

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE



The Biological Oceanography Committee (BIO) met from 08:30-15:30 hours on October 7, 2005. Due to the effects of hurricane Katrina in New Orleans, the Chairman, Dr. Michael J. Dagg, was unable to attend the meeting. Dr. Dagg and the PICES Secretariat asked Dr. David L. Mackas (Canada) to be the on-site substitute. Dr. Mackas called the meeting to order and welcomed members and observers (*BIO Endnote 1*). Drs. Angelica Peña and Michio Kishi agreed to be rapporteurs. The proposed agenda was approved without additions (*BIO Endnote 2*).

Progress reports of existing subsidiary bodies (Agenda Item 3)

The full reports of existing subsidiary bodies can be found elsewhere in this Annual Report. The following are summaries:

Working Group on Effective sampling of micronekton to estimate ecosystem carrying capacity (WG 14)

WG 14 published "*Micronekton of the North Pacific*" as PICES Scientific Report No. 30 in May 2005. This report was the final product of the BIO-sponsored group that was formed in 1998. The report was edited by Drs. Richard D. Brodeur and Orio Yamamura and contains contributions from Canadian, Japanese, Korean, Mexican, Russian and U.S. scientists.

Advisory Panel on Micronekton intercalibration sampling experiment (MIE-AP)

Dr. Evgeny Pakhomov, Co-Chairman of the Panel, reviewed their terms of reference and described MIE-AP activities in 2005. The second MIE-AP inter-calibration cruise (MIE-2) was just completed off Hokkaido, and plans for a 2006 (MIE-3) cruise in the Bering Sea are

proposed to coincide with the 2006 NPAFC BASIS program activities in this area. Attempts will be made to obtain financial support for MIE-3 from the North Pacific Research Board in 2006. So far, no financial support has been obtained for these experiments. At the next Annual Meeting, MIE-AP would like to convene a 1-day workshop on "*Synthesis of MIE-AP sampling inter-calibration experiments*" and a 1-day Topic Session on "*Micronekton biology: Advances in epi- and meso-pelagic ecosystem research*" (*MIE-AP Endnotes 1-2*). This was discussed in more detail under Agenda Item 7.

Advisory Panel on Marine birds and mammals (MBM-AP)

MBM-AP held a business meeting on October 5, 2005 and subsequently, Dr. William J. Sydeman, Co-Chairman of the Panel, reported to the BIO Committee on their accomplishments and activities in 2004-2005. The main activities of the group included a joint CPR-AP/MBM-AP monitoring project using ships of opportunity, and an upcoming special *Deep Sea Research II* issue of selected papers from the PICES XIII Topic Session on "*Hot spots and their use by migratory species and top predators in the North Pacific*". An overview of PICES XIV Topic Session on "*Factors affecting distribution, foraging ecology, and life histories of top predators in the northwestern Pacific Ocean and its marginal seas*" was presented. MBM-AP also proposed a Topic Session for PICES XV entitled "*Synchrony in responses of marine top predators to large-scale climate variability: Mechanisms of environmental forcing*" (*MBM-AP Endnote 3*). This was discussed in more detail under Agenda Item 7.

MBM-AP has continuing concern about lack of membership from all PICES member countries.

BIO-2005

Proposals for new subsidiary bodies (Agenda Item 4)

Section on Carbon and climate (CC-S)

Recognizing the need for a regional group that has a longer life-time than the typical Working Group, and which will allow PICES to maintain its pre-eminence in this arena while ensuring that the important problems of carbon cycling in the North Pacific are adequately addressed, a Section on *Carbon and climate* was established, under POC and BIO, at the inter-sessional Science Board/Governing Council meeting in April 2005. BIO welcomes the new Section and an enhanced PICES focus on biogeochemistry scientific issues.

The original idea for CC-S came from the POC WG 17 on *Biogeochemical data integration and synthesis* (now disbanded). At the time, Science Board revised the proposed terms of reference for this Section to accommodate more biological issues associated with carbon and climate (*BIO Endnote 3*). BIO reviewed these terms of reference and recommends two additional scientific topics: (1) estimates of the biological pump and (2) potential adverse effects on ocean biota of warming and/or increased CO₂ loading. Also, BIO recommends adding/replacing members to the Section so that more biologists and maybe a BIO member liaison can be added.

