The Biological Oceanography Committee

The *Biological Oceanography Committee* (BIO) held its meeting from 18:30-19:30 h on October 14 and 14:00-17:45 on October 17, 2012 in Hiroshima, Japan. The Chairman, Dr. Atsushi Tsuda, 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
Annual review of BIO activities

The BIO Committee has 6 subsidiary groups (S-CCME, S-CC, AP-MBM, WG 26, WG 28, WG 29) to understand the biological aspects of the North Pacific ecosystems. S-CC has finalized a database of physical and biochemical parameters (PACIFICA), which is one of the most valuable accomplishments of this group. AP-MBM renewed its Activity Plan last year, focusing on spatial ecology of marine birds and mammals, and actively working through a Workshop and Topic Session with other groups. WG 26 is its third year and preparing to finalize its Working Group report, and planning to contribute to an international symposium on jellyfish in 2013. WG 28 is in its second year, and its progress is obvious through a Topic Session and Workshop at PICES-2012, and inter-sessional workshops. BIO became a co-parent committee of WG 29 at the inter-sessional Science Board meeting in Busan, Korea, in May 2012. WG 22 on iron and WG 23 on krill have finished their activities in 2010 and 2011, respectively. The final report of WG 22 was submitted to BIO but is now being revised according to the Committee's comments. The final reports of both groups are expected to be published by the inter-sessional Science Board meeting in 2013. The second PICES/ICES/IOC Symposium on "*Climate change effects on the world's oceans*" was held in Yeosu, Korea, in May 15–19, 2012 (BIO member, Dr. Hiroaki Saito was a Co-convenor). The symposium was very successful and a special issue of selected papers will be published from the meeting presentations in the ICES Journal of Marine Science. The BIO Action Plan was discussed at the Committee meeting at PICES-2012 and will be finalized by the next inter-sessional Science Board meeting.

AGENDA ITEM 4
Oral and Poster awards

The procedure to select the Awards at PICES-2012 was confirmed as follows: Each BIO member was to list two top candidates for oral presentation by an early carrier scientist in BIO-sponsored workshops W1, W2, W3, W5 and the BIO Paper Session and provide the names to the BIO Chairman. For Poster presentations, each Committee member was to list two top candidates and provide the names to the BIO Chairman by email. Rankings were compiled by the Chairman and presented to the Secretariat for certificate preparation at the Closing Session. Best Oral presentation was awarded to early career scientist, Tabitha C.Y. Hui of Hokkaido University, for her presentation on "*Spatial, temporal and dietary overlap between harbour seals and fisheries in Erimo, Japan: Conflict at sea?*" and Best Poster was awarded to Chiyuki Sassa of the Seikai National Fisheries Research Institute, for his presentation on "*Seasonal occurrence of mesopelagic fish larvae in the onshore side of the Kuroshio off southern Japan*". (For further details on Award recipients, see the end of the Session Summaries section of the 2012 PICES Annual Report.)

AGENDA ITEM 5
Reports from FUTURE Advisory Panels

Reports synthesizing activities of AICE, COVE, and SOFE were summarized by Dr. Saito. Topics reported included: a) the FUTURE roadmap (see the FUTURE Advisory Panel reports) was summarized and discussed. b) A summary of activities since last year was given. c) Communications between Committees and FUTURE

still require some improvement. d) Planning for the FUTURE Ocean Science Meeting was described. BIO members should propose topic sessions or workshops, and possible speakers for the FUTURE OSM before the inter-sessional Science Board meeting in spring 2013. BIO endorses this concept and any ideas should be presented as soon as possible. e) The development of NPESR III was briefly described (see the report of AP-SOFE for details); f) Some ways to encourage early career scientists were presented; BIO representatives on FUTURE APs are: Hiroaki Saito for COVE and Sun Song for AICE. Dr. William Peterson was nominated as a SOFE member from the BIO Committee because there was no BIO representation. For FUTURE AP meetings, it was decided that if a BIO member cannot attend, someone else from BIO should attend as a replacement. It is important for the APs to report back to Committee, to maintain good communication.

AGENDA ITEM 6
Reports from subsidiary bodies

Full reports of BIO's subsidiary bodies can be found elsewhere in the 2012 Annual Report. Brief highlight are given below.

