 9
Proposed workshop and Topic Sessions at PICES-2011

BIO supports the following workshop and sessions at PICES-2011:

- a 1½-day MEMIP 4 workshop (see *BIO Endnote 4*);
- a 1-day BIO Paper Session (BIO Endnote 7);

Three additional proposed sessions for BIO co-sponsorship were brought to BIO during the annual meeting:

- a 1-day BIO/POC Topic Session on "*Mechanisms of physical-biological coupling forcing biological "hotspots" in the Western North Pacific and Western North Atlantic* [later shortened to "*Mechanisms of physical-biological coupling forcing biological "hotspots"*"] (*BIO Endnote 8*). Dr. Sydeman gave a brief presentation of this late request. BIO supports this topic session.
- a 1-day MONITOR/POC/BIO workshop on "*Recent advances in monitoring and understanding of Asian marginal seas: 5 years of CREAMS/PICES East-I program*". A paper copy of this late request was provided to BIO at the Committee meeting but no presentation was made. BIO will defer to MONITOR and POC on this issue.
- a 1-day FIS/BIO Topic Session on "*The impacts of hypoxia on the mesopelagic micronekton and its implications for marine food webs*". No presentation was made to BIO regarding this late request. BIO (incorrectly) interpreted this proposal to be mainly focused on the east side of the Pacific and considered this theme too narrow. This session was not endorsed by BIO but if FIS is strongly supportive and there is space, BIO would consider co-sponsorship.

AGENDA ITEM 10
Additional financial requests

In addition to the financial requests associated with proposed workshops, a letter was received requesting support for the ESSAS meeting in Seattle in May 2011 (see *BIO Endnote 9*). BIO supports this request.

AGENDA ITEM 11
North Pacific Ecosystem Status Report II

This report (Marine Ecosystems of the North Pacific Ocean, 2003–2008) is published (PICES Special Publication 4, McKinnell, S.M. and Dagg, M.J. (Eds.) 2010, 393 pp.) and a copy was provided to all meeting participants. The BIO Chairman encouraged Committee members to provide comments to the Chairman of the SOFE-AP (Robin Brown), and especially to provide suggestions for formats and mechanisms for synthesizing and presenting future status and trends within the North Pacific.

AGENDA ITEM 12
Elections

The PICES Executive Secretary, Dr. Alexander Bychkov, led the election of a new BIO Chairman. Dr. Atsushi Tsuda was elected for a 3-year term. Dr. Tsuda requested that a Vice-Chair be elected. Previously, BIO did not have a Vice-Chairman but to provide efficient continuity in Committee activities, Dr. Michael Dagg, previous BIO Chairman, was elected to serve as Vice-Chairman.

AGENDA ITEM 13
Other items

A survey developed by the FUTURE Advisory Panels was circulated to Committee members and completed. The purpose of this short survey was to assist the FUTURE APs in setting priorities for their activities in the next few years.

AGENDA ITEM 14
Adjourn

The meeting was adjourned at 18:00 hr.

BIO Endnote 1

BIO participation list

Members	Observers
Michael Dagg (U.S.A., Chairman)	Harold Batchelder (U.S.A.)
Young-Shil Kang (Korea)	Ric Brodeur (U.S.A.)
Alexei Orlov (Russia)	James Christian (Canada)
Angelica Peña (Canada)	Joaquim Goes (U.S.A.)
William Peterson (U.S.A.)	George Hunt (ESSAS)
Vladimir Radchenko (Russia)	Stewart Johnson (Canada)
Hiroaki Saito (Japan)	Hidehiro Kato (Japan)
Michael Seki (U.S.A.)	Dahe Eerkes-Medano (U.S.A.)
Atsushi Tsuda (Japan)	Josiane Mélançon (Canada)
Atsushi Yamaguchi (Japan)	William Sydeman (U.S.A.)
Sinjae Yoo (Korea)	Tom Wainwright (U.S.A.)

BIO Endnote 2

BIO meeting agenda

1. Welcome, introductions
2. Meeting agenda
3. Reports from subsidiary bodies
4. Updates on Symposia and meetings endorsed by BIO
5. Publications endorsed by BIO
6. Topic sessions and workshops completed at PICES-2010
7. Proposed new working groups
8. Proposed inter-sessional workshop
9. Proposed workshop and Topic Sessions for the 2011 PICES Annual Meeting in Khabarovsk, Russia
10. Additional financial requests
11. North Pacific Ecosystem Status Report II
12. Elections
13. Other items
14. Adjourn

BIO Endnote 3

Activities, accomplishments, and future of the
Advisory Panel on Marine Birds and Mammals (MBM-AP)

A report to the Biological Oceanography (BIO) Committee

Prepared by Dr. William J. Sydeman, Co-Chairman; wsydeman@comcast.net

October 8, 2010

I. REVIEW OF APMBM ACTIVITIES AND ACCOMPLISHMENTS, 2005–2009

A. Business meetings of MBM-AP

27 October 2009, Jeju, Korea.
26 October 2008, Dalian, China
30 October 2007, Victoria, Canada
13 October 2006, Yokohama, Japan
5 October 2005, Vladivostok, Russia

All business meetings were attended and chaired by Drs. William Sydeman and Hidehiro Kato. Reports for each business meeting were prepared and archived with the PICES Secretariat. Reports through to 2007 are posted on the PICES website.