Advisory Panel on Iron fertilization experiment in the subarctic Pacific Ocean (IFEP-AP)

Dr. Jun Nishioka gave a presentation on the recent and planned activities of IFEP-AP. There was an IFEP/MODEL Workshop at PICES XIV to initiate discussions on incorporating the iron cycle into ecosystem models. A SEEDS-II Workshop will be held in Tokyo on October 17-18, 2005. Several papers on the results of the iron fertilization experiments initiated by the Panel in the subarctic North Pacific have been published. The Panel requested a 1-day joint IFEP/MODEL Workshop on "*Modeling iron biogeochemistry and ocean ecosystem*" (*IFEP-AP Endnote 5*) and a 1-day BIO Topic Sessions on "*Synthesis of in situ iron enrichment experiments in the eastern and western subarctic*

Pacific" (*IFEP-AP Endnote 6*) to be convened at PICES XV. The details of this proposal were discussed under Agenda Item 7.

BIO members unanimously approved re-organizing IFEP-AP under BIO. However, the Committee expressed concern about the duration of IFEP-AP activities and the need to work on a timetable for completion of these activities. These issues will be discussed at the next meeting of IFEP-AP.

Concept for a Working Group on Euphausiids

Dr. William T. Peterson summarized the BIO Topic Session (S2) on "*Life history and ecology of euphausiids in coastal and oceanic waters around the Pacific Rim*", and followed up with a review of current developments toward a PICES-sponsored "Year of the euphausiid" program (see *SB Endnote 10* in the 2004 Annual Report). Possibilities range from a synthesis paper to be presented in April 2006 at the CCCC Symposium on "*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*", to establishing a Working Group on *Euphausiids* at PICES XV, if there is sufficient interest (especially from the western Pacific). A document on "*Live euphausiid experimental protocols*" was prepared and circulated to attendees, and will be posted on the PICES website.

Inter-sessional PICES-sponsored meetings and workshops for 2005 and beyond (Agenda Item 5)

2005 OECOS Workshop

A workshop on "*Oceanic Ecodynamics Comparison in the Subarctic Pacific (OECOS)*" was organized in May 2005, in Corvallis, U.S.A., by Drs. Charles B. Miller and Tsutomu Ikeda. This workshop was co-sponsored by PICES and the Oregon State University. Japanese and North American scientists discussed the fundamental questions and observational details of proposed comparative studies of ecological processes in the upper waters of the oceanic subarctic Pacific (*BIO Endnote 4*).

Dr. Harold P. Batchelder gave a presentation summarizing the OECOS Workshop and an update on OECOS future activities. This included a Japanese proposal for a western Pacific cruise on R/V *Hakuho-Maru* in 2007, between Sakhalin Island and Hokkaido (partly in Russian territorial waters). The funding for the proposal will be known by December 2005. Dr. Ikeda sent a letter to Dr. Vladimir I. Radchenko inviting Russian scientists to join this cruise and is awaiting a response.

Dr. Radchenko stated that Russian scientists are negotiating with Moscow and some difficulties remain. If a Russian ship was used, it would be much simpler, politically, but this is likely not feasible due to specific logistic requirements for berthing space and laboratory facilities.

Dr. Young-Shil Kang requested that Korean scientists be included into the OECOS project. BIO suggests that this request be passed to Drs. Ikeda and Miller.

2006 Line-P Symposium

A status report was given by Dr. Angelica Peña on the symposium titled "*Time series of the Northeast Pacific: A symposium to mark the 50th anniversary of Line-P*". The symposium will be held from July 5-8, 2006, in Victoria, Canada, co-sponsored by Fisheries and Oceans Canada and PICES. Selected papers (oral and posters) will be published in a special issue of *Progress in Oceanography*. A symposium web page will soon be developed and launched on the PICES website.

4th Zooplankton Production Symposium

The symposium, co-sponsored by ICES, PICES and GLOBEC, will be held from May 28–June 1, 2007, at the International Conference Center in Hiroshima, Japan. The primary organizer of this meeting is Dr. Shin-ichi Uye (Japan). Some details of the current status of organization are provided in *BIO Endnote 5*. Dr. Mackas reported that the symposium is on track and will include a special session on comparison of zooplankton time-series.