Section on Climate Change Effects on Marine Ecosystems (S-CCME)

S-CCME Co-Chairman, Dr. Suam Kim, gave a brief oral report on the S-CCME program, which is a 9-year program spread over three 3-year cycles.

Advisory Panel on *Marine Birds and Mammals* (AP-MBM)

A report summarizing the meeting of AP-MBM, held October 13, 2012, was presented by Dr. Yutaka Watanuki. This detailed presentation included a description of the revised Terms of Reference, the proposed 3-year Activity Plan, and a summary of the AP-MBM Topic Session (S6) on environmental contaminants in marine ecosystems and Workshop (W3) on prey consumption by marine birds and mammals.

Recommendation: BIO approves of the IWC accepting a PICES observer. (This recommendation will be brought forward to the Science Board for approval.)

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

A summary of activities of this Section was given by Section Co-Chairman, Dr. James Christian. The extensive data set (PACIFICA) they have been working up (approximately 350 cruises over the past 20 years) is now available. This is a great accomplishment and the participants of this Section are to be commended.

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 (USA) and Song Sun (China) had a term from 2007–2011. The status of the final WG report was briefly explained by Dr. Peterson and it will be published in spring 2013.

Working Group on *Jellyfish Blooms around the North Pacific Rim: Causes and Consequences* (WG 26)

WG 26, chaired by Drs. Shin-ichi Uye and Richard Brodeur, has a 3-year term from 2010–2013. A summary of the WG 26 meeting, held on October 14, 2012 and their Topic Session (S7, "*Jellyfish in marine ecosystems and their interactions with fish and fisheries*") on October 18, 2012, was presented by Dr. Brodeur. There were 12 members from all PICES countries present at this meeting, which was primarily an overview of research projects in each country and discussion on the final report. They proposed to convene an inter-sessional workshop in association with the 4th International Jellyfish Bloom symposium in Hiroshima in June 2013. They also requested PICES endorsement for the symposium.

Recommendation: BIO recommends PICES co-sponsorship of the 4th International Jellyfish Bloom symposium.

Working Group on *Development of Ecosystem Indicators to Characterize Ecosystem Responses to Multiple Stressors* (WG 28)

WG 28, chaired by Drs. Motomitsu Takahashi and Ian Perry, has a term from mid-2011–2014. Their main advancement was the development and application of a web-based questionnaire regarding expert opinions on habitats, such as spatial extent, frequency, trophic impact, resistance to change and recovery time, which may be vulnerable to multiple stressors. The results of the survey of experts to identify habitats, stressors, and the vulnerability of habitats to each stressor was discussed for each country and location. Reports of their business meeting, and their Workshop (W1, "*Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts*") and Topic Session (S10, "*Ecosystem responses to multiple stressor in the North Pacific*") at PICES-2012 were presented by Dr. Takahashi.

Marine Ecosystem Inter-comparison Project (MEMIP)

An oral report summarizing the MEMIP meetings and workshop (W5 titled "*Comparison of multiple ecosystem models in several North Pacific shelf ecosystems (MEMIP-IV)*") held on October 12–13, was given by Dr. Harold (Hal) Batchelder. The presentation was followed by discussion about how the goals of the model intercomparison had changed and noted that the group had made very little progress in the past year. He stated that the MEMIP project will not be requesting any financial support from PICES this year and the members will attempt to make good progress before PICES-2013. If successful, they would then request a final session at PICES-2014. BIO commented positively about the progress of MEMIP and fully endorsed its plan for the next year. (*BIO Endnote 3*).

AGENDA ITEM 7
International relationships

International Whaling Commission (IWC)

Dr. Hidehiro Kato, PICES observer to the IWC, reported on the 2012 IWC meeting and its response to a PICES request made last year (*See AP-MBM Endnote 3*). PICES made a request to conduct a sea-bird sighting survey on the IWC/POWER (Pacific Ocean Whale and Ecosystem Research) cruise, but it was not accepted by IWC for logistical reasons. BIO decided to repeat the request.

BEST-BSIERP/NPRB (Bering Sea Project)

Dr. Francis Weise gave a short oral report describing the activities of the North Pacific Research Board (NPRB) emphasizing especially the NPRB programs of relevance to PICES. Projects funded under their annual RFP and their large-scale ecosystem studies were briefly described. Some potential areas for collaboration with PICES were mentioned (*e.g.*, modelling, pollock migrations and habitat use). It was noted that anyone can apply for NPRB funds as long as the work is done in the NPRB study regions and relevant to the NPRB goals, and that PICES scientists are welcome to suggest topics for NPRB study.

