

# PICES Press



Newsletter of the North Pacific Marine Science Organization (Published semi-annually)



## The state of PICES science - 2005

PICES has grown rapidly since its inception in 1992 and has become the primary organization of marine sciences in the North Pacific. At its Annual Meetings, the PICES community gathers at scientific sessions, workshops and at meetings of Scientific, Technical and Executive Committees, to move forward in achieving the mandate of the Organization, stated clearly in Article III of its Convention: firstly, to promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned and of its living resources, and secondly, to promote the collection and exchange of information and data related to marine scientific research in the area concerned.

### PICES XIV Annual Meeting

The PICES Fourteenth Annual Meeting (PICES XIV) was held from September 28-October 9, 2005, in Vladivostok, Russia, with a total of 316 registered participants attending the 17 sessions and workshops. The keynote lecture, "*Far-eastern sea shelf ecosystems of yesterday, today, and tomorrow*", was given by Dr. Vladimir I. Radchenko of Sakhalin Research Institute of Fisheries and Oceanography. He reviewed the research conducted on the Russian Far-eastern shelf since 1950 on bottom sediments, physical conditions, fish and invertebrate abundance and distribution, and discussed processes which can affect ecosystem functioning on long-term time-scales. The

keynote lecture was followed by the Science Board Symposium on "*Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions*".

PICES XIV should be recognized as the first annual meeting to take a concrete step toward the development of the next major scientific integrative program of PICES after the completion of the CCCC Program. The Study Group on *Future Integrative Scientific Program(s)* reviewed themes of potential interest to all PICES member countries and presented the results to the Governing Council. Following recommendations from the Council, the Study Group placed the suggested themes on the PICES website for comment and solicited new proposals from the scientific community. The Study Group is expected to provide a final report on themes to the Governing Council and prepare for an open forum to discuss the recommendations at PICES XV.

Congratulations are in order for winners of Best Presentation Awards at PICES XIV. These awards are given to scientists, nominated by the Science Board and each PICES Scientific Committee, who gave the best presentation in a scientific session sponsored by the Board or Committee. The Science Board Awards went to Dr. William Peterson (U.S.A.) for his paper on "*Extreme climate variability in the northern California Current: Can we explain the current anomalous warm state and its*



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Dr. Vladimir Radchenko giving the keynote lecture at the PICES Fourteenth Annual Meeting.



Members of the Study Group on Future Integrative Scientific Program and invitees participate enthusiastically in the group's meeting at PICES XIV.

effects on the coastal upwelling ecosystem off Washington and Oregon” (co-authored by Rian Hooff and Robert Emmett) and to Hanna Na (Korea) for her poster (Best Poster Award) on “Temporal variation of the estimated volume transport through the Korea and Tsugaru Strait” (co-authored by Kuh Kim). The BIO Award was given to Jaime Jahncke (U.S.A.) for his paper on “Krill and krill-predators: Habitat associations in the dynamic Gulf of the Farallones, California” (co-authored by Benjamin L. Saenz, Chris Rintoul and William J. Sydeman). The FIS Award went to Eun Jung Kim (Korea) for her paper on “The vertical and horizontal distribution of bigeye (*Thunnus obesus*) and yellowfin tuna (*Thunnus albacares*) related to ocean structure” (co-authored by Suam Kim, Dae-Yeon Moon and Jeong-Rack Koh). The MEQ Award was given to Xuelei Zhang (China) for his paper on “Benzene toxicity to the scallop, *Chlamys farreri*, and the shrimp, *Penaeus japonicus*” (co-authored by R. J. Wu, Z.

H. Zhang and Z. F. Dong). The POC Award had a tie and went to Yuri Yu. Nikonov (Russia) for his paper on “Water and chlorophyll circulation modeling of Aniva Gulf according to oceanographic data from the year 2002” (co-authored by Valeriy N. Chastikov and Ludmila Yu. Gavrina) and Satoshi Osafune (Japan) for his paper on “Bidecadal variability in the intermediate waters of the northwestern subarctic Pacific and the Okhotsk Sea in relation to the 18.6-year nodal tidal cycle” (co-authored by Ichiro Yasuda). The CCCC Award was given to Chiyuki Sassa (Japan) for his paper on “Recruitment processes of jack mackerel (*Trachurus japonicus*) in the East China Sea in relation to environmental conditions” (co-authored by Youichi Tsukamoto, Yoshinobu Konishi, Song-Guang Xie, Yoshiro Watanabe and Hideaki Nakata).

### Highlights from 2005 and features for 2006

PICES is known for its excellent publications. The CCCC/BASS workshop on “Linkages between open and coastal systems” held at PICES XII in Seoul in 2003, produced 9 papers in *Deep-Sea Research II*. Selected papers from the 2004 Symposium on “Quantitative ecosystem indicators for fisheries management”, co-sponsored by IOC, SCOR, PICES, GLOBEC, etc., were published in the *ICES Journal of Marine Science*. In the coming year, 3 special issues will be published in *Progress in Oceanography*, *Deep-Sea Research II*, and *Ecological Modeling*.

It is remarkable that the North Pacific Ecosystem Status Report was published as *PICES Special Publication No. 1* in spring of this year, taking only two and a half years. Many PICES scientists were involved in this important task by participating in workshops and meetings, and as 14 lead authors and 67 contributors for chapters on Synthesis, Ocean and Climate Changes, and 13 regions in the North Pacific. This report lays a foundation for future scientific activities of PICES.

A parallel collaborative effort between PICES and the Census of Marine Life made it possible to publish “*Marine Life in the North Pacific: The Known, Unknown, and Unknowable*” as *PICES Special Publication No. 2*. This publication was edited by Drs. Ian Perry and Skip McKinnell, who also put in months of work on the publication of the North Pacific Ecosystem Status Report. PICES should be proud of these two marine scientists who worked so hard and effectively for the last three years to produce these two *PICES Special Publications*.

Completion of the North Pacific Ecosystem Status Report opened the door for new missions. A Study Group on *Fisheries and Ecosystem Responses to Recent Regime Shifts* was formed to respond to the first formal request (from NOAA/Fisheries of the United States) to PICES for scientific advice on the implication of a potential 1998



*Scientists who received Best Presentation Awards at PICES XIV. Top row: Science Board Award - William Peterson (U.S.A.), Best Poster Award – Hanna Na (Korea); middle row: BIO Award - Jaime Jahncke (U.S.A.), FIS Award – Eun Jung Kim (Korea), MEQ Award – Xuelei Zhang (China), CCCC Award - Chiyuki Sassa (Japan); bottom row: POC Award – Satoshi Osafune (Japan) and Yuri Nikonov (Russia). Their presentations can be found on the PICES website (just click on the presentation photo on the main page <http://www.pices.int>).*

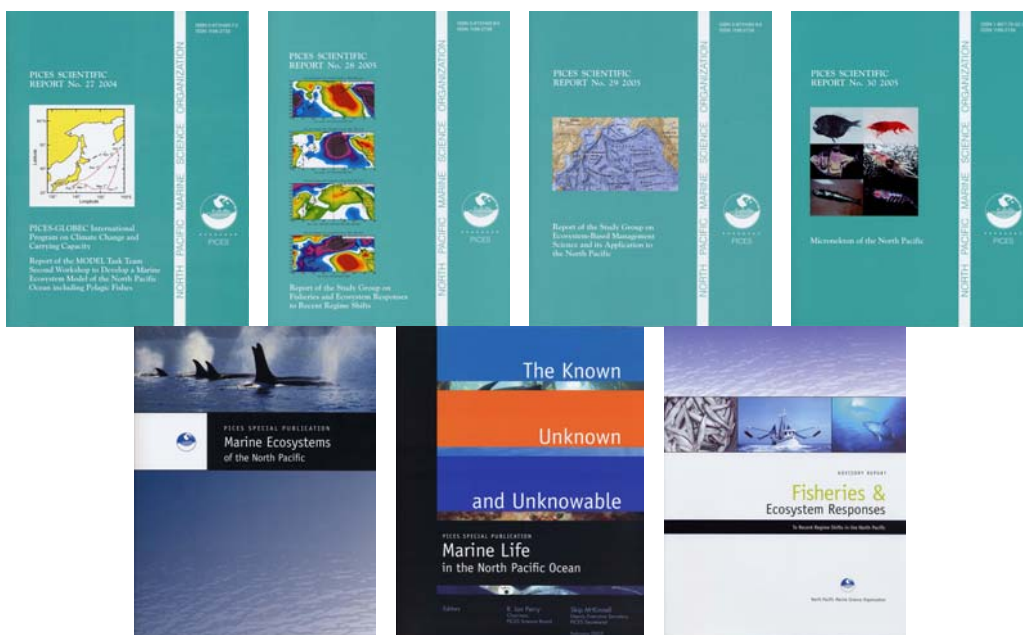
regime shift. The Study Group published its report as *PICES Scientific Report No. 28*, edited by Dr. Jacquelynne R. King. An abstract of this report was also published as PICES’ first Advisory Report.

The PICES Scientific Report Series has reached 30 volumes. *PICES Scientific Report No. 27* is the proceedings of the MODEL Task Team Second Workshop which was held in March 2003, in Yokohama, Japan, to develop a marine ecosystem model of the North Pacific Ocean that includes pelagic fishes. *PICES Scientific Report No. 29* is the final report of the Study Group on *Ecosystem-based Management Science and its Application to the North Pacific*, established under FIS and MEQ. *PICES Scientific Report No. 30* is the final report of the Working Group 14 on *Effective Sampling of Micronekton to Estimate Ecosystem Carrying Capacity*.

PICES also fulfills its mandate through scientific meetings. Examples are:

- The first CREAMS/PICES workshop on “*East Asian Seas Time-series (EAST)-I*” was held in April 2005, in Seoul, Korea, as part of the CREAMS/PICES Program which was approved by the Science Board last year. Establishing permanent observation stations in the Japan/East Sea was discussed as an initial focus of the Program.
- In May 2005, a 2-day Oceanic Ecodynamics COMparison in the Subarctic Pacific (OECOS) workshop on “*An east-west comparative study of lower trophic level pelagic ecology in the subarctic Pacific Ocean*” was convened in Corvallis, U.S.A., and co-sponsored by PICES and the Oregon State University.
- A 2-day CCCC/CFAME workshop was held also in May 2005, in Victoria, Canada, to develop a workplan for future Task Team activities and hypothesis for CCCC synthesis.
- PICES co-sponsored a 5-day GLOBEC/ESSAS symposium on “*Climate variability and sub-Arctic marine ecosystems*” in May 2005, in Victoria, Canada.





*The most recent PICES Scientific Reports and Special Publications*

- Close collaboration between PICES and ICES continued this year with two theme sessions jointly organized at the ICES Annual Conference (Aberdeen, Scotland): “Multidisciplinary approaches to the identification of stock structure of small pelagics: Implications for assessment and sustainable management” and “Regional ecosystem pilot projects, ecosystem forecasting, and operational oceanography”. A joint workshop on “Introduced species in the North Pacific” was also convened at PICES XIV.

PICES is developing successful cooperation with regional organizations such as the North Pacific Research Board (NPRB). Through funding from NPRB, a new project has been initiated on “Integration of Ecological Indicators for the North Pacific with emphasis on the Bering Sea”, and further updates to the North Pacific Ecosystem Status Report will be made.

PICES evolves as needs arise and new groups emerge. A Section on *Carbon and Climate* was established in 2005, under the BIO and POC Committees, recognizing that PICES has proven its expertise and leadership through earlier activities of Working Groups 13 and 17, to coordinate scientific problems related to carbon cycling on a regional scale, which could then be put into a global scale. PICES also formed an Advisory Panel (under POC) to oversee activities of the *CREAMS/PICES Program in the East Asian Marginal Seas*. Three new groups were established at PICES XIV, and will begin active work in 2006: a Working Group on *Evaluations of Climate Change Projections* (under POC); a Working Group on *Aquatic Non-indigenous Species* (under MEQ); and a Study Group to develop a strategy for GOOS (under MONITOR).

In coming years, PICES will be busy with several important meetings. In April 2006, PICES will convene a symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*” in Honolulu, U.S.A., co-sponsored by GLOBEC. The objective of this symposium is a synthesis of all scientific activities of the CCCC Program since its beginning in 1994. In July 2006, a symposium to celebrate the 50<sup>th</sup> anniversary of sampling along Line P and at Ocean Station P will be held in Victoria, Canada, co-sponsored by Fisheries and Oceans Canada and CLIVAR. In 2007, the 4th Zooplankton Production Symposium will be convened in Hiroshima, Japan, co-sponsored by PICES, GLOBEC and ICES. Two more joint events with ICES, a conference on “*Marine bioinvasions*” and a Young Scientists Conference on “*New frontiers in marine science*” are scheduled for 2007 and are in various stages of planning.