Proposal for an ICES/PICES/IOC Symposium on "Effects of climate change on the world's oceans"

This is proposed to be held in spring 2008, in Gijon, Spain (site of the PICES/ICES/GLOBEC 3rd Zooplankton Production Symposium in 2003). The intended focus and definition for climate change is "global warming trend", not "decadal variability". The BIO Committee endorses the symposium but no member from BIO expressed interest in being a member of the Scientific Steering Committee.

Interactions with international scientific organizations and programs (Agenda Item 6)

Census of Marine Life

Dr. Robin Rigby presented an overview of the Census of Marine Life (CoML) program. So far, there is no regional implementation committee in the North Pacific. A collaborative initiative between CoML and PICES to look at North Pacific eco-regions was discussed. This collaboration could be implemented by having joint workshops, scientific exchanges (scientific internships for young scientists) and publications (e.g. an updated look at North Pacific ecosystems). CoML would like to have a more active participation of BIO members on this program since the activities of CoML are most relevant to BIO and MONITOR activities. The BIO Committee suggests that CoML be invited to participate as observer in future BIO meetings to maintain and strengthen PICES interactions with CoML.

Joint sponsorship of scientific session(s) at the 2006 ICES Annual Science Conference

ICES provided a list of topic sessions for its next Annual Science Conference and asked if PICES would like to co-sponsor one or more. The topics were discussed and broadly endorsed by BIO members, but none of the proposed topics is very closely related to BIO Committee activities. BIO supports having joint sessions with ICES but it will not propose co-sponsorship for 2006.

ESSAS/GLOBEC

Dr. George L. Hunt described a new GLOBEC regional program on *Ecosystem Studies of Sub-Arctic Seas* (ESSAS) and tabled a proposal for a joint ESSAS/PICES Workshop on comparing four sub-Arctic ecosystems (the Bering Sea, the Okhotsk Sea/Oyashio region, the Barents Sea and the Newfoundland/Labrador Shelf) to be held in spring 2006, St. Petersburg, Russia (*CCCC Endnote 3*). BIO broadly endorsed ESSAS objectives, but did not propose travel support from BIO for workshop attendees.

Sessions and workshops at PICES XV (Agenda Item 7)

The PICES XV theme is “*Boundary current ecosystems*”. BIO received proposals for a total of 10 scientific sessions/workshops to take place before and during PICES XV (*BIO Endnote 6*). The total number of requests exceeds both the scheduling capacity (9 session-days for all PICES committees) and travel support budget (~\$5K for BIO). BIO Committee rankings and recommendations follow:

1. A 1-day Workshop or Topic Session on “*Ocean environmental change and jellyfish*” was proposed as a joint BIO/FIS/MEQ event by Dr. Tokimasa Kobayashi (*BIO Endnote 6a*). The proposal was rated very high by BIO members, especially from Asian nations. BIO recommends a 1-day session and travel support for 1 invited speaker.
2. A 1-day Topic Session on “*Interactions between biogeochemical cycles and marine food webs in the North Pacific*” was proposed by Drs. Angelica Peña and Hiroaki Saito (*BIO Endnote 6b*). This was rated very high. BIO recommends a 1-day session and travel support for 1 invited speaker. This session could be co-sponsored by IMBER, which would fund an additional invited speaker.
3. A ½-day Topic Session on “*Ecosystem responses to climate induced changes in along- and cross-shelf transport*” was suggested by Dr. Michael Dagg (*BIO Endnote 6c*) as a joint BIO/POC event. This topic was initially rated very high by BIO,

however it was not supported by POC due to scheduling concerns. The topic is sufficiently inter-disciplinary as to require POC participation for success. BIO chose to postpone, and allocate the slot to the next highest-ranking session (see 5, below).