B. Peer-reviewed publications in the primary literature

1. *Marine Ecology Progress Series,* Theme Section. *Marine ecosystems, climate and phenology: Impacts on top predators* (Coordinator and Guest Editor: William J. Sydeman). **2009**. Volume 393, pp. 185–301. This peer-reviewed theme section in *MEPS* resulted from a Topic Session held at the 2007 PICES Annual Meeting in Victoria, Canada. The original Topic Session was entitled "*Phenology and climate change in the North Pacific: implications of variability in the timing of zooplankton production to fish, seabirds, marine mammals, and fisheries (humans)*".
2. *Deep-Sea Research II, Special Volume. Top predator "hot spots" in the North Pacific* (Guest Editors: William J. Sydeman, Richard D. Brodeur, Alexander S. Bychkov, Churchill B. Grimes, Stewart M. McKinnell). **2006**. Volume 53, pp. 247–449. This peer-reviewed special volume in *DSR II* resulted from a Topic Session held at the 2004 PICES Annual Meeting in Honolulu, U.S.A. The original Topic Session was entitled "*Hot spots and their use by migratory species and top predators in the North Pacific*".

C. Topic Sessions organized at PICES Annual Meetings by MBM-AP

1. Integration of marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in North Pacific and North Atlantic. **2009**.
2. Phenology and climate change in the North Pacific: implications of variability in the timing of zooplankton production to fish, seabirds, marine mammals, and fisheries (humans). **2007**.
3. Factors affecting the distribution and abundance of top predators in the Sea of Okhotsk and western North Pacific. **2005**.

D. Workshops organized at PICES Annual Meetings by MBM-AP

1. Integration of marine mammal populations and rates of prey consumption in models of climate change-ecosystem change in North Pacific and North Atlantic. **2009**. Joint PICES/ICES workshop.
2. Responses of marine mammals and seabirds to large-scale and long-term climate change: Mechanisms of environmental forcing. **2006**. Sponsored by Hokkaido University Center of Excellence.

E. Outreach of MBM-AP

MBM-AP Co-Chair, Dr. Kato, has served as the PICES representative to the International Whaling Commission (IWC) for the past 5 years. In this capacity, Dr. Kato has attended IWC meetings and represented PICES interests during these proceedings.

II. FUTURE OF MBM-AP

A. Continuation of MBM-AP

- Action Item: MBM-AP provides unique information and perspective to the PICES community. MBM-AP has been scientifically and organizationally productive, including publication of 2 special volumes in the primary literature, and hosting 3 topic sessions and 2 workshops at PICES Annual Meetings over the past 5 years. Marine birds and mammals are not explicitly considered by any program or standing committee of the PICES community, yet can and should play an important role in PICES's new integrative scientific program, FUTURE. Therefore, MBM-AP strongly recommends that BIO and Science Board consider continuation of the AP for another 5-year period.

B. Leadership of MBM-AP

- Action Item: Co-Chairs Drs. Sydeman and Kato have been overseeing the activities of MBM-AP for 7+ years. Dr. Sydeman is a seabird specialist from the U.S.A., while Dr. Kato is a marine mammal specialist from Japan. New leadership of the AP is required. The AP nominates current members Dr. Yutaka Watanuki (seabirds, Japan) and Dr. Rolf Ream (mammals, U.S.A.) as new co-chairs for the AP. Dr. Douglas Bertram (Canada) has also expressed interest in serving on MBM-AP, and potentially as a chair-person.

C. Terms of Reference

The Terms of Reference (TOR) for MBM-AP are as follows:

1. Provide information and scientific expertise to BIO and the FUTURE Program, and, when necessary, to other scientific and technical committees, with regard to the biology and ecological roles of marine mammals and seabirds in the PICES region;
2. Identify important problems, scientific questions, and knowledge gaps in assessing the roles of marine mammals and seabirds in marine ecosystems;
3. Assemble relevant information on the biology of marine mammals and seabirds and disseminate it to the PICES community through scientific reports and symposia;
4. Develop strategies to improve collaborative, interdisciplinary research with marine mammal and seabird researchers and the PICES scientific community.

