REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

The meeting of the Biological Oceanography Committee (BIO) was held from 13:30-17:45 hours on October 17, 2004. The Chairman, Dr. Vladimir I. Radchenko, called the meeting to order and welcomed members and guests (*BIO Endnote 1*). Attendees were informed that Dr. Young-Shil Kang became the new BIO member from Korea, replacing Dr. Jae-Hyung Shim. However, she left the meeting one day earlier for another engagement.

The Committee reviewed the agenda, and some items were added. Dr. Tsutomu Ikeda suggested moving the discussion of the new scientific project "An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean" from Agenda Item 10 ("High priority projects") to Agenda Item 6 ("Items with financial implications"), since presenters would like to propose a workshop in the near future. Dr. Sinjae Yoo informed the Committee about a request from CREAMS (*Circulation Research in East Asian Marginal Seas*) to endorse an Advisory Panel for a CREAMS/PICES Program with the inclusion of biological and fisheries research, and asked to have this item included in the agenda. The revised agenda is presented as *BIO Endnote 2*. Dr. Angelica Peña agreed to serve as rapporteur.

Election of new BIO Committee Chairman (Agenda Item 3)

Since the PICES Executive Secretary must be present for the election of the Committee Chairman, this item was postponed and discussed after Agenda Item 13. Dr. Radchenko reviewed the PICES Rules of Procedure on elections and informed the Committee members on nomination procedures. Dr. Michael J. Dagg (U.S.A.) was elected as the new BIO Chairman by acclamation, with the term of his appointment (2004-2007) to begin immediately after the close of the PICES Thirteenth Annual Meeting.

Progress reports of existing subsidiary bodies and proposals for new subsidiary bodies (Agenda Item 4)

WG 14 on *Effective sampling of micronekton*

Dr. Richard D. Brodeur informed the Committee that the final draft of the WG 14 report was completed this summer and sent to BIO and Working Group members for review. At the end of August 2004, this draft report was placed on the PICES website. Now the final report is ready to be published. Dr. Patricia A. Wheeler complemented the report but suggested some editorial changes. The Committee officially approved the WG 14 report for publication in the PICES Scientific Report Series.

Dr. Brodeur also reported that a special issue of *Journal of Marine Systems* on "The role of biophysical coupling in concentrating marine organisms around shallow topographies" was published in September 2004 (Vol. 50, Nos. 1-2). This volume comprises of selected papers from the BIO/POC/FIS Topic Session convened at PICES XI (October 2002, Qingdao, China).

Advisory Panel on *Micronekton sampling inter-calibration experiment* (MIE-AP)

Dr. Michael P. Seki, MIE-AP Co-Chairman, reported on a pilot micronekton inter-calibration cruise conducted onboard the NOAA ship *Oscar Elton Sette* in central North Pacific waters off the west side of Oahu Island, and the follow-up MIE-AP workshop on "Micronekton sampling gear inter-calibration experiment" with attendance of all cruise participants. The report of the MIE-AP meeting/workshop is included elsewhere in this Annual Report. A presentation was given on the preliminary results from the cruise. Different gears resulted in different catches since they had different mesh sizes. The question has arisen – what is the standard to be selected for future studies?

After the successful pilot cruise, MIE-AP is planning a new field experiment in the Bering Sea or subarctic Pacific. To be better prepared for the next cruise, the Panel requested some changes in the current membership and chairmanship:

- Dr. Evgeny Pakhomov (Canada) to continue as MIE-AP Co-Chairman;
- Dr. Michael Seki (U.S.A.) to step-down as Co-Chairman, but to remain as a member of the Panel;
- Dr. Orio Yamamura (Japan) to be added to the Panel and become a Co-Chairman;
- Additional members from under-represented countries be nominated to the Panel.

The Committee supported these recommendations and will direct them to Science Board.

Advisory Panel on *Marine bird and mammals* (MBM-AP)

Dr. Hidehiro Kato reported on MBM-AP activities during the interim period, and Dr. William J. Sydeman presented the results of the MBM-AP workshop on "Combining data sets on diet of marine birds and mammals II" held October 14, 2004, immediately prior to the Panel meeting. The report of the MBM-AP meeting and the summary of the workshop are included elsewhere in this Annual Report.