4. A 1-day Workshop on “*Synthesis of MIE-AP sampling inter-calibration experiments*” and a 1-day Topic Session on “*Micronekton biology: Advances in epi- and meso-pelagic ecosystem research*” were recommended by MIE-AP (*MIE-AP Endnotes 1-2*). The workshop will allow time to analyze data from the two MIE cruises, and the session is a follow-up to WG 14 activities. BIO recommends a 1-day workshop, and merging the session into proposal 5 (below).
5. A ½- or 1-day BIO Topic Session on “*The composition and functioning of mid-water ecosystems*” was proposed by Dr. Alexei Orlov (*BIO Endnote 6d*). This topic is relevant to WG 14 and MIE-AP, and also to the “shadow zone” component of IMBER. This topic was ranked high by BIO, but initially left unscheduled for PICES XV due to lack of time. However, after BIO learned that POC would not be co-sponsoring the proposed joint session (see 3, above), BIO recommends a 1-day session (combined with 4, above) and travel support for 1 invited speaker.
6. A 1-day IFEP/MODEL Workshop on “*Modeling iron biogeochemistry and ocean ecosystem*” and a 1-day BIO Topic Session on “*Synthesis of in situ iron enrichment experiments in the eastern and western subarctic Pacific*”, and travel support for 2 invited speakers were requested by IFEP-AP (*IFEP-AP Endnotes 5-6*). BIO felt that these are useful, but that there would not be sufficient time and meeting space available during the meeting. IFEP-AP agreed to propose both as workshops, and to seek travel support elsewhere.
7. A 1-day Topic Session on “*Comparative ecology of North Pacific copepods in genus Neocalanus*” was suggested by Drs. Toru Kobari and Michael Dagg (*BIO Endnote 6e*). BIO did not support the session this year. Although it is a good topic, BIO felt that important new information would be

available after at least one year of sampling during the OECOS project.

8. A 1-day Topic Session on “*Synchrony in responses of marine top predators to large-scale climate variability: Mechanisms of environmental forcing*” was proposed by MBM-AP (MBM-AP Endnote 3). Travel support is requested for 4 scientists. This was not supported for this year. The MBM-AP has held workshops and/or sessions at each of the last three PICES Annual Meetings. BIO felt that papers on this topic can fit in the Science Board Symposium on “*Boundary current ecosystems*” (SB Endnote 6) or in the POC/MONITOR/CCCC Topic Session on “*Synchronous and asynchronous responses of North Pacific boundary currents systems to climate variability*” (POC Endnote 7).

Theme for PICES XVI (Agenda Item 8)

PICES XVI will be held in 2007, in Victoria, Canada. The host country proposed a theme “*The changing North Pacific: Previous patterns, future projections, and ecosystem impacts*” (SB Endnote 8) for this meeting. BIO members endorsed the theme.

Financial requests (Agenda Item 9)

BIO recommends allocating CND \$5,000 available for invited speakers of BIO-supported Topic Sessions at PICES XV, as described under Agenda Item 7.

BIO Action Plan (Agenda Item 10)

BIO reviewed the draft Action Plan prepared by BIO Chairman, Dr. Michael Dagg, and suggested only a few minor revisions and additions. These will be passed to Dr. Dagg for final editing.

Future integrative scientific program(s) of PICES (Agenda Item 11)

Dr. Mackas summarized discussions from the Science Board meeting of October 2. BIO

endorses the general outline, and the new goal of making forecasts and predictions, but cannot comment further until the proposals are posted on the PICES website.

BIO web page (Agenda Item 12)

Dr. Harold Batchelder (Chairman of the *ad hoc* website committee) described plans to date. Most of the discussion was on his suggestion that the PICES website should include a current events component on “hot topics” or “PICES science in the news”. This could be added as links to other sites where the information can be found (*e.g.* newspapers, program websites, *etc.*). Dr. Batchelder asked members to be proactive and send information to the PICES Secretariat when something unusual or interesting happens. Discussion points and questions from BIO included:

- Cost and labor needed to maintain this by PICES;
- Archival and quality control/peer review;
- Need to obtain copyright permission for any reproduction of media articles.

BIO sees considerable value in Dr. Batchelder’s proposal, but also numerous potential problems, and recommends that such a “Current Events” page should be tested for a year as a “closed” (password protected) page, and evaluated for successes and problems next year.

2005 BIO Best Presentation Award

A quorum of BIO Committee members met before the Closing Session to select a winner of the BIO Best Presentation Award. The award was given to Dr. Jaime Jahncke (U.S.A.) for his excellent presentation on “*Krill and krill-predators: Habitat associations in the dynamic Gulf of Farallones, California*” (co-authored with Benjamin L. Saenz, Chris Rintoul and William J. Sydeman).