- Action Item: These TOR were revised in 2008. MBM-AP feels these TOR properly reflect the goals of the AP, and do not require further modification.

D. Integration of MBM-AP with FUTURE

The stated goals of FUTURE are to:

(i) promote and increase understanding of climate change and anthropogenic impacts on marine ecosystems in the PICES region,
(ii) enhance forecasting capabilities of future ecosystem change, and
(iii) enhance communications with society.

- Action Item: MBM-AP reiterates its primary mission is to provide advice to the PICES community about the role of marine birds and mammals in North Pacific marine ecosystems, and secondly to ensure that seabirds and marine mammals are included in PICES-related ecosystem research and communications, including FUTURE. At its last meeting in Jeju, Korea, the AP discussed that many long-term datasets on marine birds and mammals could and should be used in analyses (*e.g.*, PICES Ecosystem Status Reports) and models of marine ecosystem change. Multi-decadal information on abundance, population variability, diet, prey consumption, and demographic attributes are available from numerous sites in the North Pacific for analysis. Marine birds and mammals are also excellent indicators of marine ecosystem structure and functions and could be used in this capacity. Changes in bird and mammal populations will also have an impact on the ocean as these predators consume large quantities of prey and may exert "top-down" control of food webs. MBM-AP seeks support from BIO and Science Board to continue efforts to coordinate and integrate marine bird and mammal datasets, contribute to PICES ESR and similar, and investigate the use of seabirds and marine mammals as indicators of ecosystem change in the North Pacific.

E. Issues facing MBM-AP

- Action Item: There has been excellent participation in APMBM over the years from the USA, Canada, and Japan. Korea and Russia have regularly provided delegates, but personnel have often changed. China has not provided delegates. APMBM requests that BIO encourage participation of all member nations in APMBM.

BIO Endnote 4

Marine Ecosystem Model Inter-Comparison Project

Bernard A. Megrey (U.S.A.), Harold (Hal) Batchelder (U.S.A.), Shin-ichi Ito (Japan) and Guimei Liu (China)
Summary provided by H. Batchelder
updated October 25, 2010

At PICES-2009 (Jeju, Korea) the PICES Marine Ecosystem Model Inter-comparison Project (MEMIP) Working Group met to discuss future activities. Several "active team" members for this project agreed to provide data and/or model configurations inter-sessionally (before PICES-2010) so that a workshop that was approved by Science Board for PICES-2010 could make substantial progress in comparing different ecosystem model configurations embedded in ROMS-2D sections in several locations of the North Pacific. Sections targeted for the 2010 workshop are those extending offshore of (1) Newport, OR [Newport], (2) Seward, AK [Seward], and (3) Northern Japan [A-Line]. All three lines have been sampled extensively for multiple components of the ecosystems in recent decades, and particularly in the early 2000s. The agenda of the PICES-2010 workshop is included below as Addendum 1.

Bernard Megrey arranged for MEMIP to conduct these simulations on a recently purchased computing cluster at the Alaska Fisheries Science Center (AFSC). Team members were provided login accounts. An IT technician at AFSC, John Miller, was very helpful in installing software and libraries on the system that is needed for compiling the Regional Ocean Modeling System (ROMS) code. One software code of value to the team, Matlab, is not available on the MEMIP server. Alternative public domain (free) alternatives are unsatisfactory. This means that model results will need to be transferred from the MEMIP computer to other machines at the workshop for plotting simulation results and comparisons with data sets.

Significant inter-sessional progress was made to allow model intercomparisons within well defined (and constant across simulations) physical simulations for two locations: Newport and Seward. In mid-summer, the Newport 2D domain was compiled and run in test mode and evaluated by Yvette Spitz (USA) of the active team. The code produced simulations that agreed with simulations done by Dr. Spitz on other computers elsewhere. Bernard Megrey, working with Wei Cheng of the University of Washington, provided the code and forcing files for Seward in July 2010. However, the 2D Seward ROMS transect does not exactly overlap the Seward Line from which the observations were made by US GLOBEC. Consequently, Wei agreed to

reconfigure a new domain (done) and forcing files (being done now) so that the Seward model domain exactly overlaps the Seward Line observation stations. Wei is optimistic that the forcing files for Seward will be available for our workshop. If they are not, we will use the other (non-overlapping domain for the PICES-2010 MEMIP workshop. Progress on the model for the A-Line has stalled, and it is uncertain that a model will be configured for that region for the upcoming workshop.