MBM-AP is asking for a special PICES issue in a peer-reviewed journal such as *Progress in Oceanography*. About 10 papers presented at the 2003 and 2004 MBM-AP workshops on "Combining data sets on diet of marine birds and mammals" are available for this publication. For PICES XIV (October 2005, Vladivostok), MBM-AP proposed a 1-day workshop on "Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea" (*MBM-AP Endnote 4*) and a 1-day Topic Session (to be convened jointly by BIO, FIS and POC in collaboration with MONITOR and TCODE) "Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations" (*MBM-AP Endnote 5*).

MBM-AP has completed five years of its work, and at the 2004 interim Science Board meeting, BIO was requested to review and evaluate the Panel's progress to date. The Committee received some feedback on new directions, goals, and updated terms of reference from the MBM-AP Co-Chairmen (*BIO Endnote 3*). It was suggested that fish species, which are top predators in the North Pacific ecosystems, be also included in the MBM-AP scope of studies to attract new members from countries other than Japan and the United States. Dr. Dagg raised the question of how to solve problems of standardizing observations due to different observers? Dr. Sydeman responded that if there is interest, MBM-AP could train observers from different countries. After the discussion, the MBM-AP performance was highly evaluated, and a new 5-year term for the Panel was approved. The Panel was requested to develop a Strategic Plan and a vision for the next term.

Proposals for new subsidiary bodies

No new subsidiary bodies were proposed. Dr. Radchenko briefly informed the Committee on the recommendation of the Study Group on *Ecosystem-based management science and its application to the North Pacific* to establish a Working Group on this topic, under the direction of FIS and MEQ.

Business from the last year's meeting (Agenda Item 5)

Dr. Radchenko reviewed the status of intersessional meetings, publications and travel requests proposed at PICES XII.

The PICES-IFEP workshop on "*In-situ* iron enrichment experiments in the eastern and western subarctic Pacific" was held February 11-13, 2004, in Victoria, Canada. The goal of the workshop was to review the results and outstanding questions from previous iron enrichment experiments, and to discuss plans for the second longer-term experiment (SEEDS-II) in the western subarctic Pacific. 26 scientists from Canada, Japan and U.S.A. attended the meeting. The results of the workshop have been reported in PICES Press (July 2004, Vol. 12, No. 2), and will be published as a PICES Scientific Report in 2004 or early 2005.

Travel funds for invited speakers provided by PICES upon the request of BIO, were divided between the two Topic Sessions at PICES XIII on "Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?" and on "Role of gelatinous zooplankton in coastal and oceanic ecosystems". Dr. George L. Hunt emphasized that the former Topic Session also received financial support from the Alaska Fisheries Science Center and other U.S. agencies, and that ensured good attendance and will be helpful in preparing a special PICES issue of *Progress in Oceanography* for publication. Full travel support was also provided for 1 invited speaker to the MBM-AP workshop at PICES XIII on "Combining data sets on diets of marine birds and mammals - Phase II".

There are no special publications from last year's BIO Topic Sessions. The status of supported publications is as follows:

- The final WG 14 report will be published in the PICES Scientific Report Series in early 2005;
- A special issue of *Journal of Marine Systems* on "The role of biophysical coupling in concentrating marine organisms around shallow topographies" (Guest Editors: J.F. Dower and R.D. Brodeur) was published in September 2004 (Vol. 50, Nos. 1-2);
- The North Pacific Ecosystem Status Report (the Jeju edition) is now available on the PICES website.

Items with financial implications (Agenda Item 6)

Inter-sessional meetings proposed for 2005 and beyond

Dr. Hunt emphasized the importance of the forthcoming GLOBEC Symposium (co-sponsored by PICES) on "Climate variability and sub-Arctic marine ecosystem" (May 16-20, 2005, Victoria, Canada).