The Committee thanks Dr. Sinjae Yoo, who represented BIO on the Best Poster Award Committee.

BIO-2005

BIO Endnote 1

Participation list

Members

Young-Shil Kang (Korea)
Michio J. Kishi (Japan)
David L. Mackas (Canada, Acting Chairman)
Hideki Nakano (Japan)
Alexei Orlov (Russia)
Angelica Peña (Canada)
Vladimir I. Radchenko (Russia)
Sinjae Yoo (Korea)

Observers

Harold P. Batchelder (U.S.A.)
George L. Hunt Jr. (U.S.A.)
H-K. Kang (Korea)
Jun Nishioka (Japan)
Evgeny Pakhomov (Canada)
William T. Peterson (U.S.A.)
Robin Rigby (CoML)
Tracy Shaw (U.S.A.)
William J. Sydeman (U.S.A.)

BIO Endnote 2

BIO meeting agenda

1. Welcome and introductions of members and observers, appointment of rapporteur
2. Approval of agenda
3. Progress reports of existing subsidiary bodies:
 - MIE-AP
 - MBM-AP
 - WG 14 final report
4. Proposals for new subsidiary bodies
 - Biogeochemical issues
 - “Year of the euphausiid” program
5. Inter-sessional PICES-sponsored meetings and workshops for 2005 and beyond:
 - 2005 OECOS Workshop
 - 2006 Line-P Symposium
 - 2007 Zooplankton Symposium
6. Interactions with international scientific organizations and programs
7. Sessions and workshops at PICES XV
8. Theme for PICES XVI
9. Financial requests
10. BIO Action Plan
11. Future integrative scientific program(s) of PICES
12. BIO web page
13. Other business

BIO Endnote 3

Terms of reference for Section on *Carbon and climate* (April 2005)

1. Coordinate and encourage ongoing and planned national and international syntheses of carbon cycle research studies in the North Pacific and, where necessary and appropriate, for the larger Pacific basin;
2. Ensure effective two-way communication with other international scientific groups that have a responsibility for coordination of ocean carbon studies, such as the International Ocean Carbon Coordination Project (IOCCP), and the SOLAS/IMBER implementation group for carbon research;
3. Review the existing biogeochemical information on carbon cycling within the North Pacific, identify gaps in our knowledge and make prioritized recommendations for future research;
4. Periodically review the status of the methodology of CO₂ measurements including the preparation of standards and reference materials, and advise on inter-calibration and quality control procedures;
5. Identify suitable data sets on the oceanic CO₂ system in the Pacific region as they become available, and recommend the mechanisms of data and information exchange;

6. Carry out and publish (in the refereed literature) basin-scale syntheses of carbon cycling in the North Pacific, including new data whenever appropriate, and encourage scientific interpretation of these evolving data sets;
7. Organize symposiums, workshops, or annual meeting sessions on carbon cycle and climate studies in the North Pacific.

BIO Endnote 4

Scientific issues posed by the OECOS project

The physical setting in the subarctic Pacific was well described by Favorite *et al.* (*Bull. Intl. North Pacific Fish. Comm.*, 3: 1-187, 1976). North of the latitude, about 43°N, where the 33 pss salinity isocline turns vertical and surfaces, the water column is characterized by a 1 pss halocline at about 100 meters, a density gradient which supports substantial internal waves. It is also a barrier to vertical mixing throughout the year, preventing (1) full replenishment of surface nutrients to deep concentrations and (2) complete removal of euphotic zone biota during winter mixing. From spring through autumn, there is also a seasonal thermocline, usually at about 35 m, which divides the euphotic zone into two distinct habitats. The region is a current gyre with slow, disperse flow along the southern side, slow at least east of the dateline, and stronger flow with rapid central cores (the Alaska 'stream') along the northern side. Flow is northward along the British Columbia-Alaska coast (the Alaska Current) and southward past Kamchatka, the Okhotsk Sea entrance and northern Japan (the Oyashio). There is also evidence, although not particularly clear evidence, that this gyre divides into two south of the central Aleutians, with partially closed western and eastern subarctic gyres.