Data sets for temperature and salinity (Newport and Seward), nutrients (Newport and Seward), chlorophyll (Newport and Seward), PON and DON (Newport), and zooplankton biomass (Seward and Newport) are already, or will be, available on the MEMIP computer "observations" directories for the workshop. This third MEMIP workshop will be technical and hands-on, and will focus on parameterizing, executing and calibrating Newport and Seward versions of several biogeochemical lower trophic level (LTL) marine ecosystem models. Three to six ecosystem models will be run at each test bed. Specific ecosystem models (*i.e.*, NPZD, NEMURO and CoSINE) will be executed. Some ecosystem models will be tuned to hindcast data from a specific region and be tested by application other available North Pacific test beds. An important aspect of MEMIP is that the physical model for each test bed location will be a fixed scenario simulation, so that comparisons of ecosystem model to data, or model to model, will eliminate variability due to differently tuned physical models. Model skill will be assessed quantitatively.

In summary, the MEMIP project will, through this series of workshops, utilize a consistent ocean physics model (using 2D version of ROMS) at each site, use early 2000's forcing (2001–2003 in each site), provide qualitative and quantitative skill assessment concerning the models ability to represent *in situ* data, identify mechanisms that are important controls on the level and variability of secondary production at each test bed site, and bound the levels of uncertainty in model predictions by calculating ensemble statistics. The models will be used to identify processes that are important in controlling secondary production, zooplankton biomass and variability, to bound the levels of uncertainty in model predictions, and to identify processes that are particularly sensitive to change and thereby susceptible to potential future climate variability and change. Comparisons at multiple locations will provide information on the spatial–temporal robustness of particular model structures and parameterizations. The products of the comparison will contribute to FUTURE by estimating the uncertainty and the limits of forecasting.

Update following the PICES-2010 workshop

Eighteen scientists from seven countries (all six PICES member countries plus Norway; Addendum 2) participated in some or all of the 3rd MEMIP workshop that was held Saturday–Sunday, October 23–24, 2010. After reviewing the current status of MEMIP and describing the general goals and objectives, we heard an interesting invited talk by Guimei Liu of China on a nowcast/forecast model in the South China Sea. Hal Batchelder and Shin-ichi Ito described the datasets that are available and the data that have been prepared and place on the "orion" server at the Alaska Fisheries Science Center. Following a question regarding the continued availability of "orion", which was provided by Bernard Megrey, Batchelder agreed to contact the appropriate people at AFSC to determine if it would be possible to continue MEMIP use of "orion" for another two years. Jeff Napp was contacted and indicated that he would approve such use following a written request from the MEMIP group. Batchelder agreed to prepare such a request shortly, following the conclusion of PICES-2010. In addition, the group will request an additional user account be established for a new active member of MEMIP, Jerome Fiechter of the U.S.A.

Our original goal was to have at least one, and hopefully two, regional 2D models configured to provide a well defined and consistent physical test bed for the testing of multiple ecosystem models. Toward that end, Dr. Spitz configured a domain for the Newport Line prior to the meeting, and expected to have a domain configured for the Seward (GAK) Line shortly, following the meeting. We had agreed at the MEMIP-2009 workshop to freeze the ROMS code based on a November 2009 version. However, two participants during the workshop (Angelica Peña and Jerome Fiechter) indicated that the biological codes in ROMS had been extensively reconfigured in summer 2010. This was the first major reorganization of the biological codes in ROMS in more than 5 years. The changes were so significant and would simplify the addition of new models, thus the MEMIP team agreed to update to the most recent version. The adoption of this will greatly simplify

the addition of new ecological models. More importantly, the new version has a more accurate advection-diffusion code for biological tracers. We retrieved the new ROMS code from the ROMS repository and installed it on "orion". Thanks to the concerted work of Peña and Spitz during the workshop, test codes were successfully compiled and run. Unfortunately, it was not possible to recode the Spitz model of the Newport system (our working test bed) into the new version during the workshop.
During the final two hours of the workshop, the group held a broad-ranging discussion of MEMIP's future directions (short- and long-term), products and deliverables, and a timeline for completing the outlined tasks. The group agreed that MEMIP should focus on activities that will advance the main deliverables of the project, namely:

- Parameterize, execute (and optionally calibrate) multiple ecosystem models (3–6) in each of three test bed regions;
- Perform a quantitative skill assessment;
- Identify mechanisms that are important controls on the level and variability of secondary production (= zooplankton biomass) at each test bed site;
- Bound the levels of uncertainty in model predictions by calculating ensemble statistics.

We believe the above list is in priority order (highest to lowest), mostly because the activities logically proceed from the first to the last.