Drs. Charles B. Miller and Tsutomu Ikeda presented a multi-national project entitled "An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean" (*BIO Endnote 4*). Groups of scientists on the respective sides of the ocean will develop programs for their regions, sustaining communication between the groups. A workshop is proposed in the spring of 2005 (with participation of approximated 20 scientists, 10 from each side of the Pacific) to initiate this communication and to examine all of the basic issues, looking toward actual expeditions in 2007 or 2008. PICES was asked for endorsement and financial support for the 2005 spring workshop (maybe two persons from each side of the Pacific). The proposal was well received by BIO members. It fits well into PICES objectives, and therefore the Committee requested as much support as possible from PICES.

Dr. Peña reported on the request to PICES for logistical support and minor travel support (1 or 2 invited speakers) for a 3-day symposium celebrating the 50th anniversary of sampling along Line-P and at Station PAPA planned for 2006, or 2007. The Committee recommended continuing the discussion of this request at the 2005 interim Science Board meeting.

Support for a new SCOR Working Group on *Global comparisons of zooplankton time series*

Dr. Peña informed the Committee that SCOR approved the formation of a Working Group on *Global comparisons of zooplankton time series* (Co-Chairmen: Drs. David L. Mackas and Hans Verheye). At the 2004 interim meeting, Science Board suggested that PICES provide funding for one additional member (from PICES) to participate in this Working Group, should it be accepted by SCOR. BIO members strongly supported this recommendation.

Proposed publications for 2005 and beyond

Three publications are expected from this year's BIO Topic Sessions and workshops:

- A *Progress in Oceanography* special issue based on selected papers presented at the BIO Topic Session on "Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?";

- A *Deep-Sea Research II* special issue based on selected papers presented at the BIO/FIS Topic Session on "Hot spots and their use by migratory species and top predators in the North Pacific";
- A special volume of a leading international journal resulting from the 2003 and 2004 MBM-AP workshops on "Combining data sets on diet of marine birds and mammals".

Travel support requests

The Committee supports the following requests:
- Travel funds for MIE-AP cruise participants, if another micronekton sampling inter-comparison will be carried out;
- 1 invited speaker for the proposed MBM-AP workshop on "Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea" at PICES XIV;
- 2 invited speakers for the proposed Topic Session on "Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations" at PICES XIV.

Other items with financial implications

On behalf of CREAMS, Dr. Yoo asked for endorsement of an Advisory Panel for a 3-year CREAMS/PICES Program on East Asian Marginal Seas, with the inclusion of biological and fisheries research. A proposed workplan for the Panel includes convening three joint CREAMS/PICES workshops in 2005-2007 (*POC Endnote 4*). Minor travel support was requested from PICES for the first workshop on "East Asian Seas Time Series" to be held in the spring of 2005. BIO supported the formation of the Advisory Panel and the request for travel.

The Committee discussed and prioritized requests for workshops and travel:
- The first priority is the start-up workshop for the project "An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean";
- The second priority is the micronekton inter-calibration cruise (MIE-AP was requested to present a formal report on Panel activity and future directions as condition for this support). Another second level priority item is the 2005 CREAMS/PICES workshop on "East Asian Seas Time Series";
- The third priority is the MBM-AP workshop at PICES XIV. This workshop, could be deferred for 1 year if there are not enough funds.

Dr. Radchenko noted that travel funds being allocated by PICES for invited speakers are traditionally distributed among sessions sponsored by the Committee.

Scientific sessions supported by BIO at PICES XIII (Agenda Item 7)

At PICES XIII, BIO convened four sessions, and each session had a Committee member among conveners:
- a 1½-day BIO Topic Session (S2) on "Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?" (Dr. Kishi);
- a ½-day BIO Topic Session (S3) on "Role of gelatinous zooplankton in coastal and oceanic ecosystems" (Dr. Brodeur);
- a 1-day BIO/FIS Topic Session (S4) on "Hot spots and their use by migratory species and top predators in the North Pacific" (Dr. Kato);
- ½-day BIO Paper Session (Dr. Radchenko).

Summaries of all sessions are included elsewhere in this Annual Report. Science Board recommended that the winner of the BIO Best Presentation Award be selected from eligible papers presented at the Topic Sessions S2 and S3, and at the BIO Paper Session.