Ecosystem Studies of Sub-Arctic Seas (ESSAS)

Dr. Franz Mueter briefly introduced ESSAS, an IMBER regional program. ESSAS is now chaired by Drs. Kenneth Drinkwater and Mueter. The ESSAS OSM meeting in Seattle, USA, in May 22–26, 2011, was described briefly and 2012 activities were listed. Mostly they have been focusing on Arctic-Subarctic interactions. The activities include a workshop (W4, "*Subarctic–Arctic interactions*") held during PICES-2012.

Action: BIO requests support from PICES for a PICES scientist to attend the ESSAS ASM in January 2013 in Hakodate, Japan, on "Spatial dynamics of lower trophic levels".

Surface Ocean and Lower Atmospheric Studies (SOLAS)

A short oral report was presented by Dr. Yukihiro Nojiri who discussedg the SOLAS summer school that is planned for Fall 2013 in Xiamen, China. Partial support for 3 students was requested, as for the previous SOLAS

summer school in Cargèse, France in 2011. BIO recognized the importance of the SOLAS summer school, especially if held in a PICES member country.

ICES

The Committee members discussed the proposed theme sessions for the ICES ASC in 2013. No strong connections to BIO were apparent. None of these have been jointly developed with BIO members.

AGENDA ITEM 8
Topic sessions and Workshops completed at PICES-2012

Summaries of each BIO-sponsored Topic Session and Workshop convened at PICES-2012 can be found in the Session Summaries Section of the 2012 PICES Annual Report.

S6 "*Environmental contaminants in marine ecosystems: Seabirds and marine mammals as sentinels of ecosystem health*" (BIO/MEQ), Co-convenors: Peter Ross (Canada), Hideshige Takada (Japan) and Yutaka Watanuki (Japan).
S7 "*Jellyfish in marine ecosystems and their interactions with fish and fisheries*" (BIO/FIS), Co-convenors: Richard Brodeur (PICES/USA), Cornelia Jaspers (ICES/Denmark), Christopher Lynam (ICES/UK), Song Sun (PICES/China), Shin-Ichi Uye (PICES/Japan) and Won-Duk Yoon (PICES/Korea).
S10 "*Ecosystem responses to multiple stressors in the North Pacific*" (BIO/MEQ/FUTURE), Co-convenors: Vladimir Kulik (Russia), Ian Perry (Canada) and Motomitsu Takahashi (Japan). See WG28 Addendum 5.
S12 "*Advances in understanding the North Pacific Subtropical Frontal Zone Ecosystem*" (BIO/FIS/POC), Co-Convenors: Taro Ichii (Japan), Skip McKinnell (PICES) and Michael Seki (USA).
BIO Paper Session Co-convenors: Michael Dagg (USA), Hiroaki Saito (Japan) and Atsushi Tsuda (Japan).

W1 "*Identifying critical multiple stressors of North Pacific marine ecosystems and indicators to assess their impacts*". Co-convenors: Jennifer Boldt (Canada), Vladimir Kulik (Russia), Chaolun Li (China), Jameal Samhouri (USA), Motomitsu Takahashi (Japan) and Chang-Ik Zhang (Korea).
W2 "*Secondary production: Measurement methodology and its application on natural zooplankton community*". Co-convenors: Toru Kobari (Japan) and William Peterson (USA).
W3 "*The feasibility of updating prey consumption by marine birds, marine mammals, and large predatory fish in PICES regions*". Co-convenors: George Hunt, Jr. (USA), Hidehiro Kato (Japan) and Michael Seki (USA).
W5 "*Comparison of multiple ecosystem models in several North Pacific shelf ecosystems (MEMIP-IV)*". Co-convenors: Harold Batchelder (USA), Shin-Ichi Ito (Japan), Angelica Pena (Canada) and Yvette Spitz (USA).

AGENDA ITEM 9
Proposed Workshop and Topic Sessions at PICES-2013 in Nanaimo

Proposals for Topic Sessions and Workshops at PICES-2013, and inter-sessional workshops were summarized. Topic sessions had been ranked by BIO Committee members but there were some proposed additions/modifications to the workshop list. BIO endorsed the final summary.