MEMIP recognizes that comparisons must include both model-data and model-model. Model-model comparisons are simpler because more complete information is provided by models. Model-data comparisons are more difficult because models and observations are often in different units, required conversion and assumptions (*e.g.*, models provide phytoplankton biomass, but field data are usually chlorophyll concentrations). Also, the real ocean has additional variability due to three-dimensional processes that are not represented in the 2D models employed by MEMIP. There was discussion of the relative value of *in situ* observations and satellite observations as the data for comparison to model output. It was suggested that we might consider using 3D model fields (archived at frequent intervals) using newly developed offline biological-physical coupling of ROMS physical fields. Given the desire of MEMIP to conclude the projects activities by PICES-2012, we felt that it would be best to continue with the planned 2D comparisons of the A-Line, GAK and Newport Lines. We agreed that we should attempt multiple simulations to generate ensembles of outputs using different ecosystem models, parameter values and different forcing years.

Although substantial work was done inter-sessionally to reformat data and transfer the data from the GAK and Newport Lines to "orion", there is still additional work needed. A desire for "rate" data was expressed. Not much rate data are available from the GLOBEC investigations in Newport, some (primary productivity; limited microzooplankton grazing rates) are available for the GAK Line, and a mix of different rate data is available for the A-Line, though often from different years.

Recognizing that 2D models may have difficulty adequately hindcasting the physics of the GAK and A-Lines, we agreed to a timeline of inter-sessional milestones that must be met to make the progress desired in the next year:

- Jan. 10, 2011: GAK and A-Line physical models established and minimally evaluated to observations; evaluating will include:
  - T/S properties across shelf; T-S diagrams for each year/month AND monthly climatology,
  - MLD (spatially and seasonally),
  - Use of interannual variability in surface forcing for each region to assess the models ability to simulate physics in different years.
- Mar. 1, 2011: All ecosystem models coded and debugged in ROMS,
- May 1, 2011: All ecosystem models tuned to a parameter set that will be used cross regionally,
- June 1, 2011: Runs completed,
- July 1, 2011: Plots and sharing of results accomplished.

This ambitious timeline was established so that all of the model simulations are completed before the PICES-2011 in Khabarovsk, Russia. Batchelder will send appropriate reminders about deadlines 1 month and 2 weeks prior to the above target dates. The January 10, 2011 target date for confirming that suitable 2D physical models are available for the GAK and A-Lines is the key. If we have confirmed that those physical test beds are available (as is the Newport Line now), then we expect that the other tasks and target dates will be feasible.

Proposal for 1½-day Workshop: MEMIP IV at PICES-2011

[later renamed as "*MEMIP IV: Quantitative comparison of ecosystem models applied to North Pacific shelf ecosystems–humble pie or glee?*"]

The focus of this 4th MEMIP workshop will be quantitative model-model and model-data analysis and comparison of the results of the simulations.

Proposed convenors: Harold (Hal) Batchelder, Shin-ichi Ito, Yvette Spitz, and Angelica Peña.

Specific tasks to be completed during this workshop are:

- Within model domain comparisons of different ecosystem models. The list of models (and responsible MEMIPer) that will be configured and simulations run includes NPZD+ (Pena), NAPZD+ (Spitz), Nemuro (Ito), UMaine (Liu), NPZD_Fe (Fiechter), Nemuro_Fe (Fiechter), NemuroK5 (Batchelder), and (perhaps) Biology (Spitz).
- The goal is that BEFORE the proposed workshop, each model will have simulated the following periods for each 2D domain:
  - Newport: 2000, 2001, 2002 (Apr-Sep)
  - GAK: 2000, 2001, 2002 (Apr-Sep)
  - A-Line: 2001, 2002, 2003, 2007 (Mar-Sep)
- The combination of different years and up to 6 or so different models for the three regions should provide sufficient runs to provide ensemble-based estimates of the uncertainty of ecosystem hindcasts, which will provide information needed for assessing FUTURE coupled ecosystem-physical forecast products.

Request: travel for 2 scientists from the U.S.A. (Yvette Spitz and Jerome Fiechter).