Topic Session proposals for PICES XIV (Agenda item 8)

Two Topic Sessions were proposed for PICES XIV:
- a 1-day BIO/FIS Topic Session on "Use of top predators as temporal indicators of changes in oceanographic conditions and prey populations" (*MBM-AP Endnote 5*);
- a ½-day BIO Topic Session on "Comparative life history of euphausiids around the Pacific rim" (*BIO Endnote 5*).

It was emphasized that the approved list of PICES XIV Topic Sessions (including draft descriptions and potential conveners) must be presented to the Science Board Chairman before the Closing Ceremony.

It was also reiterated that BIO supports the MBM-AP request to convene a 1-day workshop on "Factors affecting distribution and foraging ecology of top predators in the Okhotsk Sea" (*MBM Endnote 4*).

Theme for PICES XV (Agenda item 9)

The Committee suggested two potential themes for PICES XV (October 2006, Japan):

- Linking scientific disciplines to understand and predict ecosystems;
- North Pacific links to global processes/ issues.

High priority projects (Agenda item 10)

A proposal for a multi-national project entitled "An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean" (*BIO Endnote 4*) was considered under Agenda Item 5 and strongly supported by BIO.

Discussion of the PICES Strategic Plan and BIO Committee contribution to the PICES Action Plan (Agenda Item 11)

Discussion focused on several questions:

- How will the Committee contribute to the PICES Action Plan?
- What are the priority issues of BIO for the next 3-5 years (these issues must be reflected in the BIO Strategic Plan, which is developed but needs to be updated)?
- How will the Committee address the goals of PICES and BIO?

Dr. Wheeler suggested including benthos, and Dr. Peña recommended elaborating more on the use of satellite data (particularly ocean color data) in point 4 of the existing Strategic Plan. Both issues could be covered in the section on "understudied" areas. Efforts to validate satellite ocean color data could be carried out in collaboration with SYMBIOS, which is working on comparing satellite imagery with shipboard data already in hand. This work can be undertaken together with the new MONITOR Technical Committee.

The Committee agreed to work by e-mail with the aim to refine the BIO Strategic (Action) Plan, and prioritize efforts for the next 3 years before the interim Science Board meeting in the spring of 2005. As a part of this work, the Committee should also discuss PICES Capacity Building opportunities (Agenda Item 16).

Discussion of potential topics toward the next major PICES scientific program(s) (Agenda Item 12)

It was agreed that the North Pacific Ecosystem Status Report might serve as a source of guidance and ideas for future major PICES programs.

PICES website: Contributions from BIO (Agenda item 13)

The BIO Chairman will be submitting information for the PICES website. It was suggested that a temporary site be set up where material could be posted for Committee members' review and approval before formal appearance on the BIO web page.

Discussion of developing a Vice-Chairman position for BIO (Agenda item 14)

BIO members see no need for appointing a Vice-Chairman unless this person will serve as the next Committee Chairman, and can attend Science Board meetings.

Another suggestion was to have a Vice-Chairman with a term of appointment shifted for one year relative to the Chairman's term. It would facilitate the exchange of experience and knowledge with the new Chairman (or Vice-Chairman) and ensure a good continuity within the Committee.

It was recommended that the discussion of this issue be continued within the Science Board.

Relations with international organizations and programs (Agenda item 15)

Committee members again emphasized the importance of closer links with GLOBEC International, CLIVAR, GOOS and ICES for BIO activities.

Dr. Kato, PICES representative to the International Whaling Commission (IWC), reported on the 2004 IWC Scientific Committee meeting. There were no items considered that were related to PICES activities. However, IWC indicated their intention to encourage development of a scientific project for future cooperation with PICES. BIO approved the report by Dr. Kato and suggested continuing the connection with IWC.

Discussion of PICES Capacity Building opportunities (Agenda Item 16)

Dr. Dagg commented that the biggest problem with capacity building is to find out what can be done using a "no cost" approach, because PICES is unlikely to have additional resources to devote to this. One proposal was to have a social session (1-2 hr) that involves BIO members and students interested in biological oceanography who are already at the Annual Meeting. It was also proposed that students awarded the best presentation at the Topic Sessions should obtain funds to attend the next PICES scientific meetings or symposia.