The PICES Science Board has approved many exciting topic sessions and workshops for PICES XV to be held on October 13-22, 2006, in Yokohama, Japan, with a general theme of “*Boundary current ecosystems*”. A detailed program is now available on the PICES website. You can look forward to a slightly different meeting format, with the Committee meetings taking place in the afternoon of the third day for vigorous and closer involvement of the scientific community in the activities of PICES Committees. We are also beginning to plan PICES XVI, which will be held in Victoria, Canada, in 2007.

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## 2005 Wooster Award



The 2005 Wooster Award presentation ceremony took place on October 13, 2005, during the Opening Session of the PICES Fourteenth Annual Meeting in Vladivostok, Russia. Dr. Vera Alexander, PICES Chairman, and Dr. Kuh Kim, Science Board Chairman, conducted the ceremony. Dr. Kuh Kim announced that **Dr. Daniel Ware (Canada)** was the recipient of the 2005 Wooster Award and quoted the following Science Board citation (reading of the Science Board citation was accompanied by a special slide show dedicated to Dr. Ware):

*The Wooster Award was established in 2001 to honour Dr. Warren S. Wooster, the principal founder and first Chairman of PICES, and world-renowned researcher and statesman in the area of climate variability and fisheries production. The award is given annually to an individual who has made significant scientific contributions to North Pacific marine science; has achieved sustained excellence in research, teaching, administration or a combination of these in the area of the North Pacific; has worked to integrate the various disciplines of the marine sciences; and preferably someone who is, or has been, actively involved in PICES activities. The late Professor Michael M. Mullin (U.S.A.), Prof. Yutaka Nagata (Japan), Prof. William Pearcy (U.S.A.) and Prof. Paul H. LeBlond (Canada) were honoured with the Wooster Award from 2001-2004. A permanent plaque identifying Wooster Award winners resides at the PICES Secretariat in Sidney, British Columbia, Canada.*

*In April of this year, the Science Board evaluated the nominations and selected Dr. Daniel Ware as the recipient of the Wooster Award in 2005. Sadly, Dr. Ware passed away in late July of this year, but we are fortunate that his wife, Madeleine, is able to join us for this celebration of Dr. Ware's accomplishments.*

*Dr. Ware began his scientific career in 1967 at the University of British Columbia where his doctoral research was part of a multidisciplinary study of food web structure and dynamics in a lake ecosystem. A move to the Atlantic coast for a decade at the Marine Ecology Laboratory*

*allowed Dr. Ware to conduct theoretical and field research on fish bioenergetics, fisheries oceanography, stock-recruitment theory, and early life history biology of cod, mackerel, and herring. He returned to the Pacific Coast as a scientist at the Pacific Biological Station and served for a period as Head of the herring research section. He collaborated with Japanese scientists in a comparative study of the Oyashio and British Columbia marine ecosystems. Dr. Ware was Adjunct Professor at both the Simon Fraser University and the University of British Columbia. Following his retirement from Fisheries and Oceans Canada in 2000, he was the President of Aquatic Ecosystem Associates, and Chairman of the Science Panel of the Herring Conservation and Research Society.*

*Dr. Ware is unique among the recipients of this award in that his career was spent in government rather than academia. He tackled both theoretical topics in marine ecosystem science as well as scientific problems associated with the management of fisheries. During the course of his career, he either wrote or contributed to over 50 articles in the primary scientific literature. The most recent of these appeared this year in the prestigious journal, Science. Co-authored with Dr. Richard Thomson of Fisheries and Oceans Canada, the paper demonstrated a strong bottom-up level link between primary productivity and resident commercial fish yield for the entire west coast of North America, extending from the California Bight to the western Aleutian Islands. As an example of the breadth of his scientific interests, his first paper in Nature in 1974, coincidentally with the former PICES MEQ Committee Chairman, Dr. Richard Addison, was on contaminants in plankton.*

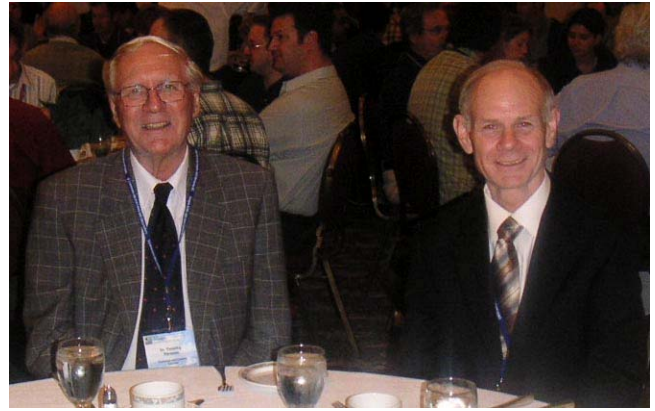
*Dr. Ware is also unique in being the first person to hold the position that I now occupy, Chairman of Science Board. He led the Organization through its formative years and was a leading force in the establishment of the PICES/GLOBEC Climate Change and Carrying Capacity Program, or the CCCC Program. After serving his 3-year term at the helm, he continued with the CCCC/MODEL Task Team during the development of the now well-known ecosystem model, NEMURO. He was particularly interested in the role of microbial processes. A special issue of Ecological Modelling to be published in 2006 will be the first major publication on NEMURO and NEMURO.FISH models, and this issue will be dedicated to Dan.*

*In June of this year, Dr. Ware received the Timothy R. Parsons Ocean Science Award from Fisheries and Oceans Canada. It is given to residents of Canada for distinguished accomplishments in multidisciplinary facets of ocean sciences either during their lifetime or for a recent outstanding achievement. Dan was the first recipient of this Award after Dr. Parsons.*





*Dan with colleagues at the PICES BASS/MODEL Workshop in Honolulu in March 2001.*



*Dan at the dinner table with Dr. Timothy Parsons after receiving the Timothy R. Parsons Ocean Sciences Award in June 2005.*



*A photo with colleagues, many of whom are familiar faces at PICES Annual Meetings.*



*A gathering of PICES friends at Dan's home in Nanaimo during PICES V in October 1996. Among them are Drs. Warren Wooster and Timothy Parsons.*



*Dan opening the Welcome Reception at a PICES Workshop in Nemuro in January 2000.*



*Dan with close friends and colleagues Drs. Makoto Kashiwai and Tokio Wada in a fish market in Japan. Makoto became PICES' second Science Board Chairman after Dan, and Tokio is the current Vice-Chairman of PICES.*

Dr. Warren Wooster was the Chairman of PICES during the period when Dr. Ware served as the Science Board Chairman, and they developed a special working relationship. Dr. Alexander read the following tribute sent by Dr. Wooster:

*To a taxonomist, the word “holotype” designates the single specimen used as the basis for the original description of a species. In re-reading the criteria for the Wooster Award, I realized that Dan Ware must have been its holotype. His research was certainly inter-disciplinary as it focused on important aspects of ecosystem response to human and climate interactions. This was a central theme of PICES from the beginning and one that he significantly advanced as first Chairman of the PICES Science Board and then as active participant in its working groups. Both his scientific contributions and his sustained efforts on behalf of our organization clearly qualify him to receive the award. He was a valued friend and colleague, and one who will be greatly missed.*



Dr. Alexander presented a commemorative plaque to Ms. Madeleine Ware, who accepted the award with the following remarks:

*In Daniel’s name, I would like to thank you all for this award. I do remember how pleased and honoured Dan was when he heard about the nomination. He was truly looking forward to travelling to Vladivostok and to reconnect with his colleagues and friends. PICES, or rather the people connected and involved with it, were close to his heart.*

*Dan was passionate about his research, and he believed strongly that solid marine ecological research was paramount to manage fish stocks responsibly. He saw his duty as being twofold: firstly, to guarantee the survival of the resource, and secondly, to guarantee the survival of the fishing industry. Dan wrote his personal “Code of Ethics” that always guided his approach to research as well as the interpretation of the data. Here are his words:*

- Always err on the side of the Resource;
- Produce a high quality product;
- Always tell the client the “truth”, whether he/she wants to hear it or not;
- Work co-operatively with all clients to come up with the best advice.

*Dan was passionate about his work, and he felt fortunate that his work connected him with so many dedicated and talented people, many of whom became close personal friends. I know he would have acknowledged you all by name and thanked you for your support and the myriad ways in which your vision influenced his research.*

*I would like to close by quoting Dan when he accepted the Timothy Parsons award in Vancouver this spring “I want to thank you all for this award. It is an honour to be acknowledged by your colleagues and peers.”*

Ms. Marija Kronic, a close friend to Dan and Madeleine, then got on stage and read Madeleine’s remarks in Russian.



*Wooster Award recipients: 2001 – Prof. Michael Mullin (U.S.A.); 2002 – Prof. Yutaka Nagata (Japan); 2003 – Prof. William Percy (U.S.A.); 2004 – Prof. Paul H. LeBlond (Canada); and 2005 – Dr. Daniel Ware (Canada).*

**We are now soliciting nominations for the 2006 Wooster Award** (contact the PICES Secretariat at [secretariat@pices.int](mailto:secretariat@pices.int) or see PICES Press Vol. 9 (1) 2001 for selection criteria and award description). **Nominations must be received no later than May 1, 2006**, and should include the following information: nominee’s name, institutional affiliation and title, address, biographical resume, and statement of justification for the nomination. The award will be presented during the Opening Session of PICES XV on October 16, 2006, in Yokohama, Japan.



## Korea and U.S. federate marine metadata collections

By S. Allen Macklin, Bernard A. Megrey, Kyu-Kui Jung and Hae-Seok Kang

### Summary

Representatives (Fig. 1) of the Korea Oceanographic Data Center (KODC) and the NOAA-PICES North Pacific Ecosystem Metadatabase (NPEM) have exploited a communications technique that allows public Internet search of their combined metadata collections in a single session. The approach requires that each metadata provider establish English-language XML (Extensible Markup Language) metadata records in the FGDC (Federal Geographic Data Committee) standard format. The XML records are served using the Z39.50 communications protocol. Access is through a metadata clearinghouse that supplies search and delivery scripts to the user. Presently, the federation uses FGDC's National Spatial Data Infrastructure Clearinghouse (<http://www.fgdc.gov/clearinghouse/clearinghouse.html>), in which KODC and NPEM each have registered nodes.



Fig. 1 The KODC-NPEM Federation Team outside the National Fisheries Research and Development Institute, Busan, Korea; Back row, left to right: Bernard Megrey, Allen Macklin, Dan Klawitter and Hae-Seok Kang; front row, left to right: Joon-Yong Yang, Kyu-Kui Jung, Kimberly Bahl and Hee-Dong Jeong.

Using partial support from PICES, KODC and NPEM personnel developed the application over the past year, with major progress coming from joint meetings held in Seattle

in August 2005, and Busan in October 2005. KODC is expanding the information that it serves through prioritized translation of metadata records from Korean to English and their subsequent conversion to the FGDC standard. The greater intention of this project is to federate the marine metadata holdings of all PICES member countries. Japan and Russia have expressed interest in joining the PICES federation.

### What is federation?

Federation is a process of joining for mutual benefit. For example, suppose Provider 1 produces Product A, and Provider 2 produces Product B. In a non-federated system, a consumer wanting A would have to get it from 1, and B would only be available from 2. However, if 1 and 2 are willing and able to cooperate, each provider can maximize the distribution of its own product by also offering it through the other provider. This is a federation.

This federation promotes efficiency for the provider and the consumer. Each provider effectively boosts its product line by having available more products without actually having to produce them. The consumer benefits by being able to locate more products without having to know more providers.

### Metadata

In this case, the product is metadata. Metadata, or data about data, describe the content, quality, condition, and other characteristics of data. When seeking a certain kind of data, a scientist will examine a broad body of metadata, eliminating those records that do not satisfy the search criteria. For example, when searching for vertical profiles of ocean properties obtained from hydrographic casts, a scientist might specify the locations and times of the casts, the inclusive depths and the variables measured. The successful search will reiterate these parameters and tell the scientist the location of the data, and how those data can be obtained. In general, metadata include thematic, semantic and syntactic descriptors of the data they reference.

- Thematic metadata describe the context of the study that produced the data. Such descriptors can include principal investigator, species association and study hypothesis.
- Semantic metadata describe contextual information about the data. Candidate descriptors are measurement type, measurement device, units of measurement, calibration information, etc.
- Syntactic descriptors define the way the data are packaged, *e.g.*, file size, file format, storage mechanism and location.



Metadata are described in a common set of terminology, definitions and format that are the metadata standard. The metadata standard determines what thematic, semantic and syntactic descriptors are catalogued and how they are presented. There are a number of metadata standards, *e.g.*, Dublin Core, Ecosystem Metadata Language, Federal Geographic Data Committee (FGDC), Directory Interchange Format (DIF). KODC uses the DIF standard to catalog data, while NPEM uses FGDC.