MEMIP Addendum 1: Agenda for 2010 Workshop

W1 – BIO Workshop: Marine ecosystem model inter-comparisons (III)

Saturday, October 23 (9:00–18:00), Day 1

9:00	*Workshop Convenors* *Welcome, Introductions and General MEMIP Goals*
9:30	Guimei Liu, Hui Wang and Fei Chai (Invited) Developing Nowcast/Forecast Ecosystem Model in the South China Sea
10:00	Harold Batchelder Data types and availability for the CCS (Newport) and GOA (Seward) test bed locations
10:30	***Coffee/Tea Break***
10:50	Shin-ichi Ito Data types and availability for Western Subarctic (A-Line) test bed location
11:05	Harold Batchelder (with input from all) Test beds, Ecosystem Models Available, Computer Platforms for MEMIP
11:25	Yvette Spitz Demonstration: How to merge/modify an ecological model into ROMS/Compiling Example

11:55	Small group activity Whet your modeling appetite before lunch; identify biological models to implement
12:30	***Lunch***
14:00	Implement new ecosystem models into ROMS and run existing codes
15:30	***Coffee/Tea Break***
15:50	Meet in plenary to discuss problems/troubleshoot
16:10	Continue implementation of models
18:00	***Session Ends***

Sunday, October 24 (9:00-18:00), Day 2

9:00	*Introduction by Session Convenors*
9:05	Yvette Spitz Demonstration: Running a model; an example from the Oregon Shelf; BC's, IC's, surface forcing
9:25	Continue implementation of models/run models if ready/debugging
10:30	***Coffee/Tea Break***
10:50	More debugging; also informal viewing of contributed posters
12:30	***Lunch***
14:00	More debugging, and hopefully some successful model runs
15:30	***Coffee/Tea Break***
15:50	Debugging, debugging, debugging…
17:30	Progress Review, Timetable, Next steps incl. post-simulation analyses, Action Item Identification (Session Convenors)
18:00	***Workshop Ends***

MEMIP Addendum 2: Participation in 2010 Workshop

Canada:	Angelica Peña
China:	Guimei Liu
Japan:	Shin-ichi Ito Michio J. Kishi
Korea:	Chan Joo Jang Jung Jin Kim Sinjae Yoo
Russia	Vladimir Kulik Elena Ustinova
USA:	Harold Batchelder Brian Burke Jerome Fiechter David Fluharty Brie Lindsey Yvette Spitz Tom Wainwright
Norway:	Ken Drinkwater Trond Kristiansen

BIO Endnote 5

(a.) Proposal for a new Working Group on
"Jellyfish Blooms around the North Pacific Rim: Causes and Consequences"

Co-Chairs: Shin-ichi Uye (Japan), Richard Brodeur (U.S.A.), Young-Shil Kang (Korea)

Duration: 3 years (2011–2013)

Terms of Reference

1. Review past and ongoing studies on the reproductive biology of jellyfish species that cause problematic blooms;
2. Compile existing data on temporal variations in jellyfish abundance in the North Pacific and its marginal seas, and analyze them in relation to regional environmental and climate changes in order to identify causes of increasingly recurrent jellyfish blooms;
3. Elucidate the role of jellyfish in coastal and oceanic marine food webs and assess the impacts of jellyfish blooms on marine ecosystems and socio-economies such as fisheries and aquaculture;
4. Evaluate methodologies for predicting blooms and for diminishing their impact on marine and human systems, including bloom forecast modeling and the modification of fishing gears;
5. Promote international collaboration among PICES member countries for exchanging available information on jellyfish, and encourage joint research surveys on jellyfish among PICES member countries;
6. Provide jellyfish metrics as indicator of ecosystem change and resiliency in cooperation with FUTURE AICE-AP and SOFE-AP and FUTURE related WGs;
7. Publish a final report summarizing the results, including recommendations to policy makers for reducing impacts of jellyfish blooms in the North Pacific.

Potential members:

Canada: Mary Arai
Lucas Brotz
Evgeny Pakhamov

China: Song Sun

Japan: Hideki Akiyama
Haruto Ishii

Korea: Won-Duk Yoon
Changhoon Han
Kyoung-Soon Shin

Russia: Alexander Zavolokin

U.S.A.: Jenny Purcell
John Field
Lisa Eisner

(b.) Proposal for a new Working Group on
"Ecosystem Responses to Multiple Stressors"

Motivation

Marine ecosystems of the North Pacific are impacted by multiple emerging stressors, such as increase in temperature, change in iron supply, harmful algal bloom events, invasive species, hypoxia/eutrophication and ocean acidification. These multiple stressors can act synergistically to change ecosystem structure, function and dynamics in unexpected ways that differ from single stressor responses. The emerging stressors will vary by region, and critical stressors in PICES' regional ecosystems should be identified. Comparative studies on North Pacific ecosystem responses to multiple stressors will help determine how ecosystems might change in the future, and also identify ecosystems that are vulnerable to natural and anthropogenic forcing. This working group can address emerging issues from WG 22 (iron chemistry in low pH ocean, anthropogenic dust flux), WG 23 (hypoxia impact on euphausiids), and WG 21 (non-indigenous marine species) thereby highlighting the need for integrative studies. The proposed Chair is Motomitsu Takahashi (Japan).