Oceanic sectors of the seas are defined as far from the influence of land. The cores of both western and eastern gyres (whether or not they are indeed separate) definitely qualify as oceanic. In the Gulf of Alaska at sufficient distance from shore, oceanic character includes HNLC conditions, high-nitrate (HN) and low-chlorophyll (LC) throughout the year. Despite the presence of high concentrations of major nutrients (*e.g.*, nitrate always greater than 6 μM), phytoplankton never bloom. The bulk of phytoplankton are always nanoplankton, cells

smaller than about 5 μm , and chlorophyll levels rarely exceed 0.5 $\mu\text{g l}^{-1}$.

It is established that the high-nitrate, low-chlorophyll (HNLC) character of subarctic Pacific waters far from land is attributable to limited availability of iron in the euphotic zone (suggested by Martin and Fitzwater, *Nature*, 331: 341-343, 1988). Several mesoscale iron-addition experiments, the Japanese SEEDS project (Tsuda *et al.*, *Science*, 300: 958-961, 2003) and Canadian SERIES experiment (Boyd *et al.*, *Nature*, 428: 549-553, 2004) have shown that adding soluble iron to the upper mixed layer induces strong increases in standing stocks of microplanktonic (>5 μm) diatoms, algae that without iron addition are present in very low abundance. Part of the explanation of the low chlorophyll condition (Miller *et al.*, *Limnol. Oceanogr.*, 36: 1600-1650, 1991) is that microheterotroph (protozoan) grazers capable of rapid increase can eat the consistently small phytoplankton. With iron-limitation firmly established, it remains to explain fully the processes and variations of the lower trophic levels under normal circumstances without iron addition.

Despite the continuously low chlorophyll concentrations in oceanic sectors, there is substantial seasonality of phytoplankton production rates. In the course of the spring transition, during thermal stratification, rates more than double (Harrison *et al.*, *Prog. Oceanogr.*, 43: 205-234, 1999; Welschmeyer *et al.*, *Prog. Oceanogr.*, 32: 101-136, 1993). This surely is attributable to the reduced extent of vertical mixing and consequent increase in cellular light exposure. Nitrate levels are reduced in this period. This is the time that the production *vs.* grazing balance of the HNLC

BIO-2005

regime must be most challenged by increasing growth potential of the phytoplankton. In the east, there are oscillations in chlorophyll levels between about 0.15 and 0.6 µg/l, which imply shifting in trophic relations among phytoplankton, protozoa and possibly higher levels including copepods. It is in this period that a suite of copepod species (3 species of *Neocalanus* and *Eucalanus bungii*), which mostly reside at depth in diapause stages the rest of the year, run through active recruitment to older stages, grow and prepare for return to diapause after accumulation of large lipid stores. At least in the eastern gyre these copepods do not eat much phytoplankton directly, as shown by the absence of chlorophyll in their guts (Dagg *et al.*, *DSR-I*, 40: 1431-1445, 1993; *Prog. Oceanogr.*, 32: 163-183, 1993), but they grow (Miller, *Prog. Oceanogr.*, 32: 1-15, and 32: 295-317, 1993) and thus must be eating foods without green pigments, presumably protozoa. Thus, a food chain of at least three or four steps is implied just in getting to copepods.

For the eastern sector, the dynamics of phytoplankton oscillations have been a subject of speculation (Strom *et al.*, *Mar. Ecol. Prog. Ser.*, 193: 19-31, 2000), but there has been as yet little direct research. One aim of OECOS is to understand the control of these oscillations. A section is devoted to this below.

In the western sector, atmospheric dust transport extends farther to sea, allowing spring blooms dominated by diatoms to extend well out into the western gyre, although it appears that the core of the gyre is persistently HNLC. After the bloom passes, apparently due to onset of iron limitation, HNLC conditions are established for the remainder of the year, since major nutrients are not exhausted. The spring bloom creates an opportunity to compare aspects of subarctic ecology with (east) and without (west) iron limitation, at least during the spring transition. The bloom should be fully characterized from before its onset to its termination. Nutrient drawdown, floristics, fate of primary organic matter and the feeding and growth responses of the copepod complex should be characterized in detail. The dominant spring copepods are the same species with the same prolonged diapause phases as inhabit the eastern subgyre, so the comparison of growth under field conditions should be very informative. It is expected that the availability of large phytoplankton will shorten the food chain, provide much more food and allow much more rapid growth.