### Method

To enable an Internet browsing client to search and discover information through a federated metadatabase, four elements must be in place. First, the client must be able to communicate with the clearinghouse using normal web communications. Second, the clearinghouse must offer an Internet communication protocol and associated utilities that permit search and discovery of federated metadata records. Third, each federated partner must maintain metadata records using a standard that is supported by the communication protocol. Fourth, each federated partner must serve the Internet through a server that is conversant in the communication protocol and that hosts metadata records in the proper standard. Figure 2 shows these elements.

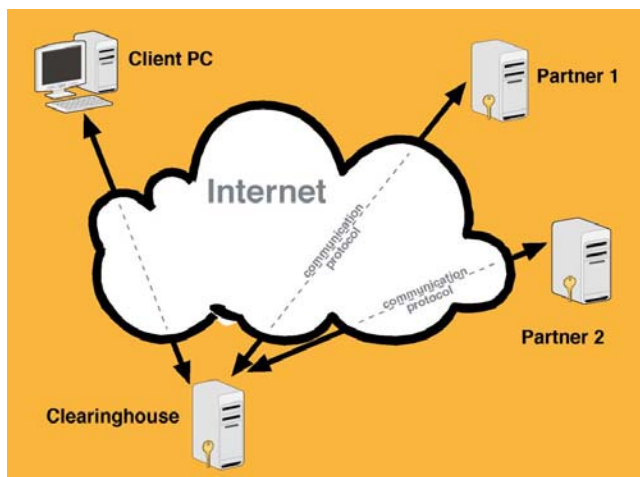


Fig. 2 An Internet metadata federation requires a clearinghouse and partners sharing a communication protocol and serving metadata using the same standard.

### Approach

With this understanding of requirements to build a federation in hand, NPEM members approached KODC personnel at the PICES Twelfth Annual Meeting in Seoul, in October 2003, with an invitation to cooperate on a joint federation project. KODC expressed interest in federating with NPEM. Informal communications between parties that year culminated in the submission of a proposal from TCODE to the PICES Science Board at the PICES

Thirteenth Annual Meeting in Honolulu the following October. PICES agreed to fund, in part, two meetings of KODC and NPEM principals over the coming year to establish the federation, and to promulgate information to other PICES member countries about joining the federation.

Also during this exploratory period, NPEM was working to establish partnership in an existing federation sponsored by FGDC, called the National Spatial Data Infrastructure (NSDI) Clearinghouse. The NSDI Clearinghouse requires metadata to be coded using the FGDC standard, and it uses ISite, an instance of the Z39.50 communication protocol, for queries and exchanges. Although NPEM was already using the FGDC standard and the installation of ISite was relatively straightforward, security issues slowed progress so much that NPEM was not able to demonstrate this federation feature at the first joint KODC-NPEM federation meeting in Seattle, in August 2005.

At that meeting (Fig. 3), principals presented details of NPEM operations and a tutorial on ISite and its installation. During the discussions, it was revealed that principals do not know the metadata standards used by other PICES-member oceanographic data centers. Perhaps the FGDC/ISite model is not the proper one for the greater PICES federation. Are there web-resident clearinghouses that use different approaches than NSDI? Are there morphing routines available that translate from one metadata standard to another? These were some of the issues that needed clarification before the next meeting in Busan, which was scheduled to occur following the PICES Fourteenth Annual Meeting in Vladivostok. In addition, KODC would translate some key metadata records to English and format them using the FGDC standard. The goal was to demonstrate an NPEM-KODC federation through the NSDI Clearinghouse by the end of the year.



Fig. 3 KODC and NPEM representatives working at the Alaska Fisheries Science Center in Seattle, in August 2005; left to right: Allen Macklin, Bernard Megrey, Hae-Seok Kang (mostly hidden by laptop), Kyu-Kui Jung and Kimberly Bahl.

Following the August meeting, NPEM was able to solve its server security problems and became a registered node of the NSDI Clearinghouse. This utility was demonstrated at

the PICES Fourteenth Annual Meeting in Vladivostok. At this meeting, too, TCODE representatives were instructed to ascertain the metadata standard(s) used by their respective ocean data centers and to query their centers about interest in joining the PICES federation. Several PICES representatives stated that their countries would be interested in joining the federation.

At the October 2005 KODC-NPEM meeting in Busan, the team first reviewed the function and holdings of KODC. NPEM group reported that they had been unable to locate any cost-free, public clearinghouses other than those that use FGDC and Z39.50. Morphing applications from DIF to FGDC are available through NASA. KODC had translated some metadata records to English and was ready to serve them as XML files in FGDC format. With a bit of tweaking of the ISite software and some calls to the server site in Seoul, KODC became a registered node of the NSDI Clearinghouse (<http://www.fgdc.gov/clearinghouse/>, Figs. 4 and 5).



Fig. 4 KODC becomes a registered node of the NSDI Clearinghouse; left to right: Joon-Yong Yang watches on the big screen, Dan Klawitter just made the final keystroke, Hae-Seok Kang talks with the server site in Seoul, and Kyu-Kui Jung looks on.

**Future work**

With the initial work completed to become registered nodes of the NSDI Clearinghouse, the focus for the KODC-NPEM federation team is now on increasing the number of metadata records offered by KODC in the English language and adhering to the FGDC format. Because these exercises will require funds beyond the budgets of the two sponsoring groups, the principals will develop proposals to be submitted to agencies and institutions that look favorably on these kinds of projects. To facilitate the conversion of DIF metadata records to FGDC, we obtained Excel VisualBasic routines from NASA. The routines are being examined to

determine what modification they might need for the KODC-NPEM work. At some point, it may become desirable for PICES to host its own clearinghouse separate from FGDC NSDI.

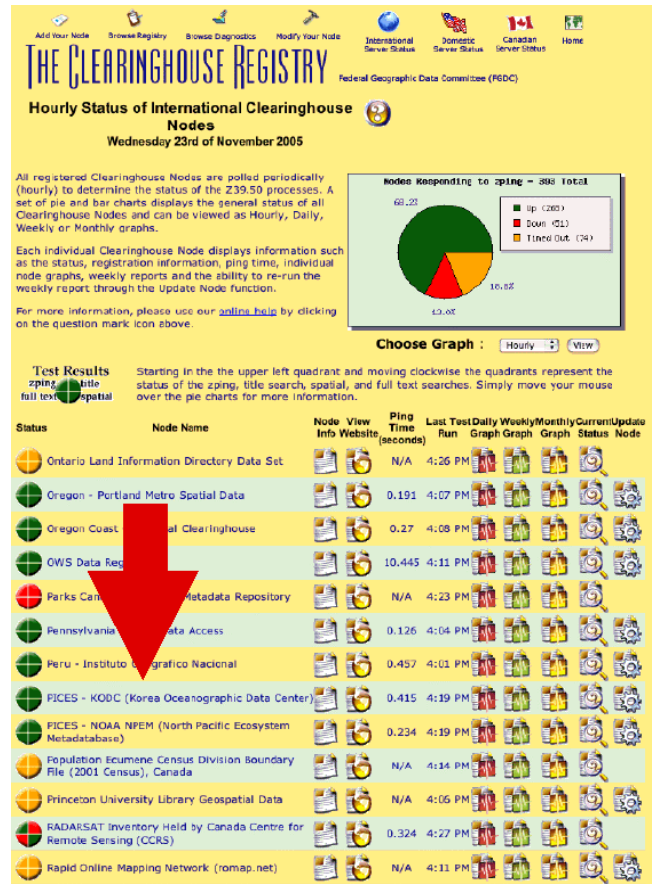
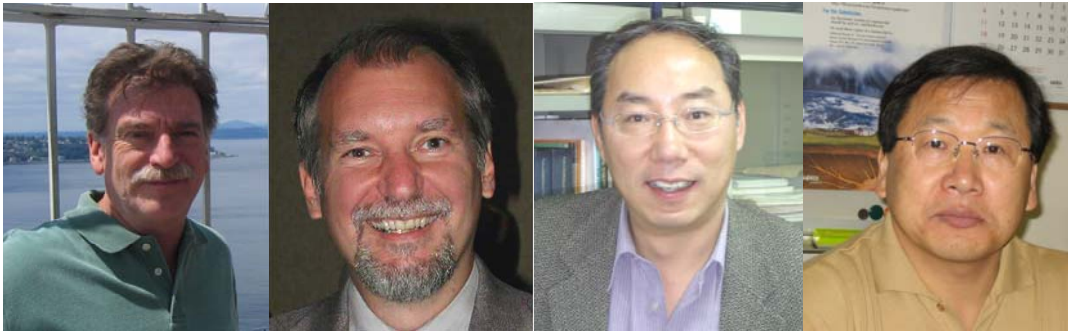


Fig. 5 The arrow points to the current PICES nodes (KODC and NPEM) of the Clearinghouse registry. The symbols describe connectivity statistics for all registered sites. At this time, there were 393 sites participating in the clearinghouse (not all shown).

As the federation grows, the accumulated experience will make it easier for other PICES partners to join. Personnel from the Japan Oceanographic Data Center, the Japan Marine Information Research Center and the Pacific Institute of Geography of the Far Eastern Branch of the Russian Academy of Sciences soon will join the federation process. To aid the ongoing effort, proposals were submitted to the Sasakawa Peace Foundation and to PICES. We encourage interested parties to step forward with further ideas for funding and federation. We anticipate a full PICES federation by the end of the decade.

[This article is contribution 2882 to NOAA's Pacific Marine Environmental Laboratory and contribution FOCI-0580 to NOAA's Fisheries-Oceanography Coordinated Investigations.]





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*Mr. Hae-Seok Kang (hskang@kordi.re.kr) has co-directed the development of the Korea Oceanographic Data and Information Service System for seven years since 1999. Hae-Seok is a manager of the Ocean Data and Information Division of the Korea Ocean Research and Development Institute (KORDI). He has more than 20 years' experience designing and implementing oceanographic data and information management systems. Hae-Seok also serves as a member of TCODE.*

## PICES Interns



PICES offers sincere thanks to **Mr. Jin-Yong Lee** (Korean Ocean Research and Development Institute), the 2005 PICES intern, who completed his term at the Secretariat at the end of June, and has returned to Korea. We are very grateful for his dedicated work during this past year.

We are pleased to announce that **Mr. Pavel Vorobyov** from the Pacific Scientific Research Fisheries Center (TINRO-Center), Vladivostok, Russia) joined the Secretariat in early January as the Seventh PICES Intern. Pavel helped us out at PICES XIV in Vladivostok last year, and you will have an opportunity to meet him this year at the Symposium on "Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis" in Honolulu or at the PICES Secretariat office.

# Studies on long-term variation of ocean ecosystem/climate interactions based on the Odate collection: Outline of the Odate Project

By Hiroya Sugisaki

Recently, long-term variations and trends of global climate have been identified as serious problems affecting the biosphere, especially global warming problem. The ocean is thought to play an important role by absorbing carbon dioxide (the most serious greenhouse gas) through various biological processes. Phytoplankton synthesize carbon dioxide in the surface layer and are mainly consumed by zooplankton. The subsequent destination of the carbon, however, depends on the species and ecology of the zooplankton. Small zooplankton distributing in the shallow layer produce small fecal pellets, and they are usually degraded in the shallow layer. Therefore carbon dioxide is recycled within the sea/atmosphere interface layer of the ocean, and can potentially return to the atmosphere. On the other hand, large zooplankton produce large fecal pellets. Most of their bodies and feces quickly sink into the deep layer. Large plankton are also selectively consumed by large predators, such as fish and whales. These predators can swim extensively both horizontally and vertically, and their bodies sink to the deep layer rapidly after their death. Through these processes, inter-specific relationships affect the ocean ability to absorb carbon dioxide and transport it into the deep layer. In order to monitor the relationships between climate change and biological processes, extensive zooplankton samples which have been collected over a long-time period are necessary, however such zooplankton collections are quite rare in the world. In the North

Atlantic Ocean, the CPR (Continuous Plankton Recorder) project has been carried out since 1946 (sample numbers are over 170,000), and precise atlases, including phytoplankton, are already published (Edinburgh Oceanographic Laboratory 1973; CPR Survey Team 2004). In the eastern North Pacific, the CalCOFI (California Cooperative Ocean Fisheries Investigations) project has continued since 1950. The original purpose of this project is to study the condition of the fishing grounds, and more than 60,000 samples of zooplankton were collected. The atlases of this dataset have been published since 1963, and the latest is No. 35 (Moser *et al.* 2002). Using these plankton samples, various works on long-term variability of zooplankton ecology have been published (*e.g.*, Roemich and McGowan 1995; Edwards and Richardson 2004; Richardson and Schoeman 2004). In the western North Pacific, on the contrary, there are very few zooplankton sample sets collected systematically over a long period of time besides the Odate collection.