Terms of Reference

1. Review and identify critical stressors responsible for ecosystem-level changes, with an emphasis on North Pacific ecosystems;
2. Identify spatial extent/regional differences in anthropogenic (and natural) stressors among North Pacific ecosystems (possibly based on ecosystems identified in the Marine Ecosystems of the North Pacific Ocean status report);
3. Identify potential sources of data/information available from national/international programs on ecosystem responses/anthropogenic stressors;
4. Provide metrics of ecosystem change, resiliency and vulnerability for implementation within the PICES FUTURE program as per recommendations from the inter-sessional FUTURE workshop on ecosystem indicators;
5. Convene workshops and sessions to compare the ecosystem responses by regions and to evaluate results;
6. Publish a final report summarizing results.

BIO Endnote 6

Proposal for an inter-sessional workshop on
"*Indicators of status and change within North Pacific marine ecosystems: A FUTURE workshop*"

Duration: 3 Days
Time: Spring of 2011 (possibly linked to the inter-sessional Science Board meeting)
Location: TBD
Convenors: Thomas Therriault, AICE-AP (Canada), Jacquelynne King, COVE-AP (Canada), Chang-Ik Zhang (Korea), Sachihiko Itoh (Japan)

Workshop description

Ecosystems are affected by a number of natural stressors and, more recently, an increased number of anthropogenic ones. Ultimately, these stressors result in changes to ecosystem structure and function, which in turn can affect their overall productivity and the societies that depend on them. Metrics of ecosystem status are required to measure impacts of stressors and monitor change. Ecosystem indicators also could be used to identify systems that are resilient or vulnerable to stressors.

One of the themes of the PICES FUTURE Science Plan focuses on ecosystem resiliency and vulnerability to stressors and how these attributes might change in the in the future. In order to ensure PICES scientists have the ability to detect ecosystem-level changes in a consistent and standardized way, common metrics must be

developed. Further, in an attempt to understand the amount of inherent variability in marine ecosystems, these metrics also need to incorporate measures of uncertainty that can be conveyed to end users, including managers and policy makers.
The goals of this workshop will be to:
1) identify means of determining ecosystem resilience or vulnerability;
2) identify ecosystem-level indicators of status and change, including but not limited to fisheries-based indicators;
3) identify methods to characterize uncertainty in these indicators;
4) identify common ecosystem indicators to be used for regional comparisons by the PICES' community.

Proposed workshop structure

We propose to have 3 keynote speakers and limited contributed oral presentations addressing the first 3 workshop goals (above). Following keynote addresses workshop participants will form breakout groups/group discussions (½ day goal 1, 1 day goal 2, ½ day goal 3). Participants will provide feedback on available data for determining common ecosystem indicators (½ day). Final product will be a workshop report with brief summary of keynote addresses, summary of discussions and recommendations for implementation/use within the PICES FUTURE program and revision to Terms of Reference for proposed working group on multiple stressors (½ day). In addition, we would host a contributed poster session on the application of ecosystem indicators.

Supporting information

This proposed workshop will consider progress since:
1. the 2004 IOC/SCOR/GLOBEC/ICES/PICES-sponsored symposium "Quantitative Ecosystem Indicators for Fisheries Management" with an emphasis on North Pacific ecosystems (papers published in the ICES Journal: http://icesjms.oxfordjournals.org/content/62/3.toc).
2. the Report of Working Group 19 on Ecosystem-based Management Science and its Application to the North Pacific. PICES Sci. Rep. No. 37, 166 pp. which provided some recommendations on fisheries-based ecosystem indicators for the PICES' regions

Request: support for 3 invited speakers

BIO Endnote 7

Proposal for a 1-day BIO Contributed Paper Session at PICES-2011

Co-convenors: Michael Dagg (U.S.A.) and Atsushi Tsuda (Japan)
Invited speakers: none

Description: Papers are invited on all aspects of biological oceanography and climate in the North Pacific and its marginal seas not covered in Topic Sessions sponsored by BIO.

BIO Endnote 8

Proposal for a 1-day BIO/POC Topic Session on "*Mechanisms of physical-biological coupling forcing biological "hotspots" in the Western North Pacific and Western North Atlantic*"
[later shortened to "*Mechanisms of physical-biological coupling forcing biological "hotspots"*"]

This topic session will examine the physical and oceanographic factors that result in biodiversity, ecological, or economic hotspots in the North Pacific. Spatially, this session will focus on the Kuroshio/Oyashio extensions and ecotone, the intersection of the Sea of Okhotsk and the western North Pacific (Kuril Islands region), and the Western Bering Sea. For the Atlantic, this session will focus on the intersection of the Gulf

Stream and Labrador Current in addition to tidally driven systems such as the Gulf of Maine and Gulf of St. Lawrence.