OECOS participants propose that much can be learned from parallel studies and comparisons of processes in eastern and western subarctic sectors, taking advantage of both differences (bloom *vs.* continuous HNLC conditions) and similarities (identical copepod communities) between them.

BIO Endnote 5

4th International Zooplankton Production Symposium

Dates and venue

May 28 – June 1, 2007, Hiroshima, Japan.

Scientific focus

Human and climate forcing of zooplankton populations

Symposium sponsors

PICES, ICES, GLOBEC

Local sponsors

The Plankton Society of Japan
The Japanese Society of Fisheries Oceanography

Symposium conveners

Dr. Michael J. Dagg (PICES/U.S.A.)
Dr. Roger Harris (GLOBEC/U.K.)
Dr. Luis Valdés (ICES/Spain)
Dr. Shin-ichi Uye (Japan)

Scientific steering committee

Dr. Michael J. Dagg (PICES/U.S.A.)
Dr. Ruben Escibano (GLOBEC/Chile)
Dr. Steven Hay (ICES/U.K.)
Dr. Roger Harris (GLOBEC/U.K.)
Dr. David L. Mackas (PICES/Canada)
Dr. Sun Song (China)
Dr. Luis Valdés (ICES/Spain)

Local organizing committee

Dr. Shin-ichi Uye, Chief (Hiroshima University)

Dr. Hideaki Nakata (Nagasaki University)

Dr. Shuhei Nishida (University of Tokyo)

Dr. Michio Kishi (Hokkaido University)

Program

May 28 (Mon.): workshops

May 29 (Tues.): opening, oral session, reception

May 30 (Wed.): oral and poster sessions

May 31 (Thur.): oral and poster sessions, excursion, conference dinner

June 1 (Fri.): oral and poster sessions, closing

Proceedings

To be published in the *ICES Journal of Marine Science*

Other news:

- Dr. Shin-ichi Uye met the manager of the Hiroshima International Conference Center to discuss the possible room arrangement for the Symposium.
- Dr. Shin-ichi Uye submitted an application to Hiroshima City Office for financial support to the Symposium; a favorable answer was obtained, although the amount is not large.
- A preliminary announcement of the Symposium that was posted on the PICES website and on the ASLO website.
- Dr. Hiroaki Saito (Japan), a member of the IMBER SSC submitted a request to organize a topic session entitled “*Biogeochemical circulation and zooplankton*” (tentative).

BIO Endnote 6**Workshops and Topic Sessions proposed for PICES XV**

a) 1-day BIO/FIS/MEQ Topic Session on “*Ocean environmental change and jellyfish*” [later re-named “*The human dimension of jellyfish blooms*”]

We can detect changes of ocean environment by observing natural phenomena. The massive jellyfish bloom is one of them. New knowledge has been recently accumulating on the role of jellyfish in the production and food web of the ocean ecosystem. With the progress of the jellyfish study, their importance in the vertical material flow and in the relationship between fish populations has been recognized. It has also been noted that their biomass changes in accordance with changes in the ocean environment and the population size of major marine species. Large jellyfish blooms are becoming increasingly common in many marginal seas in the North Pacific, and may be important regulators of marine ecosystems. In the Bering Sea, the biomass of jellyfish increased in the 1990s and decreased after that. Recently, jellyfish bloomed on a massive scale in the East China Sea, and along both the Japan/East Sea and Pacific coast of Japan. They damaged coastal and offshore fisheries, even in semi-closed fishing grounds. It is suggested that those phenomena are influenced by changes in

the marine ecosystem. Therefore it is timely to discuss the role of jellyfish in the marine ecosystems with lower and higher trophic level of production, including climate and human impacts to the environment. The themes for the proposed session include:

- Life history and ecology of jellyfish, and the effect of environmental change on these;
- Role of jellyfish in the production and food web of the ecosystem;
- Relationship between the fluctuation of fish resources and the frequency of jellyfish blooms.