## What is the Odate collection?

The Odate collection is a set of more than 20,000 formaline preserved zooplankton samples which are stocked at the Tohoku National Fisheries Research Institute (Japan). These samples were collected extensively over the western North Pacific since 1950 (Fig. 1). The Odate collection samples were mainly collected from along fixed sampling

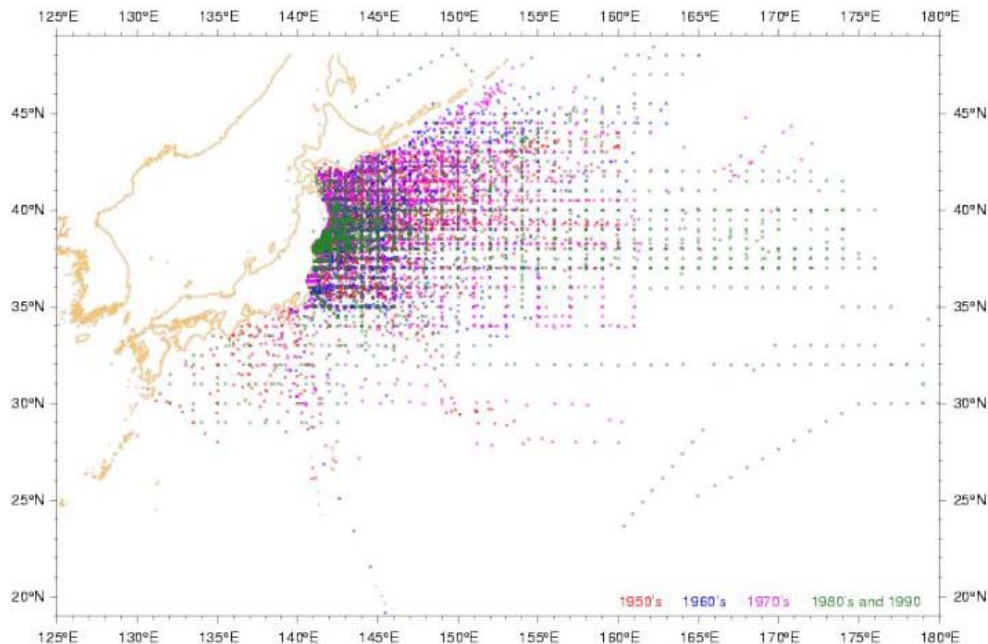


Fig.1 Location of sampling stations of the Odate collection.



lines for the purpose of routine monitoring of prey abundance in fisheries grounds and oceanic environment by national or prefecture institutes in northeastern Japan. Samples were usually collected either monthly or seasonally. Sampling gear used were conical standard plankton net systems called marutoku net and Norpac net. Both of them have 45 cm diameter and 0.33 mm mesh size. The net was towed vertically from 150 m depth layer to the surface.

Long-term variation of biomass (total wet weight) of this sample set was analyzed by Dr. Kazuko Odate, formerly of the Tohoku National Fisheries Research Institute, from the 1950s to the early 1990s, and this sample set is called the Odate collection. Decadal oscillations of zooplankton biomass (wet weight) were clearly observed by Dr. Odate (Fig. 2). Most of these samples are still available for identification of species, because the preserved condition is fairly good. Therefore, we planned a research project re-investigating zooplankton species composition in order to analyze long-term variation of the oceanic ecosystem and mechanisms of ecosystem variation affected by climate shift using the Odate collection.

### Species composition analysis

Information from the total wet weight of zooplankton is not sufficient to assess the biological processes occurring in the oceanic ecosystem. From the total biomass we cannot deduce what has happened in the oceanic ecosystem in relation to climate change. It is probable that the effect of the climate shift is different between warm-water species, and cold-water species, between large and small species, and between gelatinous and crustacean species, etc. In the study area of the Odate collection, there are both cold current (Oyashio) and warm current (Kuroshio) systems, and therefore the species composition shows large variation. So, it is necessary to analyze the species composition of the zooplankton. During the species identification procedure, copepods have been sorted out and identified into species using the latest information on copepod classification. Classification has been conducted by Dr. Hiroshi Itoh (Suidosha Co. Ltd.). Adults and larvae of all species were distinguished. Besides, copepodite larval stages (I-V) of dominant copepods in the Oyashio region (*Neocalanus*, *Eucalanus*, *Calanus* and *Metridia* species) were precisely identified. The total number of each classified species and life stage category were calculated.

### What has happened to the zooplankton community in the second half of the 20th century?

The study area was divided into three regions according to Odate (1994): the Oyashio cold current region (water temperature at 100 m depth <5°C), the Kuroshio warm current region (water temperature at 100 m depth >15°C), and the Kuroshio-Oyashio mixed region (5°C < water

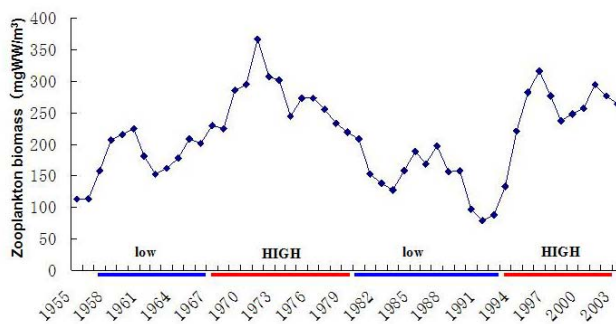


Fig. 2 Long-term variation of zooplankton biomass collected in the Oyashio region; revised from Odate (1994).

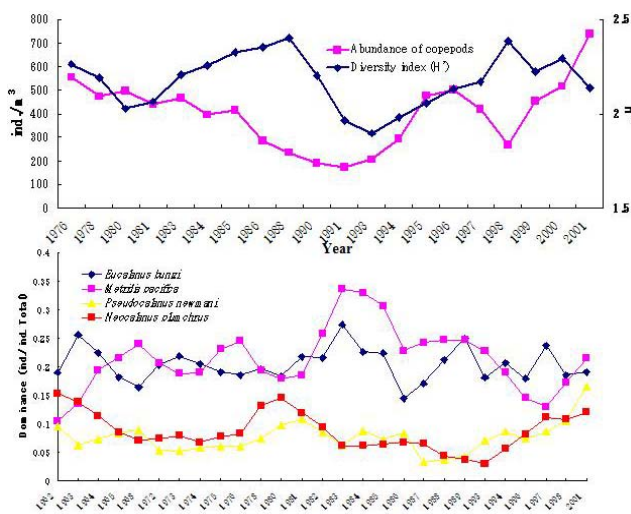


Fig. 3 (Top) Long-term variations of abundance of total copepods and their species diversity (Shannon-Wiener's diversity index,  $H'$ ) during summer season (June-Aug); (Bottom) Long-term variation of dominance ratio of 4 dominant species (*Eucalanus bungi*, *Metridia pacifica*, *Neocalanus plumchrus* and *Pseudocalanus newmani*).

temperature at 100 m depth <15°C). Here, we briefly introduce a preliminary report on the long-term variability of the copepod composition collected in the Oyashio region as an example of this study, because the species identification analysis for this area has been completed. Odate (1994) reported that in the Oyashio region, the species composition is relatively simple compared with the other sea areas, and the zooplankton biomass is high and their long-term variation was clearly observed. In this study, 1527 samples collected from 1960 to 2002 in the Oyashio region have been investigated and 206 species of copepods detected. Over the 40-year period, the five most dominant species were *Eucalanus bungii*, *Metridia pacifica*, *Neocalanus plumchrus*, *Pseudocalanus newmani*, *Oithona similis*, and they dominated more than 70% of the total abundance of copepods. The long-term variability of

species diversity and total abundance were clearly observed. It seems that there are decadal oscillations with high diversity and low abundance of total copepods during the 1980s (Fig. 3a). Decadal variation is also observed in the abundance of each dominant copepod. During the 1980s, *Metridia pacifica* was dominant, while the abundance of *Neocalanus plumchrus* was low compared to other decades (Fig. 3b). The abundance of most of these species clearly shows decadal oscillations. The abundance of some species was high during the 1980s and some were low. The depression of some dominant species, such as *Neocalanus plumchrus*, might be a factor leading to the low abundance and high species diversity during the 1980s.

We are now analyzing the mechanisms of this long-term variation of the copepod community. We especially wish to examine the effects of climate oscillation, top-down control and tidal oscillation. As for climate oscillation, the timing of shifts of well-known climate oscillations, *e.g.*, PDO (Pacific Decadal Oscillation) or AO (Arctic Oscillation), seemed to roughly match with the timing of the phase change of zooplankton abundances. Dr. Sanae Chiba (project member) suggested the hypothesis that cold winters and hot summers during the 1980s led to the short productive season for some dominant cold-water species (Chiba, 2005). As for top-down control, Dr. Kazuaki Tadokoro (project member) reported that the feeding pressure of Japanese sardine on *Neocalanus* species had been high during the 1980s. During that time, stock size of Japanese sardine off the Pacific side of Japan was estimated at over 15 million metric tons (estimated stock size in 2004 was only 110 thousand tons). Since sardine prey on *Neocalanus* copepods efficiently, high feeding pressure on *Neocalanus* by sardine might have occurred during the 1980s. Tadokoro *et al.* (2005) estimated that Japanese sardine could consume 32-138% of the daily production of *Neocalanus* species during summer off the northern part of Japan. This top-down control may explain the reason of depression of the abundance of *Neocalanus*. Dr. Ichiro Yasuda (project member) has been doing research on the basin scale physical oceanographical mechanism in relation to the abundance of zooplankton (Yasuda, 2005). The 18.6-year cycle oscillation of the earth axis induces an oscillation in the strength of tidal mixing. This tidal cycle causes an intrusion of Okhotsk water into the Oyashio region, and this physical oceanographical variation is thought to be related to the biological variation. The strong intrusion of low-nutrient water from the Okhotsk region may cause the low primary production and low abundance of large copepods such as *Neocalanus* species.

Consequently, long-term variability of the copepod community is clearly observed from this research of species composition data set. Details of the mechanism of the long-term variation of the copepods community in relation to physical and biological effects will be published by the members of this project elsewhere.

### ***Work in progress***

Now we are analyzing the species composition of more than 3000 samples from the Odate collection sampled in the Oyashio-Kuroshio mixed region and the Kuroshio Extension area. These areas are warmer than the Oyashio region, so species diversity is much higher. The mechanism of long-term variation in the plankton community will be examined in detail (especially the trends of global warming, climate oscillation, tidal oscillation, predation by sardine, *etc.*) as well as that of the Oyashio region. The mechanism of long-term variation of oceanic zooplankton communities of both subarctic and subtropical current systems in the western North Pacific will be synthetically examined.

The database of the species composition made by this project (more than 5000 samples collected from 1960-2002 in the western North Pacific) will be open to the public through the internet site after all species identification is completed. We hope that this data set will be useful for research on the global ecosystem as a resource available to all.

### ***Importance of continuous field monitoring research***

There are still a large amount of zooplankton samples and datasets that have been kept unused in various institutes in Japan, because they were collected for temporal purposes, *e.g.*, the condition of fishery grounds or environment factors at that time. On the other hand, as interest in the information of long-term variation of the ocean ecosystem becomes stronger because we need to estimate the effects of long-term climate change such as regime shift and global warming effect, we have to accumulate ecological data of the ocean over a long period. 50 years' accumulation of the Odate data is not enough to research on a more than 50-year cycle of some fish abundance (*e.g.*, sardine, herring and so on) or estimate the trend of global warming to the 22<sup>nd</sup> century. However, due to competition from other research with more immediate benefits, it is difficult to maintain the funding to continue the current field monitoring research, because instantaneous prominent results cannot be expected. But we should not quit. We have to realize the importance of continuous field monitoring research for the science of the next generation.

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*Dr. Hiroya Sugisaki (sugisaki@affrc.go.jp) is a biological oceanographer specializing in studies of zooplankton ecology, particularly in species interaction between zooplankton and fishery resources. He works at the Tohoku National Fisheries Research Institute of the Japanese Fishery Agency. His current research is on the distribution and feeding habits of micronekton and macrozooplankton. He is also in charge of more than 20,000 zooplankton samples stocked in his laboratory. Dr. Sugisaki is the leader of the Odate Project supported by the Global Environment Research Fund of the Japanese Ministry of the Environment.*

## Hokkaido University Fisheries & Oceanographic Database CD-ROM



Since 1957, Hokkaido University has carried out regular oceanographic and fishery surveys with the fisheries training vessels *Oshoro maru* (PICES Press Vol. 9(1): 25-28) and *Hokusei maru* (PICES Press Vol. 10(2): 25-28). Biological and environmental data collected on these surveys are published annually in the “*Data Record of Oceanographic Observations and Exploratory Fishing*”.