2004 BIO Best Presentation Award (Agenda item 17)

Akinori Takasuka (Japan) won the BIO Best Presentation Award for his paper "Differential optimal temperatures for growth of larval anchovy and sardine" (co-authored by Yoshioki Oozeki, Ichiro Aoki, Ryo Kimura, Hiroshi Kubota and Takashi Yamakawa). Honourable Mention from BIO went to Vladlena Gertseva (U.S.A.) for her paper "Juvenile salmon survival in coastal waters of the Northeast Pacific Ocean: Top-down or bottom-up control?" (co-authored by Thomas Wainwright and Vladimir Gertsev). Both papers were given at the Topic Session on "Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else?".

Other business (Agenda Item 18)

The Committee recommended two PICES representatives to serve on the Steering Committee of the 4th Zooplankton Production Symposium (2007, Hiroshima, Japan), co-sponsored by PICES, ICES and GLOBEC: Dr. Michael J. Dagg (as a PICES Convenor) and Dr. David L. Mackas (as a member).

Preparation of report to Science Board (Agenda Item 19)

Dr. Radchenko expressed his great appreciation to Dr. Peña for serving as the rapporteur.

BIO Endnote 1

Participation List

Members

Richard D. Brodeur (U.S.A.)
Michael J. Dagg (U.S.A.)
Tsutomu Ikeda (Japan)
Hidehiro Kato (Japan)
Michio J. Kishi (Japan)
Angelica Peña (Canada, rapporteur)
Vladimir I. Radchenko (Russia, Chairman)
Patricia A. Wheeler (U.S.A.)
Sinjae Yoo (Korea)
Ming-Yuan Zhu (China)

Observers

Harold P. Batchelder (U.S.A.)
George L. Hunt (U.S.A.)
Oleg N. Katugin (Russia)
Charles B. Miller (U.S.A.)
Kazushi Miyashita (Japan)
Jeffrey Napp (U.S.A.)
R. Ian Perry (Science Board Chairman)
Michael P. Seki (U.S.A.)
Phillip Taylor (U.S.A., NSF)
William T. Peterson (U.S.A.)
Alexander Bychkov (PICES Exec. Secretary)

BIO Endnote 2

BIO Meeting Agenda

1. Welcome and introduction of members
2. Approval of agenda
3. Election of new BIO Committee Chairman
4. Progress reports of existing subsidiary bodies and proposals for new subsidiary bodies:
   a. WG 14 on *Effective sampling of micronekton*
   b. Advisory Panel on *Micronekton sampling inter-calibration experiment*
   c. Advisory Panel on *Marine birds and mammals*
   d. Proposals for new subsidiary bodies
5. Other business from last year's meeting
6. Items with financial implications:
   a. Inter-sessional meetings proposed for 2005 and beyond
   b. Support for a new SCOR Working Group on *Global comparison of zooplankton time series*
   c. Proposed publications for 2005 and beyond
   d. Travel support requests
   e. Other items with financial implications
7. Scientific sessions supported by BIO:
   a. *Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?*
   b. *Role of gelatinous zooplankton in coastal and oceanic ecosystems*
   c. *Hot spots and their use by migratory species and top predators in the North Pacific*
   d. *BIO Paper Session.*
8. Topic session proposals for PICES XIV in Vladivostok, Russia
9. Theme for PICES XV
10. High priority projects
11. Discussion of the PICES Strategic Plan and BIO Committee contribution to the PICES Action Plan
12. Discussion of potential topics toward next major PICES scientific program(s)
13. PICES website: Contributions from BIO
14. Discussion of developing a Vice-Chairman position for BIO
15. Relations with international organizations and programs
16. Discussion of PICES Capacity Building opportunities
17. 2004 BIO Best Presentation Award
18. Other business
19. Preparation of report to Science Board

BIO Endnote 3

Advisory Panel on *Marine bird and mammals*: Evaluation and future activities

(submitted by MBM-AP Co-Chairmen, Drs. Hidehiro Kato and William J. Sydeman)

Future directions

BIO is the parent committee of the Advisory Panel on *Marine bird and mammals* (MBM-AP). At the MBM-AP meeting held at PICES XIII (October 14, 2004), attendees supported the continuation of the Panel beyond the initial 5-year term as a specialist group for BIO and the PICES community in general.