This year, a new system for proposals of Topic Sessions and Workshops was employed, but BIO felt there were some difficulties remaining. BIO consensus is that the new procedure is a good one and some time may be needed for the community to adjust to the new schedule. All members were asked to review the rankings of sessions and workshops for next year's meeting.

BIO preferred Topic Sessions in ranked order:
1. "*Ecosystem indicators to characterize responses to multiple stressors in North Pacific marine ecosystems*". *(WG 28 Endnote 5),*

2. "*Recent trends and future projections of North Pacific climate and ecosystems*" *(WG 29 Endnote 5)*.
3. "*Marine ecosystem services and the contribution from marine ecosystems to the economy and human well-being*" *(S-HD Endnote 3)*.
4. "*Are marine ecosystems of the North Pacific becoming more variable?*" *(AP-MBM Endnote 6)*.

BIO recommended workshops

1. "*Marine bird and mammal spatial ecology*" *(AP-MBM Endnote 7)*.
2. "*Identifying mechanisms linking physical climate and ecosystem change: observed indices, hypothesized processes, and "data dreams" for the future*" *(WG 27 Endnote 3)*.

AGENDA ITEM 10
Additional financial requests

None

AGENDA ITEM 11
Revision of BIO Action Plan

The BIO Action Plan has not been revised since 2007 and a new PICES Strategic Plan was presented after the establishment of the FUTURE program. The BIO Committee discussed an outline of the Action Plan. A new BIO Action Plan will be circulated from BIO Chair to the members and finalized by the next inter-sessional Science Board meeting.

AGENDA ITEM 13
Other items

None

AGENDA ITEM 14
Adjourn

The meeting was adjourned at 17:45 hr.

BIO Endnote 1

BIO participation list

Members

Michael Dagg (USA, Vice-Chairman)
Se-Jong Ju (Korea)
Hyung-Ku Kang (Korea)
Alexei Orlov (Russia)
Angelica Peña (Canada)
William Peterson (USA)
Vladimir Radchenko (Russia)
Hiroaki Saito (Japan)
Michael Seki (USA)
Atsushi Tsuda (Japan., Chairman)
Mingyuan Zhu (China)

Observers

Harold Batchelder (USA)
Richard Brodeur (USA)
James Christian (Canada)
Hidehiro Kato (IWC)
Suam Kim (Korea)
Toru Kobari (Japan)
Franz Mueter (ESSAS)
Yukihiro Nojiri (SOLAS)
Motomitsu Takahashi (Japan)
Shin-ichi Uye, (Japan)
Yutaka Watanuki (Japan)
Francis Wiese (NPRB)
Sinjae Yoo (Science Board)

BIO Endnote 2

BIO meeting agenda

1. Welcome, introductions
2. Meeting agenda
3. Annual review of BIO activities
4. Oral and Poster awards
5. Report from FUTURE APs
6. Reports from subsidiary bodies
7. International relationships
8. Topic sessions and workshops (completed) at PICES-2012, and inter-sessional meeting
9. Proposed workshop and Topic Sessions for the 2013 PICES Annual Meeting in Nanaimo, Canada
10. Additional financial requests
11. Revision of BIO Action Plan
12. Other items
13. Adjourn

BIO Endnote 3

Report of Marine Ecosystem Model Intercomparison Project (MEMIP)

Project goal

Our goal remains to conduct a comparison of different marine ecosystem models embedded within well defined physical frameworks at three coastal (shelf-to-slope transects) sites in the North Pacific. Progress was once again delayed due to instabilities in the physical simulations produced by 2D versions of the Regional Ocean Modeling System (ROMS) when they were run with more realistic (but still smoothed) cross-shelf bathymetry.

For the period October 2011 to October 2012, the MEMIP had one workshop in March (no funding requested or received from PICES) in Corvallis, OR, (see Appendix 1) and an abbreviated workshop (W5) at PICES-2012 (see Sessions Summaries section in the 2012 Annual Report). Results of the latter are reported in Session Summaries section of the 2012 PICES Annual Report.