The Hokkaido University has collaborated closely with the Japan Oceanographic Data Center (JODC) to assemble close to 50 years of these data in a Long-Term Fisheries and Oceanographic Data Base (HUFO-DAT). Volume 1 contains hydrographic station data, nutrients, oxygen, zooplankton wet weight, and chlorophyll-*a* concentration. Volume 2, currently in preparation, will include experimental fishing and associated biological data. To obtain a copy of HUFO-DAT Vol. 1, please contact one of the following sources:

*Working Group for Management and Distribution of Data on Oceanographic Observation and Exploratory Fishing*  
 Graduate School of Fisheries Sciences & Faculty of Fisheries, Hokkaido University  
 3-1-1, Minato-cho, Hakodate,  
 Hokkaido, Japan. 041-8611  
 E-mail: [wwwadmin@fish.hokudai.ac.jp](mailto:wwwadmin@fish.hokudai.ac.jp)

*Japan Oceanographic Data Center*  
 5-3-1 Tsukiji, Chuo-ku,  
 Tokyo, Japan. 104-0045  
 E-mail: [mail@jodc.go.jp](mailto:mail@jodc.go.jp)

## Workshop on sardine and anchovy fluctuations

By Shin-ichi Ito, Michio J. Kishi, Bernard A. Megrey, Kenneth A. Rose and Francisco E. Werner

A workshop on “*Global comparison of sardine, anchovy and other small pelagics: Building towards a multi-species model*” was held in Tokyo, Japan, from November 14-17, 2005. Support for the workshop was provided by the Japanese Fisheries Research Agency (FRA, <http://ss.myg.affrc.go.jp>), PICES (<http://www.pices.int>), Global Ocean Ecosystem Dynamics (GLOBEC, <http://www.globec.org>), the Asia Pacific Network for Global Change Research (APN, <http://www.apn-gcr.org/en/indexe.html>), Scientific Capacity Building/Enhancement for Sustainable Development in Developing Countries Program (CAPaBLE, <http://www.apn-gcr.org/en/activity/capable.html>) and the Inter American Institute for Global Change Research (IAI, <http://www.iai.int/>), enabling participation by 22 attendees from Chile, China, India, France, Japan, Mexico, Pakistan, the Philippines, South Africa, the United Kingdom, and the United States of America (see photo below). The workshop’s agenda and other preparatory material are available on <http://www.myg.affrc.go.jp/kaiyo/sardine-anchovy/index-sardine-anchovy.html>.

The goal of the workshop was to explore ways to extend an existing marine food-web and fisheries model to ecosystems containing sardine and anchovy. Together with long-term ecosystem-specific oceanographic and fisheries data sets, our aim was to:

- Understand the propagation of climate change effects up the marine food-web;

- Quantify its effects on energy cycling and fish growth and production in distinct geographic regions that support important sardine and anchovy populations;
- Explain synchronous and asynchronous patterns of abundance trends; and
- Explore how to best integrate these results into the decision making process by fisheries/resource managers and policy makers.

Over the past century, global fluctuations in the populations of sardines and anchovies have been documented (Fig. 1). The amplitude of fluctuations can be high, and inter-annual and longer-term fluctuations contribute significantly to the total variability of the world’s fish harvest. Additionally, the fluctuations appear to be at times asynchronous across species within specific regions, as well as synchronous within species at larger (basin) scales. For example, sardine populations exhibit synchrony over a large part of the Pacific (Humboldt Current, California Current, and Kuroshio Current areas). On the other hand, sardines do not show any apparent systematic synchrony between the Pacific and Atlantic Oceans. The local out-of-phase asynchrony between sardine and anchovy may result from differences in species life-histories, as well as from bottom-up processes driven by climate shifts. The in-phase synchrony of sardine populations within the Pacific also suggests a bottom-up, climate-driven component. The possibility of climate-induced variability in sardine and anchovy population



Workshop attendees left to right. Back row: Yasuhiro Yamanaka (Japan), Luis Cubillos (Chile), Carl van der Lingen (South Africa), Vera Agostini (U.S.A.), Taketo Hashioka (Japan), Bernard Megrey (U.S.A.), Michio Kishi (Japan), Manuel Barange (GLOBEC IPO), Francisco Werner (U.S.A.), Kenneth Rose (U.S.A.). Middle row: Yasuko Kamezawa (Japan), Yunne Shin (France), Shin-ichi Ito (Japan), Larry Jacobson (U.S.A.), Roehlano Briones (Philippines), Alan Koropitan (Japan), Salvador Lluch-Cota (Mexico). Front row: Akinori Takasuka (Japan), Wei Hao (China), Goh Onizuka (Japan), Francisco Chavez (U.S.A.), Kawser Ahmed (Bangladesh), Pratap Mohanty (India), and Shigeo Hayase (Japan).



fluctuations was previously discussed at the symposium entitled “*Long-term variability of pelagic fish populations and their environment*” that was held in Japan in 1989.

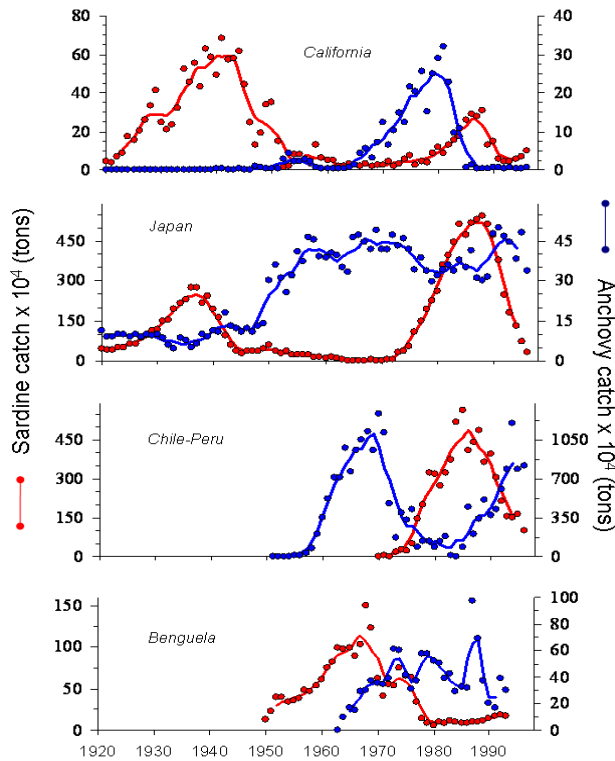


Fig. 1 Sardine and anchovy catch at three sites in the Pacific and in the Benguela region from 1920 to 1996 (courtesy of S. Lluch-Cota).

Since the 1989 symposium, our ability to model marine ecosystems and their response to physical forcing has evolved rapidly. For example, the PICES CCC MODEL Task Team has built a community ecosystem model called the “North Pacific Ecosystem Model for Understanding Regional Oceanography (NEMURO)”, and coupled the NEMURO model to a bioenergetics-based population dynamics model of fish (see PICES Scientific Report No. 20, 2002). The coupled model, called NEMURO.FISH, has been used to examine the responses of Pacific herring (*Clupea pallasii*) and Pacific saury (*Cololabis saira*) to decadal variations in climatic conditions (focusing on the 1950-2000 time period). At the November 2005 workshop in Tokyo, we reviewed recent data and modeling approaches that could help explain the annual and inter-decadal variability of sardine and anchovy populations. We also outlined a common multi-species, spatially-explicit modeling approach, which is an extension to the NEMURO.FISH model, to study the synchrony and asynchrony of sardine and anchovy populations. Workshop attendees outlined a comparative approach designed to study the effects of the climate change on sardine and anchovy population dynamics by focusing on the populations located in the key geographic areas

accompanied by supporting data for model comparison, calibration and validation.

The work-plan for the group in the coming months will focus on addressing the question “How much can bottom-up food-web dynamics explain sardine and anchovy growth and relative abundance between warm and cold regimes in the different ecosystems?” Specific tasks and objectives include:

- Initiate a review paper (as an update to the 1989 symposium) on the processes that affect sardine and anchovy populations, including comparisons among ecosystems where possible;
- Develop bioenergetics growth models for sardine and anchovy with sufficient detail to capture important differences in the feeding behavior and energetics between species;
- Update and synthesize sardine and anchovy weight-at-age data from a variety of ecosystems and identify candidate data sets for calibration of the NEMURO.FISH model and its envisioned extension to multiple species;
- Apply the NEMURO.FISH model, updated for sardines and anchovies, as a box (point) model using predicted prey from an uncoupled spatially-explicit NEMURO lower trophic model. The analysis would examine sardine and anchovy growth responses (*i.e.*, weight-at-age) to geographic variation in physical factors (*e.g.*, temperature) as well as prey dynamics and abundance;
- Extend NEMURO.FISH to a 2-dimensional model that simulates sardine and anchovy population dynamics, with potential application to a variety of geographic locations with contrasting lower trophic level and fish dynamics;
- Analyze existing field data from different locations to quantify and compare the contraction and expansion response of sardine and anchovy populations to environmental and biomass conditions;
- Consider the need to incorporate parameters and/or outputs of bio-economic models in future developments regarding NEMURO.FISH to capture the impact of top-down (human) approaches in generating or enhancing the cyclic behavior of pelagic fish populations.

Future communications among the workshop participants will occur mainly via e-mail, with a possible meeting of a subset of the participants in April 2006 in Honolulu, before the PICES/GLOBEC Symposium on “*Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis*”. Presentations of the resulting efforts are planned at a sardine-anchovy dynamics session (Topic Session on “*Modeling and historical data analysis of pelagic fish, with special focus on sardine and anchovy*”) at PICES XV in Yokohama, Japan, in October 2006.

[Article submitted by the workshop co-convenors.]



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*A great turnout at the CFAME Topic Session on “The comparative responses of differing life history strategists to climate shifts”.*



*Opening Session head table: Prof. Victor Gorchakov (Vice-Governor of the Primorye Region) and national representatives and Science Board Chairman. Not in photo: Korean delegate, I.C. Pang.*



*Wireless fever: the Multi-Purpose Room packed with work-focussed participants.*



*Governing Council representatives on a harbour cruise in sunny weather after the final meeting on October 9.*



*A very young Chinese delegation pose at the Welcome Reception.*

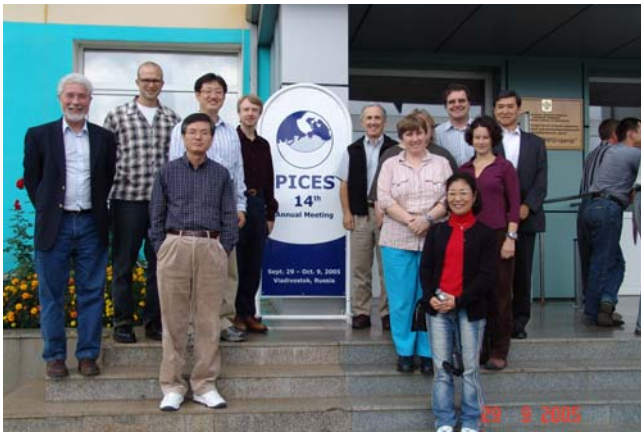




*Science Board representatives at PICES XIV: I.I. Shevchenko, H.P. Batchelder, J.M. Napp, G.H. Kruse, K. Kim, J.E. Stein, M.G. Foreman, Y. Ishida, A. Kellerman (ICES), F.L. Qiao, S.M. McKinnell (Secretariat). Not in photo: M.J. Dagg and S. Kim.*



*Interaction at the Poster Session.*



*Working Group 19 members at the entrance of the TINRO-Center.*



*After a very vigorous basketball match, the PICES and TINRO teams pose for a friendly group photo before the prize (also in photo - 1 crate of vodka) was consummated.*



*TCODE members' special excursion to the Marine Museum of the TINRO-Center.*



*Governing Council representatives from China, Japan and Korea mingle and relax before the harbour cruise.*

## Workshop on SEEDS-II

By Atsushi Tsuda, Shigenobu Takeda, Mitsuo Uematsu, Mark L. Wells and Maurice Levasseur

A workshop on SEEDS-II (Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study II) was held from October 17-18, 2005, at the Ocean Research Institute, University of Tokyo. In attendance were scientists from Canada, Japan, New Zealand and the United States of America (see photo below). There were 7 keynote talks and 13 posters presented, followed by working group discussions aimed at synthesizing these findings. The SEEDS-II expedition was conducted in the western subarctic Pacific in the summer of 2004, following the successful SEEDS-I expedition done in these same waters in the summer of 2001. The earlier experiment generated a massive centric diatom bloom that caused a larger drawdown of macro-nutrients and  $p\text{CO}_2$  than any iron-enrichment experiment done in the world's oceans to date (Tsuda *et al.*, 2003; de Baar *et al.*, 2005). However, the fate of the carbon assimilated into phytoplankton during SEEDS-I could not be determined because of the short observation period (13 days). SEEDS-II employed two research vessels, the R/V *Hakuho-Maru* and R/V *Kilo Moana*, and was designed to measure how the fertilized patch would evolve over a longer time scale (1 month) and with a greater range of parameters than used during SEEDS-I.