The current terms of reference for MBM-AP are as follows:

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

MBM-AP members believe that these terms of reference accurately reflect the general goals of the group. However, these are flexible and may require minor revision with changes in other PICES activities. Furthermore, it is noted that many fish (*e.g.*, herring, salmonids, tunas) feed on the same trophic levels as many marine birds and mammals, and apex predators (*e.g.* sharks). Therefore, greater linkage between MBM-AP and FIS is desirable. MBM-AP is also working closely with MONITOR and the CPR Advisory Panel on the Pacific Continuous Plankton Recorder – Marine Bird and Mammal Program (see below). MBM-AP would also enhance links with other PICES groups (MODEL).

Evaluation

Over the past 5 years, MBM-AP has been productive, hosting 4 workshops and 2 Topic Sessions. The workshop at PICES IX (October 2000, Hakodate, Japan) focused on methods to estimate densities of marine birds and mammals at sea. The workshop at PICES XI (October 2002, Qingdao, China) addressed the effects of prey availability on top predators, from fish to marine mammals. The two most recent workshops at PICES XII (October 2003, Seoul, Korea) and PICES XIII (October 2004, Honolulu, U.S.A.) investigated spatial and temporal variability in food habits for well-studied marine birds and mammals in the North Pacific.

The Topic Sessions hosted by BIO at PICES XIII, with support of MBM-AP, were: "Mechanisms that regulate North Pacific ecosystems: bottom-up, top-down, or something else?" and "Hotspots and their use by migratory species and top predators in the North Pacific".

Finally, starting in June 2002, observations of marine birds and mammals were added to the North Pacific CPR survey lines. The bird and mammal observation augment the CPR program by providing a more comprehensive perspective of change in North Pacific marine ecosystems. Eight trans-Pacific surveys have been conducted to date, with plans in place to continue tri-annual surveys through March of 2006. This project will provide new information on top predator densities across the North Pacific, and how their distribution and abundance varies by season and year. These data will be used to address seasonal and inter-annual variation in prey consumption and will provide information on ecosystem "health", which may be useful in fisheries management.

Vision statement

MBM-AP will continue and enhance its strategic goal of understanding spatio-temporal patterns of ecosystem variations in the PICES region in relation to physical oceanography and climate change. Specifically, our strategic efforts for the next 5-10 years are as follows:

- calibration of the use of top predators as North Pacific ocean climate, ecosystem, and food web indicators and samplers;
- application of top predator time series and habitat models in ecosystem-based fisheries and regional ocean management (*e.g.*, marine conservation areas), addressing the primary question -- how and when can top predator time-series be used in marine ecological forecasting and fisheries stock prediction?;
- examination of oceanographic and marine ecological factors affecting the biogeography of top predators in the North Pacific;
- development of technology for operational oceanography: using top predators as sampling platforms;
- augmentation of long-term fisheries oceanography programs with the addition of marine bird and mammal datasets, to provide a deeper context for understanding coupled climate-ecosystem fluctuations;
- updating the report of WG 11 on *Consumption of marine resources by marine birds and mammals in the PICES region* (PICES Scientific Report No. 14, 2000) by 2012.

BIO Endnote 4

Proposal for a project on "An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean" (by Drs. Charles B. Miller and Tsutomu Ikeda)

PICES has designated the subarctic zone of the Pacific Ocean as its focal interest for fisheries management and ocean ecology. Oceanic sectors of this region have been conclusively shown by the SERIES and SEEDS iron-enrichment experiments to have iron-limited production at least part of the year, which explains in a general way their "high-nitrate, low-chlorophyll" (HNLC) character. Unanswered questions remain about lower trophic level production throughout the region. We ask PICES to assist in promoting observational studies to answer these questions.