Recommended convenors: Richard D. Brodeur (U.S.A.), Hiroshi Iizumi (Japan), Young-Shil Kang (Korea) and TBD (China).

b) 1-day BIO/IMBER Topic Session on “*Interactions between biogeochemical cycles and marine food webs in the North Pacific*”

Marine food webs and their components respond to, as well as influence, the abundance and distribution of biogenic elements in the ocean. A better understanding of the fundamental interactions between biogeochemical cycles and food webs is necessary to advance our

BIO-2005

understanding of the response of marine ecosystems to natural and anthropogenic perturbations, such as changes in physical dynamics and carbon cycle chemistry, dust events, eutrophication and marine harvest. The North Pacific and adjacent seas include a wide range of ecosystems and some unique environmental conditions (*e.g.*, high silicic acid concentration relative to nitrate, iron-limited HNLC region), providing the opportunity to investigate and compare the role of biological processes on biogeochemical cycles under varying environmental conditions. This session will review existing knowledge on the interaction between biogeochemical cycles and marine food webs in the North Pacific Ocean, and identify gaps in current knowledge for eventual prediction of the effect of human activities and climate change on marine ecosystems.

Recommended convenors: Angelica Peña (Canada), Hiroaki Saito (Japan) and Sinjae Yoo (Korea).

c) 1-day BIO/POC Topic Session on “Ecosystem responses to climate induced changes in along- and cross-shore transport”

No description available.

Recommended convenors: Michael J. Dagg (U.S.A.) and Michael G. Foreman (Canada).

d) 1-day BIO Topic Session on “The composition and functioning of mid-water ecosystems”

The meso-pelagic realm is arguably among the largest and one of the least variable ecosystems on the planet. Most mesopelagic organisms undertake extensive vertical migrations either on a daily or seasonal basis, occupying productive surface waters at night and descending to mid-water during the daytime to reduce predation or undertake the diapause on seasonal scales. These migrations appear to contribute significantly to the rapid vertical transport of organic material from epi-pelagic to meso-pelagic zones. Micronekton is one of the

important components of marine ecosystems linking mesozooplankton and higher trophic levels. Due to the intermediacy and mobility, quantitative sampling of micronekton has long been regarded as problematic.

Biological removal of carbon from the upper, euphotic zone and export to the deeper waters, so called the “biological pump”, plays a critical role in determining the CO₂ exchange at the surface. Greater than 90% of organic matter exported from the euphotic zone is likely remineralized within the meso-pelagic layer (~100 to 1000 m) and returned to the surface as nutrients, microelements and CO₂ on decadal scales or less, while the remaining organic material is transferred to the deep ocean interior, where it is stored for millennia. The meso-pelagic layer, therefore, plays a critical role in controlling marine productivity on global change time scales and impacting climate (possible negative feedback to global warming). It is becoming increasingly clear that gas exchange between the ocean and atmosphere is not simply a function of the biological pump, but rather dependent on carbon sequestration below the meso-pelagic layer.

One of the most important ecosystem components controlling biogeochemical cycling is food-web structure. An extensive food web network may operate within a mesopelagic zone decomposing passively settling organics and consuming vertical migrants. Micronektonic organisms may also be consumed by epipelagic predators, including salmonids, in the near-surface waters, large nekton such as tunas, sharks and swordfishes that migrate daily with the micronekton, and in the deep waters when deep-sea fishes migrate up to mid-water.

e) 1-day BIO Topic Session on “Comparative ecology of North Pacific copepods in genus *Neocalanus*”

The large copepods *Neocalanus plumchrus*, *N. flemingeri* and *N. cristatus* dominate the mesozooplankton across the entire North Pacific Ocean. They are important components of the pelagic food web and ecosystem. This session invites scientific papers that review and discuss

Neocalanus spp. biology, ecology, and contributions to North Pacific ecosystems. Topics include but are not limited to: long-term patterns of population abundance, spatial (regional) and/or temporal comparisons of life history patterns, responses to climate change; population structure and its controls, feeding,

growth, development, reproduction, and lipid storage, controls on ontogenetic migration and diapause, and biogeochemical cycling of key materials such as carbon and nitrogen.

Recommended convenors: Michael J. Dagg (U.S.A.) and Toru Kobari (Japan).