The major goals of SEEDS II were: 1) to observe the initiation, development and decline of the iron-induced diatom bloom and elucidate the fate of fixed carbon; 2) to measure additional parameters to determine the overall biogeochemical responses to iron enrichment; 3) to determine the influence of iron on trace gas production and aerosol formation; and 4) to measure gas fluxes from ocean surface to atmosphere.

The number of participants in the second experiment was much higher than in SEEDS-I. We added the same amount of iron into the same locality at the same season, and expected a big diatom bloom. The preliminary results from SEEDS-II showed both the iron-induced increase and subsequent decline in phytoplankton biomass. However, the iron-initiated bloom was much less intense than observed in SEEDS-I. Chlorophyll-*a* concentration increased only 2 to 3 times over the initial values, and the drawdown of nutrients and  $p\text{CO}_2$  were small. The aim of the SEEDS-II Workshop was to provide a forum for exchanging scientific information and expertise to better understand the underlying cause for the dramatically different chemical and biological responses observed in the experiment. The workshop main themes were:

- To synthesize the key biological findings of SEEDS-II;
- To elucidate the changes in iron biogeochemistry;
- To determine the effect of iron addition on the production of trace gases; and
- To compare the biogeochemical changes associated with SEEDS-I and SEEDS-II.

In the keynote talks, preliminary results were summarized for patch dynamics (D. Tsumune), iron chemistry (J. Nishioka), biological responses (H. Saito), carbon and nitrogen budgets (I. Kudo), onboard incubation experiments (W. Cochlan), DMS (dimethylsulfide) dynamics (M. Levasseur and I. Nagao), and atmospheric chemistry (M. Uematsu). In addition, a summary talk was presented on SAGE (SOLAS Air-Sea Gas Experiment), an iron-enrichment experiment in the sub-Antarctic Ocean whose results had similarities with the SEEDS-II findings. After the poster presentations that followed, 3 discussion



SEEDS-II workshop participants.



groups were formed: (1) *Iron and trace metal chemistry* (chaired by S. Takeda), (2) *Biological responses and budgets* (chaired by H. Saito) and (3) *DMS and atmospheric chemistry* (chaired by M. Uematsu).

The *Iron and trace metal chemistry* group focused on determining the fate and behaviour of iron during SEEDS-II. The observed changes in total and dissolved iron concentrations as well as its chemical speciation, indicate that diatoms would have had more difficulty acquiring iron during SEEDS-II than was the case in SEEDS-I. During SEEDS-I, the shallower mixed layer, higher added iron concentrations, more photoreduction, and less dilution of the patch with seawater containing free Fe(III) complexing ligands, all would have combined to increase the biological availability of iron and stimulate diatom growth. In contrast, lower added iron concentrations and greater dilution of the patch by vertical and horizontal mixing during SEEDS-II worked against increasing the iron supply to diatoms. However, the heterogeneous horizontal distribution of iron will make it very hard to construct a quantitative iron budget for SEEDS-II. The workshop participants chose the following key questions (Q) for elucidating the changes in iron biogeochemistry during SEEDS-II:

- Q1: What is the reason that the actual concentrations of iron in surface waters after the first infusion was less than target concentration?
- Q2: What is the dilution rate of iron in the patch during SEEDS-II? How does it compare with the dilution rate of patch during SEEDS-I?
- Q3: Do ADCP data support movement of the surface mixed layer relative to the deeper water?
- Q4: Did the expected loss in chemical reactivity of colloidal and particulate Fe(III) oxyhydroxides affect the analytical measurement of iron?
- Q5: What are the differences in the light conditions at the time of infusion between SEEDS-I and SEEDS-II (photochemical effects on iron speciation)?
- Q6: How did the concentrations of other trace metals change during the patch evolution?
- Q7: Is there a difference in the conditional stability constant for iron between <200 kDa and 200 kDa – 0.2  $\mu\text{m}$  size fractions?

The *Biological responses and budgets* group tabulated the system response chronically, including the changes in iron concentration, chlorophyll, phytoplankton physiology, zooplankton and bacteria, before turning their attention to the causes of the weak biological response to iron addition in SEEDS-II. In SAGE, 5 factors have been suggested (micronutrients, silicate, grazing, seed population, light limitation, dilution of the patch). The similarities and dissimilarities in the initial *in-situ* conditions for SEEDS-I and SEEDS-II were compared and contrasted. The differences included mixed layer depth, seed population of diatom, zooplankton biomass and dilution of the patch.

The discussion finished after considering the budget calculation for the patch.



Workshop in session.



Young Japanese SEEDS-II workshop participants.

The *DMS and atmospheric chemistry* group discussed data exchange and comparison among the collaborating groups. Preliminary data (DMS, DMSPp, NMHCs,  $\text{N}_2\text{O}$ ,  $\text{CH}_4$ ,  $\text{CO}$ ,  $\text{CH}_3\text{Cl}$ ,  $\text{CH}_3\text{Br}$ ,  $\text{CH}_3\text{I}$ ,  $\text{CH}_2\text{Cl}_2$ ,  $\text{CH}_2\text{ClI}$ , Isoprene and DMDS) from analysis of seawater samples (Nagoya University, University of Shizuoka, Hokkaido University, and Laval University) were listed, and differences in surface water concentrations and vertical profiles between IN and OUT patches over time were discussed. These data revealed pronounced changes in some parameters with time in the IN patch samples. However, careful determinations are still required before any final conclusions can be made. Atmospheric sampling (Nagoya University and Tokyo Metropolitan University) provided no evidence of increased emission of DMS from the iron patch. Its average atmospheric concentration (0.9 ppb) was one order of magnitude lower than that measured during SERIES (Subarctic Ecosystem Response to Iron Enrichment Study) in the eastern subarctic Pacific. There were no pronounced differences in biogases (organic halogens, isoprene *etc.*) between IN and OUT patch samples. However, regional sources and transport of DMS will strongly affect the ability of shipboard measurements to acquire this signal.

The aerosol measurements (University of Tokyo and Science University of Tokyo) showed that sulfate was dominant in the submicron aerosol (0.3-0.5 $\mu$ m) and that aerosol growth and changing particle spectra were observed in the marine boundary layer over the investigated region.

After presentations by the Chairman of each working group, there were two presentations from modelers that suggested that the high biomass of copepods and low iron

availability generated the low accumulation of phytoplankton during SEEDS-II. However, there were some discrepancies between the modeled results and the observations, especially in zooplankton biomass changes. These differences will be important considerations to be addressed during a workshop on “*Modeling iron biogeochemistry and ocean ecosystems*” and a Topic Session on “*Synthesis of in situ iron enrichment experiments in the eastern and western subarctic Pacific*” at the next PICES Annual Meeting in Yokohama, Japan.



*Dr. Atsushi Tsuda (tsuda@ori.u-tokyo.ac.jp) is a plankton biologist specializing in experiment-oriented research on zooplankton ecology. He has worked at the Hokkaido National Fisheries Research Institute, and is now an Associate Professor at the Ocean Research Institute, University of Tokyo, Japan. His major scientific interests are the grazing ecology, patchiness, and life history patterns of copepods in the Oyashio region. Within PICES, he has been a member of the Advisory Panel on Iron Fertilization Experiment in the Subarctic Pacific Ocean (IFEP-AP) from 1998, and he was a member of the Biological Oceanography Committee from 1996-2003. Atsushi also serves as a member of the SOLAS Implementation Group 1 (IG-1) on Biogeochemical Interactions and Feedbacks Between Ocean and Atmosphere.*

*Dr. Shigenobu Takeda (atakeda@mail.ecc.u-tokyo.ac.jp) is an Associate Professor of Aquatic Biology and Environmental Science Laboratory, Graduate School of Agricultural and Life Sciences, University of Tokyo. His research interests include trace metals-phytoplankton interaction, biogeochemical cycles of iron, behaviour of silicon and other trace elements in the ocean. Shigenobu is the Co-Chairman of the PICES IFEP-AP and a member of the SOLAS Scientific Steering Committee.*

*Dr. Mitsuo Uematsu received his Ph.D. in geochemistry from Hokkaido University, Japan, in 1980. He worked on the Sea/Air Exchange (SEAREX) Program at the Center for Atmospheric Chemistry, Graduate School of Oceanography, the University of Rhode Island as a research associate from 1980 to 1987. Then he joined the new Department of Marine Science and Technology at the Hokkaido Tokai University until 1997. He is currently a Professor at the Center for International Cooperation, Ocean Research Institute, University of Tokyo. His major research focuses on the long-range transport of natural and anthropogenic substances over the ocean, marine aerosol properties and their impact on climate change. He is serving as the Vice-President of the Oceanographic Society of Japan, the Chairman of American Geophysical Union's regional advisory committee for Japan, and as a member of the SOLAS Scientific Steering Committee.*

*Dr. Mark Wells (mlwells@maine.edu) is an Associate Professor in the School of Marine Sciences, University of Maine, and Researcher in the Institute of Marine Science, University of California, Santa Cruz, U.S.A. His research specializes in the influence trace metal chemistry exerts on marine phytoplankton in coastal and oceanic waters and, in turn, how marine phytoplankton influence the chemistry and cycling of trace metals in the oceans. Within PICES, Mark is a member of the IFEP-AP since 1999, and a member of the newly established Section on Harmful Algal Blooms.*

*Dr. Maurice Levasseur (Maurice.levasseur@bio.ulaval.ca) is a Professor in the Department of Biology at Université Laval, Quebec, Canada, where he is the Canadian Chair on Climate Variability and Plankton Ecosystems. He is also the Chairman of the Canadian SOLAS Network (csolas.dal.ca). His research interests are the marine production of the climatically-active gases and the eco-physiology of harmful algal blooms. Maurice has been involved in activities of the PICES IFEP-AP and participated in both SERIES and SEEDS II expeditions. He also chairs the SOLAS Implementation Group 1.*



## NPAFC – PICES joint symposium

### *“The status of Pacific salmon and their role in North Pacific marine ecosystems”*

By Richard Beamish

Pacific salmon are the dominant daytime group of fishes in the surface waters of the subarctic Pacific. Pacific salmon are also the indicator of ecosystem health most familiar to the general public. The health of ecosystems has become a focus for most marine stewardship studies. Thus, it was natural, that the North Pacific Marine Science Organization (PICES), with its focus on marine ecosystems, and the North Pacific Anadromous Fish Commission (NPAFC), with its focus on Pacific salmon, would combine efforts to assess the current status of Pacific salmon and explore the possibility that Pacific salmon dynamics provide measures of the state of large marine ecosystems.

The NPAFC – PICES joint symposium on *“The status of Pacific salmon and their role in North Pacific marine ecosystems”* was held from October 30 to November 1, 2005, in the Lotte Hotel on beautiful Jeju Island, Republic of Korea. Vladimir Radchenko and Richard (Dick) Beamish co-chaired a steering committee consisting of: Jack Helle, Yukimasa Ishida, Ichiro Kanto, Vladimir Karpenko, Suam Kim, Chae Sung Lee, Katherine (Kate) Myers, Toru Nagasawa, Ian Perry, John Stein, and Vladimir Sviridov.

The symposium program was built around three main topics: (1) status of Pacific salmon, trends in abundance and biological characteristics; (2) role of Pacific salmon in the function of North Pacific marine ecosystems; and (3) Pacific salmon as indicators of climate variability in the North Pacific. There were 32 oral and 20 poster presentations. All presentations were in English. Presenters who did not have English as a first language did an excellent job of giving their papers clearly and, on occasion, passionately.

It was evident that Pacific salmon, in general, are very healthy. In recent years, the total catch throughout the distribution has been at historic high levels (Fig. 1). Well-researched papers on the status of individual species were presented by Vladimir Radchenko, Alexander Kaev, Masaaki Fukuwaka, Alexander Starovoytov, Douglas Eggers, William Heard and Leon Shaul. There were examples of some stocks that were in low abundance off the coasts of British Columbia, Washington and Oregon, but the general trend was towards higher abundances.