Issues raised with Science Board at ISB-2012 (Busan, Korea)

1. Progress has been slow, but incremental progress on establishing physical test-beds for three years at both Newport and GAK lines in the NE Pacific is occurring.
2. Most of the ecosystem models are already coded into the form required for "plug-n-play" in the ROMS modeling framework (NemuroK5 being the exception). Establishing ecosystem boundary conditions and initial conditions will require some time. Some of this can be done from data in hand (nutrients, chlorophyll, PON, maybe zooplankton biomass) for the Newport and GAK test-beds, but it will require some time and effort. Some state variables in some models (*e.g.*, small phytoplankton *vs.* large phytoplankton; microzooplankton biomass) were not measured routinely in either ecosystem, so boundary conditions for those, especially in limited domain 3D models may be troublesome.
3. We still have hopes for successful runs in two North Pacific coastal systems before PICES-2012—but the schedule is very tight.

Proposed schedule of activities through to completion in 2014

During 2013–2014, members of the MEMIP will use 3D physical models for the three core cross-shelf transects [Newport Line in the California Current, Seward (GAK) Line in the Gulf of Alaska, and A-Line off of Hokkaido Island] as the framework for comparing various several different pelagic ecosystem models. The models are operational and tuning of the ecosystem models will be completed. The necessary comparison simulations will be run by the end of 2013, and in 2014, the MEMIP will complete the model-model ecosystem comparisons, and the model-data comparisons. In 2013, the MEMIP team will submit a proposal for a topic session to be held at PICES-2014 to showcase the results of the comparisons.

Appendix 1
Report of March 2012 MEMIP Workshop (Corvallis, OR, USA)

From March 26–30, 2012, a subset of the MEMIP investigators (Hal Batchelder, Yvette Spitz, Angelica Peña, and Jerome Fiechter) met in Corvallis, OR (USA) to make progress on several of the key steps needed to complete the model intercomparison and model-data comparisons that were promised by the group. Overall, we made some progress on establishing a physical test bed for the Newport, OR line (in the California Current seasonal upwelling region) and the GAK line that extends southeastward from Seward, Alaska. These represent two of three physical test-beds that are the focus of the MEMIP activities. The third site is the A-Line that extends southeastward to 38°N from the town of Akkeshi on the coast of Hokkaido, Japan.

After much discussion, it was decided to use a limited domain 3D model for the GAK region. The advantage of the 3D model over the originally intended 2D model is that the 3D model directly benefits from a larger scale regional ROMS physical model that assimilates physical data to better represent the substantial shelf-edge mesoscale variability (eddies) observed in the "real" ocean. The downside of the 3D model is that the resolution is relatively coarse (10 km horizontal resolution) for representing the real ocean physical variability in the inner shelf region, and for the inner shelf region the bathymetry is greatly smoothed and not particularly representative of the actual bathymetry on the GAK line (for instance, the greater depths of GAK1 [the innermost shelf station] is not represented at all in the model). Dr. Spitz is continuing to explore an alternative 2D model test-bed of the GAK line that has better horizontal resolution, 1–2 km, and closer to reality bathymetry (including GAK1). But as yet, the 2D model cannot adequately represent the inner shelf hydrographic structure due to difficulties with freshwater from the Alaska Coastal Current. It was unclear at the time of this writing whether an adequate 2D model of the GAK line will be available in time for us to proceed with our ecosystem model comparisons.

The Newport 2D model has some spurious shelf edge signals (variability) which may be real or not. These seem to be due to the sharp change in the bathymetry at the shelf-edge and slope. Dr. Spitz continues to work on resolving this. If it turns out that they are spurious due to the model formulation, we may resort to a small domain 3D model for the Newport line as well.

Because Dr. Shin-ichi Ito was unable to attend the March workshop, we do not know the status of bringing an A-Line physical test-bed to fruition. It would be nice to have a third test-bed, but for a successful MEMIP activity, we MUST have two test-beds. The hope is to have the Newport and GAK lines operational by late June 2012.

Additionally, participants in the MEMIP discussed how to summarize the ecosystem data that are available for these two transects. The Newport Line was sampled extensively in 2000, 2001 and 2002 (most extensive in the even years). In the same years, the GAK line was well sampled (2001 is the best year). Recall that a goal of the MEMIP is to assess the ability of the model to represent the cross-shelf and temporal variation of nutrients, phytoplankton (chlorophyll) and zooplankton (concurrently). Observations included nutrients (ammonia, nitrate and silicate), total phytoplankton chlorophyll (rarely size-fractionated), and mesozooplankton biomass estimation using nets of various types and mesh sizes. Nutrients and extracted chlorophyll estimates are from CTD-rosette casts, and extend to 80–100 m in most cases, depth permitting.