First, west and east sectors differ in the seasonal sequence of production events. In much of the western gyre, represented by Site H studied by Japanese scientists, there is a strong April – May phytoplankton bloom after water column stabilization, followed by an iron-limited production regime through summer and autumn. In the east, iron-limitation is continuous, but the same spring period of water column stabilization sustains a sharp increase in primary production rates without a phytoplankton stock increase. Fully exploring the contrast between these ecosystems, particularly the difference in natural (unaugmented) iron availability to phytoplankton, requires comparative examination of the two oceanic sectors during their spring transition periods, preferably in the same year.

Second, the eastern sector with continuous iron limitation shows approximately 6-10 day oscillations in phytoplankton stock (~0.15 to 0.5 μg chlorophyll L^{-1}) and ammonia. As phytoplankton stock goes down, ammonia goes up, then the reverse. The upper limit for the typical nanophytoplankton may be set by iron availability (not directly nitrogen, since nitrate is always 6 μM); whereas there is no clear idea of what sets the lower limit, why phytoplankton stocks do not go lower. Microheterotroph (protozoan) grazing is coupled to this cycle, certainly causing the periodic recycling of nitrogen. Some feature of that grazing, possibly protozoans eating each other when phytoplankton becomes scarce, could regulate the low points of the cycle. Understanding these rapid oscillations of HNLC trophic relations will be best approached through time series analysis of phytoplankton, nutrients and grazers during the spring transition when the system goes through its greatest variation in overall productivity.

Third, the spring transition in both ecosystems supports the annual growth periods of four species (three *Neocalanus* spp. and *Eucalanus bungii*) of interzonal migrating copepods, the main contributors to subarctic mesozooplankton biomass, during the spring transition. In the west they can feed on the abundant diatom production of the spring bloom. In the east they are more food-limited, primarily eating protozoa and reaching smaller sizes at their entry to diapause (with associated descent to depth, the so-called interzonal migration). Comparative west and east studies of their growth rates would show the differential effects of high versus low food abundance for these species. Newly developed, biochemical estimators of growth rate, tools not available to earlier studies, would facilitate the comparison.

All of these objectives, and others as well, could be achieved by comparative expeditions during the spring transitions in the western and eastern subarctic Pacific gyres, preferably in the same year. These would be long cruises, probably 50 or more days, possibly of two legs each. Scientists from Asia would most readily mount the western one, workers from Canada and the United States undertake the eastern one. The necessary levels of cooperation and communication to achieve fully comparable studies in each area can be greatly facilitated by PICES. Therefore, we respectfully request that the Biological Oceanography Committee (BIO) endorse this project and recommend it to the attention of the Governing Council. We are still searching for an excitement-generating name for this project and will forward it to BIO soon.

Groups of scientists on the respective sides of the ocean will develop programs for their regions, sustaining communication between the groups. We propose to initiate this communication with a workshop to examine all of the basic issues in the spring of 2005, looking toward actual expeditions in 2007 or 2008. We also ask that BIO endorse this workshop, for which we will seek support from national funding agencies.

BIO Endnote 5

Proposal for a ½-day BIO Topic Session at PICES XIV on
"Comparative life history of euphausiids around the Pacific Rim"

Euphausiids are among the most important links in coastal and oceanic food webs, transferring energy from primary and secondary producers to higher trophic level animals such as salmon, herring, sardines, mackerels, Pacific whiting, sablefish, many rockfish species, auklets, shearwaters, and whales. Given their importance in the food chain, euphausiids may be regarded as a keystone sentinel taxa. Moreover, many PICES scientists are interested in formulating ecosystem models that parameterize better the euphausiid component. This session will invite scientific papers that review and discuss results of research on the ecology and life history of euphausiids in the North Pacific Ocean, with a focus on comparative studies in continental shelf and slope waters around the Pacific Rim.

Recommended convenors: William T. Peterson and Michael J. Dagg (U.S.A.), and Anatoly F. Volkov (Russia).

Travel support is requested for two invited speakers.