Kate Myers reviewed the distributions, migration routes, migration timing and feeding areas of Asian and North American Pacific salmon. She proposed that species, populations, age and maturity groups occupy different habitats in the open ocean, and these niches can change in response to climate changes. Several papers provided

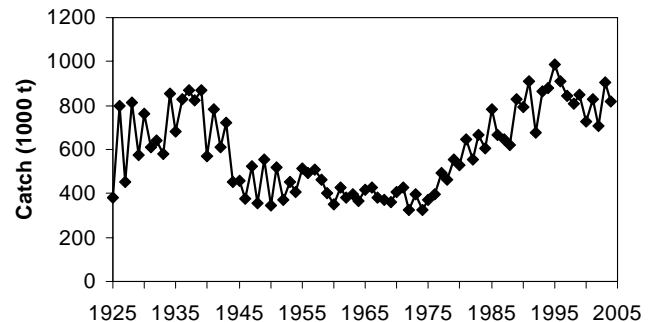


Fig. 1 The total catch of all species of Pacific salmon. The largest catch in history was in 1995 with the second largest in 2003. The preliminary catch in 2004 is slightly smaller than previous years because 2004 was the reduced abundance cycle for pink salmon from Russia.

convincing evidence that the long-term trend of decreasing individual size had reversed and average sizes were typical of lengths at the beginning of the decline. Some spectacular historic photographs of monstrous chinook salmon clearly showed that there were some stocks that have not recovered their historic growth patterns.

Franz Mueter showed that regional ocean scales of 500-800 km had similar impacts on the marine survival of salmon which was linked to ocean conditions early in the marine residence. There was also coherence in the ocean conditions that produced the best marine survival, and those conditions producing the poorest survival that were consistent with the positive and negative phases of the PDO, respectively. Mitsuhiro Nagata reported that hatcheries in Japan would get the best production when fry were released into ocean waters ranging from 7 to 12°C. Sukyung Kang and colleagues examined the ocean conditions that affected the run timing and biological characteristics of chum salmon from Korean hatcheries. The timing of the return to rivers is now about three weeks earlier than about 20 years ago. Masahide Kaeriyama looked specifically at the impacts of global warming on Pacific salmon of Asian origin. There was a better relationship between early marine survival and the coastal environment than the open ocean areas. Survival was related to growth in the coastal areas, and thus global warming impacts that affect the early rearing environment of chum salmon in the Sea of Okhotsk will have important impacts in Japanese chum salmon production. David Beauchamp showed how bioenergetic models can be used to identify the separate effects of temperature, food availability and food quality. Eventually, such models may

provide a method of forecasting the impacts of changes in coastal plankton composition, such as reported by Hiroki Asami and colleagues, and marine survival of Pacific salmon. Laurie Weitkamp and Joe Orsi stressed the importance of remembering that salmon species use their habitat differently. The different behaviour of coho and chinook is an important consideration when assessing the impacts of changing prey and predator distributions. Peter Lawson reported that the body weight increases could be an index of improved feeding conditions in the rearing areas of the various stocks. He also speculated that recent anomalies in trends of climate indices may be an impact of global warming. Edward Farley linked Pacific salmon early marine growth and recruitment through the critical size, critical period hypothesis. Results of studies of juvenile Bristol Bay sockeye, Prince William Sound pink salmon and coho from British Columbia showed that sufficient growth in the first marine summer was necessary for subsequent marine survival.

Diet studies are an essential contribution to the understanding of the linkage between ecosystems, ecosystem changes and Pacific salmon production. Detailed studies representing the results of extensive field research were presented by Vladimir Karpenko and Svetlana Naydenko. Many biologists continue to be amazed at the selectivity of some species and some stocks. Research is progressing on interpreting how the quality and the quantity of prey is linked to marine survival as reported by Edward Farley, Jack Helle, Mitsuhiro Nagata, David Beauchamp, Brian Beckman, and Vladimir Sviridov.

A number of papers described the factors that influence salmon distribution and the methods used to identify stocks and stock aggregates. Amazing progress has been made. Through cooperation and integration of research it has become possible to identify where stocks rear in the ocean seasonally for the entire period of their ocean residence. We are in the early stages of this research, but it is only a matter of money before we are able to use climate information to model how climate is affecting marine survival and migration timing. Dick Beamish, in his plea for improved communications with the general public and among us, pointed out the recent public outcry as sockeye salmon returning to the Fraser River did not do what was expected. Material presented at the symposium showed that it is possible to minimize these surprises in the future. The research by Japanese scientists that has worked out the movements of chum salmon from juveniles to adults impressed the audience as chum were shown to migrate south from the Bering Sea into the Gulf of Alaska in the winter and back to the Bering Sea in the summer. The new information on archival tags was reported by Robert (Trey) Walker. These vertical migration graphs always hold the attention of the audience as participants theorize in their own minds why salmon undergo these sometimes extensive vertical migrations.



*Symposium in session.*



*Symposium Poster session.*

A major threat to the future management of Pacific salmon is climate variability. Natural variability has several modes, but it is the regime scale that appears most influential for Pacific salmon. A number of speakers addressed the issue of the impact of climate variability but it was apparent that global warming impacts are not well discussion topic at the end of the symposium. What will the future oceanographic regime look like in the North Pacific? Will global warming enhance the natural cyclic changes or will winter storminess become weaker resulting in reduced mid-ocean upwelling and reduced Pacific salmon abundance?

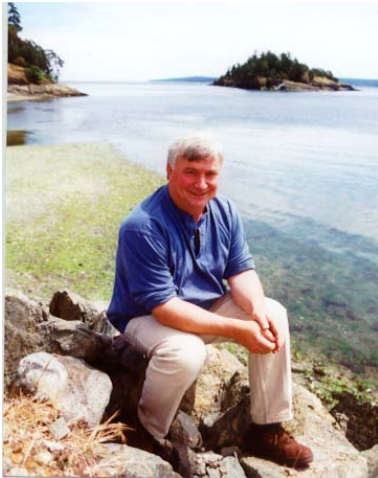
Climate change may affect the abundance of salmon predators. Several presenters from Russia provided perhaps some of the best information available on the types of predators and their impact. It was suggested that an atlas of salmon injuries, symptoms of disease and prevalence of parasites be produced. This suggestion was enthusiastically supported by the audience; but again, the limitation is money.



There were 20 posters, exactly the number that was planned. Typical of poster sessions, there was stimulating descriptions of experiments, expeditions and interpretations. Many of these posters will be written up for the publication.

The organization of the symposium and the setting for the meeting allowed for good discussion despite the ever-present language barriers. The NPAFC Secretariat, and

Vladimir Fedorenko, and Toshinori Uoya in particular, worked hard to provide flawless organization. There is no question that this was a successful symposium. Dick Beamish concluded that PICES and NPAFC are healthy organizations that are finding ways to complement each other's scientific strengths at a time that is exciting for researchers and potentially dangerous for salmon if we do not quickly work out how climate change will affect their productivity.



*Dr. Richard (Dick) Beamish is a fisheries scientist at the Pacific Biological Station Nanaimo, B.C., Canada. He represents Canada on a number of international commissions and is an editor for Transactions of the American Fisheries Society. In 2006 he will have worked for the Department of Fisheries and Oceans for 35 years and it will be time to decide what to do next. Currently, Dick is finishing some papers on the age determination of sablefish and rockfish and the pelagic life history of spiny dogfish. There are three or four new species of lampreys that also need to be reported. He is involved in the controversial topic of salmon farms and researches how their management can ensure that wild salmon are not harmed. A current project of great interest is the follow up from the Working Group 16 report on the impact of global warming on the key fisheries in the subarctic Pacific. Dick and a group of colleagues will hold a workshop in conjunction with the next PICES Annual Meeting in Yokohama, to detail how climate and ocean conditions have affected the production of species that make up the major fisheries in the North Pacific. This information will be the first step in an effort to provide a database that can be used by all scientists interested in developing forecasting models.*

## PICES Calendar

- A CCCC/CFAME Workshop on “A comparison of regional mechanisms for fish production: Ecosystem perspectives”, January 12-13, 2006, Tokyo, Japan;
- Panel discussions at the “Marine Science in Alaska” Symposium, January 25, 2006, Anchorage, U.S.A., and during the meeting of the North Pacific Fisheries Management Council, February 8, Seattle, U.S.A., to involve the Bering Sea and international communities in development of a set of operational objectives;
- Inter-sessional Science Board/Governing Council meeting, April 17-18, 2006, Honolulu, U.S.A.;
- PICES/GLOBEC symposium on “Climate variability and ecosystem impacts on the North Pacific: A basin-scale synthesis”, April 19-21, 2006, Honolulu, U.S.A.
- PICES/NPRB workshop on “Integration of ecological indicators for the North Pacific with emphasis on the Bering Sea”, May 31-June 2, 2006, Seattle, U.S.A.;
- PICES/GLOBEC Workshop to develop comparative studies of the sub-Arctic seas, June 12-14, 2006, St. Petersburg, Russia;
- Symposium on “Time series of the Northeast Pacific Ocean: A symposium to mark the 50<sup>th</sup> anniversary of Line-P” (co-sponsored by DFO Canada, PICES and CLIVAR), July 5-7, 2006, Victoria, Canada;
- CREAMS/PICES workshop and summer school on “Model-data inter-comparison for the Japan/East Sea”, August 2006, Busan, Korea;
- ICES/PICES theme sessions on “Large-scale changes in the migration of small pelagic fish and the factors modulating such changes” and on Operational Oceanography (title TBD) at the ICES Annual Science Conference, September 19-23, 2006, Maastricht, Netherlands;
- PICES Fifteenth Annual Meeting, October 13-21, 2006, Yokohama, Japan;
- International Conference on “The Humboldt Current system: Climate, ocean dynamics, ecosystem processes and fisheries” (co-sponsored with IMARPE, IRD, NASA, FAO, GLOBEC, ICES, PICES and IMBER), November 27-December 1, 2006, Lima, Peru;
- ICES/MBC/PICES Symposium on “Marine bioinvasions”, March 2007, Cambridge, U.S.A.
- 4<sup>th</sup> International Zooplankton Production Symposium on “Human and climate forcing of zooplankton populations” (co-sponsored by PICES, ICES and GLOBEC), May 28 - June 1, 2007, Hiroshima, Japan;
- PICES/ICES Young Scientists Conference on “New frontiers in marine science”, June 2007, Maryland / Washington D.C., U.S.A.;
- PICES XVI, October 26-November 4, 2007, Victoria, Canada;
- ICES/PICES/IOC Symposium on “Effects of climate change on the world’s ocean”, spring 2008, Gijón, Spain.

## New Chairman for the PICES Fishery Science Committee



Dr. Gordon H. Kruse was elected Chairman of the Fishery Science Committee in October 2005, at PICES XIV in Vladivostok, Russia. He has been active in FIS since 1995.

Gordon was born and raised in New Jersey. During childhood, he and his family spent many weekends near the ocean, where he developed an intensive curiosity in the sea and the creatures living in it. Academically, he particularly enjoyed and excelled in mathematics. By his junior year in college, he discovered fisheries oceanography as a career path that would allow him to tie all these interests together.

Gordon received his B.S. in Biomathematics from the Rutgers University in 1977, and his M.S. and Ph.D. degrees in Fisheries from the Oregon State University in 1981 and 1983, respectively. His graduate research involved effects of oceanographic conditions on spawning timing, growth, and recruitment of English soles off the Oregon coast. He received a NSERC postdoctoral fellowship to work on capelin with the Department of Fisheries and Oceans (Canada) in St. John's, Newfoundland, during 1983-1984.

He worked for the Alaska Department of Fish and Game in 1985-2001, and during most those years, he headed the State's marine fisheries research program. Since November 2001, he has been the President's Professor of Fisheries of the School of Fisheries and Ocean Sciences, located at the Juneau Center of the University of Alaska Fairbanks (UAF). At UAF, he has taught classes in Fisheries Oceanography, Fish Population Dynamics, Marine Ecosystems, and Management of Renewable Marine Resources.

Gordon's research interests are very broad, including stock assessment, population dynamics, fishery oceanography, and fisheries management. Since moving to Alaska, he

spent many years conducting applied research on crabs and other invertebrates in the Gulf of Alaska and Bering Sea. Currently, he is involved in a diversity of research projects dealing with groundfish, herring, sharks, crabs, salmon, sea lions, marine protected areas, and ecosystem-based fisheries management.