The Newport Line was occupied about 5 times per year to *ca*. 65–85 nautical miles (nm) offshore, with additional sampling for mesozooplankton, CTD casts, and surface chlorophyll and nutrients within 20 nm occurring more frequently. The most comprehensive mesozooplankton data were obtained from vertically towed 0.5 m diameter plankton nets of 202 μm mesh. Depth integrated tows were from 100 m to the surface, except where the bottom was shallower than 100 m, so tows there were from 5 m above the bottom to the surface. Abundances and biomasses of each copepod prey category were estimated. Other prey types were counted and sized, but (in some cases) have not been converted to biomass estimates. According to Dr. Bill Peterson, the originator of these data, the copepod biomass comprises "more than 90%" of the total zooplankton biomass in all samples except a few offshore stations where swarms of euphausiids were captured.

The GAK line was sampled *ca*. 7 times per year with a sampling regime for nutrients and chlorophyll that was similar to that at the Newport Line. Mesozooplankton were sampled with a CalVET net instead of a 0.5 m ring net. The CalVET net (25.4 cm diameter; 149 μm mesh) was towed vertically from 100 m to the surface, depth permitting. Abundance and wet weight biomass (estimated) was reported for each taxa captured in a tow.

Dr. Batchelder agreed to summarize the observational data to make them useful for the modelers to compare with the model outputs. A schedule of future MEMIP activities up to PICES-2012 was developed (below).

Proposed schedule (April–October, 2012)

April 6: Hal Batchelder to distribute schedule and work plan to MEMIP investigators.

May 31: Jerome Fiechter will provide the files needed to run the limited 3D domain ROMS model that includes the GAK line; this includes the surface forcing files, the FW forcing, the boundary conditions, and the initial physical conditions. On or before this date all of the files needed to run the physical test bed for GAK will be uploaded to orion.afsc.noaa.gov [ORION]. We anticipate that coupling of specific ecosystem models with the physical test-beds will be done on our own local computers. FINAL simulations for comparisons across different ecosystem models and different test-beds will all be run on "orion", to eliminate hardware and compiler dependent differences on the output.

June 30: before or on this date Yvette Spitz will upload the production version of the Newport physical model to ORION. This may be 2D or 3D, whichever does a better job of replicating the physics.

July 7: START ORION SIMULATIONS. Because there are only 8 cpus on ORION (orion.afsc.noaa.gov), we have established the following schedule for specific models/participants to do their simulations. Ideally, each different ecosystem model will be "tuned" to produce a reasonably good comparison to observations for at least one of the three model test-beds. We allocate 1 week (7 days) to each model. This is based on preliminary timings we have done (and best guesses) on how long the simulations will take. There will be a minimum of 6 simulations per model. For example, for a generic NEMURO ecosystem model there will be 3 years X 2 test-beds (= 6 simulations) done. We suggest that Yvette (1 model) and Jerome (2 models) go first, as they will be most familiar with the physical test-beds, and those three weeks will be useful to the other members in allowing them to experiment (tune) their individual ecosystem models using their local computational resources (prior to FINAL runs being done on ORION).

July 8: Yvette Spitz
July 15: Jerome Fiechter (model 1)
July 22: Jerome Fiechter (model 2)
July 29: Angelica Peña
August 5: Guimei Liu
August 12: Hal Batchelder
August 19: Shin-ichi Ito

September 1: (A) Last date for ALL ecosystem data to be compiled and appropriately aggregated and shared via either email or ORION. These will be the "observations" to which the model outputs are compared. Getting the data observations on orion will be done by Hal Batchelder, and probably much earlier than this date, because they will be useful for tuning models during the July–August timeframe. (B) ALL model simulations (7 models X 3 years X 2 sites = 35 simulations will be available on ORION. Permissions on model simulation outputs will be set so that all MEMIP members can retrieve model results (if they choose to do so).

September 2–October 1: Individual MEMIPers evaluate their model (*e.g.*, Guimei = CoSINE; Batchelder = NEMUROK5, *etc.*) to available data sets as summarized for the 1 September deadline (see above) for all 3 years at both sites.

October 12–13: MEMIP WORKSHOP just before PICES-2012 in Hiroshima, Japan.