"Hotspots" can broadly be defined as areas encompassing a high number of species, a high abundance of an indicator species, or an area of high economic value. More specifically, we seek interdisciplinary contributions on physical-biological coupling and resulting seasonal or year-round "hotspots" in primary to tertiary productivity. This includes data on physics, phyto- and zooplankton, forage fish, and upper trophic level predators (*e.g.* fish, seabirds, mammals, humans). We are particularly interested in multi-species and multi-use hotspots (*e.g.* the overlap between human and ecological importance) and potential changes in hotspots under future climate change scenarios. Modeling and empirical studies are encouraged. We would solicit a special publication in the primary literature pending subscription to the session.

Co-convenors: Elliott Hazen, Robert Suryan (U.S.A.; confirmed)
Suggested: Yutaka Watanuki (MBM Co-Chair), Ichiro Yasuda (Japan); Oleg N. Katugin, Vladamir Radchenko (Russia); (ICES – TBD)

Potential invited speakers: Sei-Ichi Saitoh (Japan, confirmed), Jum Nishioka (Japan), Yuri Artukin (Russia), Gail Davoren (Canada/ICES), Per Fauchald (Norway/ICES), Andrew Pershing (U.S.A./ICES)

BIO Endnote 9

Letter requesting PICES support for ESSAS Open Science Meeting in May 2011

21 October 2010

Dr. Alex Bychkov
Executive Secretary
North Pacific Marine Science Organization (PICES)
c/o Institute of Ocean Sciences
P. O. Box 6000, Sidney, B.C
Canada. V8L 4B2

Dear Dr. Bychkov:

On behalf of the Science Steering Committee of the IMBER Regional Program, Ecosystem Studies of Sub-Arctic Seas (ESSAS), my Co-Chair, Dr. Ken Drinkwater, and I would like to request that PICES consider Co-sponsoring, with ICES, the North Pacific Research Board, and others the travel of PICES members and students to the up-coming ESSAS Open Science Meeting to be held 22-26 May 2010 in Seattle Washington. PICES has already agreed to allow the PICES Secretariat to provide support for the OSM on a cost reimbursed basis. ESSAS is now requesting support of the travel of two scientists from PICES countries in Asia, and the support of two students or young scientists from Asia. The expected costs for this travel support, at $3,500 per person, would be $14,000.

The OSM will be supporting a one day workshop sponsored by the PICES/ICES Working Group WGFCCFIS, Sunday 22 May, on the **Biological Consequences of a decrease in sea ice in Arctic and Sub-Arctic Seas.** Additionally, during the OSM, there will be a number of sessions of direct relevance to PICES member nations including: 1) Comparative studies of polar and sub-polar seas, New observations of the eastern and western Bering Sea, Modeling marine ecosystem dynamics, New insights from the International Polar Year, and socio-economic aspects of sub-polar and polar ecosystems. More information is available at the ESSAS OSM website: www.pices.int/essas2011.aspx.

Co-sponsorship of the travel of Asian scientists and students to the ESSAS OSM would be a continuation of the strong past support provided to ESSAS by PICES. This support has included hosting the initial ESSAS / GLOBEC Symposium, "*Climate Variability and Sub-arctic Marine Ecosystems*", held in Victoria in May 2005 and providing travel support for several of the speakers. This symposium resulted in a special volume of Deep-Sea Research II, the *Effects of Climate Variability on Sub-Arctic Marine Ecosystems*, published in 2007. PICES also helped to organize and provide logistic support for the June, 2006, ESSAS St. Petersburg Workshop on *Developing Comparative Studies of Sub-Arctic Seas*, and again provided travel support so that Russian scientists were able to participate in the workshop.

In turn, ESSAS has supported the goals of PICES. ESSAS has sponsored or co-sponsored workshops during PICES meetings including: two workshops at the 2008 Annual Meeting and one in 2009. During the 2006 St. Petersburg workshop, the ESSAS community began seeking ways to strengthen future editions of the PICES Special publication, "*Marine Ecosystems of the North Pacific*", in particular by adding comparative material to the synthesis chapter. In 2009 and 2010, ESSAS took the lead in preparing the Bering Sea chapter for the 2010 update of the PICES publication "North Pacific Ecosystem Status Report", and contributed to a greatly strengthened synthesis chapter.

We hope that the PICES community will look favorably on this request to build upon these past successful collaborations between PICES and ESSAS, and that you will agree to provide financial support to aid Asian members of PICES to attend the ESSAS OSM.

Sincerely,

George L. Hunt, Jr.
Co-Chair ESSAS SSC

Ken Drinkwater
Co-Chair, ESSAS SSC