In addition to PICES, Gordon is very active in other international and U.S. national arenas. He often serves on steering committees and as editor for the Lowell Wakefield Symposia, an annual international marine science meeting held in Anchorage, Alaska. For example, he is currently the Chairman of the organizing committee for the upcoming symposium on "*Resiliency of gadid stocks to fishing and climate change*", to be held October 31 – November 3, 2006, in Anchorage. He also chairs the Scientific and Statistical Committee for the North Pacific Fishery Management Council, the organization that sets federal regulations for fisheries management off Alaska. He has served on two National Academy of Sciences committees, one examining the decline of Steller sea lions in Alaskan waters and the other on effects of trawling and dredging on seafloor habitats. He chairs the editorial board for the *Alaska Fishery Research Bulletin*. Among all these activities, Gordon derives the most joy from teaching and working with graduate students. He is confident that the fisheries profession will be in good hands in the future.

PICES thanks Dr. Yukimasa Ishida (National Research Institute of Fisheries Science, Yokohama, Japan) for his service to PICES as Chairman of the Fishery Science Committee (FIS) since 2002. Dr. Ishida led the Committee's activities, which included, among other things, the development of a Strategic and Action Plan for FIS. He will continue to contribute to PICES as a member of Science Board and FIS.



*Dr. Yukimasa Ishida, outgoing FIS Chairman, is receiving a PICES Service Award from Dr. Kuh Kim, Science Board Chairman, at the PICES XIV Closing Session.*



# The state of the western North Pacific in the first half of 2005

By Toshiyuki Sakurai

## Sea surface temperature

Figure 1 shows monthly mean sea surface temperature (SST) anomalies in the western North Pacific from January to June 2005, computed with respect to JMS's (Japan Meteorological Agency) 1971-2000 climatology. Monthly SSTs are calculated from JMA's MGDSST (Merged satellite and *in-situ* data Global Daily SST), which is based on AVHRR/NOAA data, microwave sensor (AMSR-E/AQUA) data, and *in situ* observations. Time series of 10-day mean SST anomalies are presented in Figure 2 for 9 regions (indicated in the bottom panel).

In January and February, SSTs were generally above normal in the seas adjacent to Japan, except around 40°N, 145°E. Positive SST anomalies exceeding +1°C were found around 25°N, 130°E, and west of the northern part of Japan. These positive SST anomalies were reduced in magnitude in March and April.

SSTs were below normal north of 30°N in May, and negative SST anomalies exceeding -1°C were found along 40°N. The negative SST anomalies changed to positive values from west of the northern part of Japan to the East

China Sea (regions 1, 2, 3 and 5 in Fig. 2) in June. Positive SST anomalies exceeding +1°C were found around 28°N, 155°E and along 20°N from 170°E to 180°, while negative SST anomalies exceeding -1°C prevailed along 40°N east of 160°E and around 28°N, 130°E.

## Kuroshio and Oyashio

The Kuroshio took a large-meander path from July of 2004 through the first half of 2005. The most southern position of the meander gradually moved eastward from about 137.5°E in January to about 138.5°E in June. The Kuroshio path showed an S-shaped curve around 139°E, where small perturbations propagated eastward along the Kuroshio, clearly observed from mid-March to early April and from late April to early May (Fig. 3).

Figure 4 shows subsurface temperature at a depth of 100 m east of Japan in March 2005. This chart is based on the numerical ocean data assimilation system (JMA's Ocean Comprehensive Analysis System).

The Oyashio cold water (defined as temperatures less than 5°C in Fig. 4) is known to extend southward at its

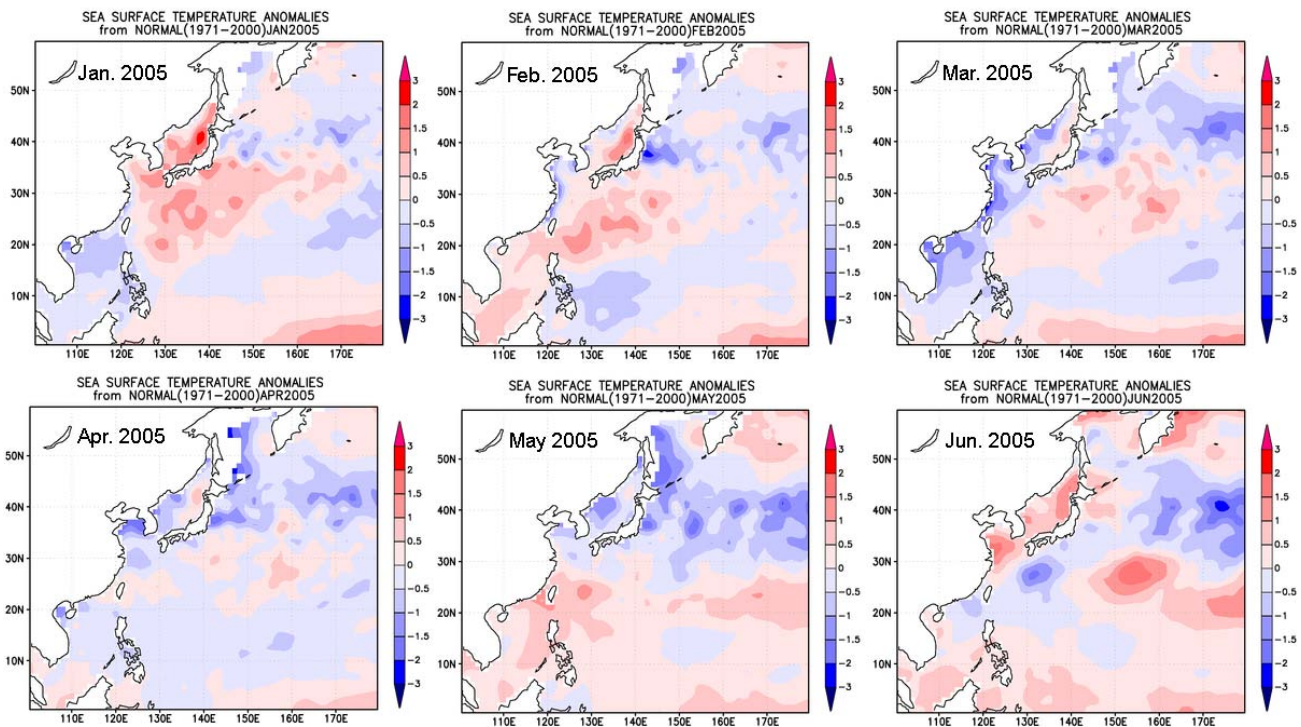


Fig. 1 Monthly mean sea surface temperature anomalies (°C) from January to June 2005. Anomalies are deviations from JMA's 1971-2000 climatology.

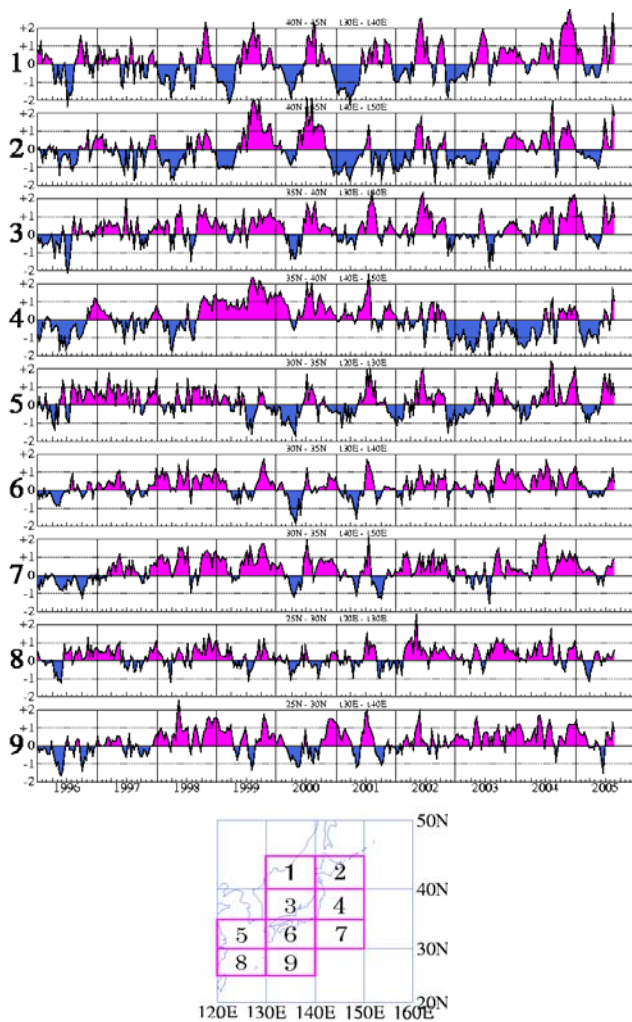


Fig. 2 Time series of the 10-day mean sea surface temperature anomalies ( $^{\circ}\text{C}$ ) from JMA's 1971-2000 climatology for the areas shown in the bottom panel.

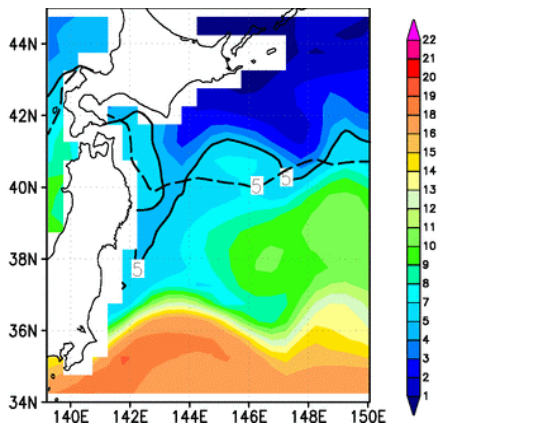


Fig. 4 Subsurface temperature ( $^{\circ}\text{C}$ ) at a depth of 100 m east of Japan for March 2005. Solid line denotes the  $5^{\circ}\text{C}$  isotherm, and dashed line that of the climatology (30-year averaged values from 1971 to 2000).

southernmost position in the spring, and return northward from summer to autumn. The coastal branch of the Oyashio cold water extended southward significantly in March 2005 (black line in Fig. 5), while it returned close to the 30-year averaged latitude after April (green line in Fig. 5). The southernmost latitude in March was  $36.7^{\circ}\text{N}$ ,  $141.6^{\circ}\text{E}$ , which is 200 km south of the 30-year averaged value.

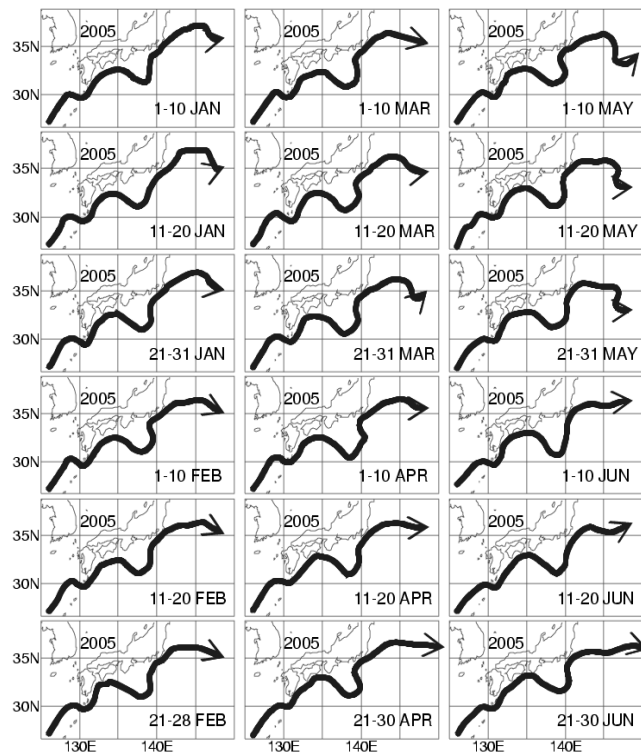


Fig. 3 Location of the Kuroshio axis from January to June 2005.

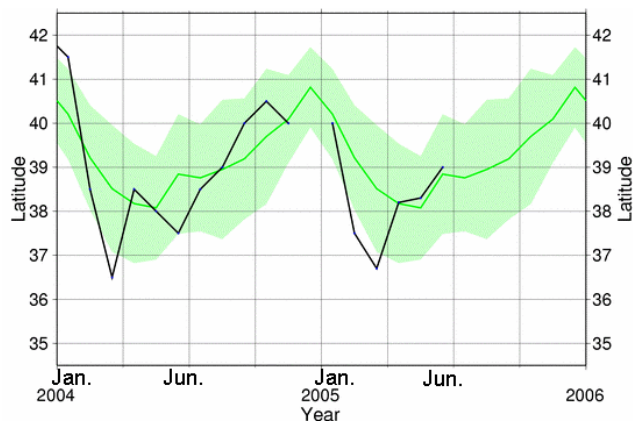


Fig. 5 The southernmost position of the coastal branch of the Oyashio cold water from January 2004 to June 2005 (black line), and the 30-year averaged values (green line), with the range of one standard deviation (green shade) from 1971 to 2000.



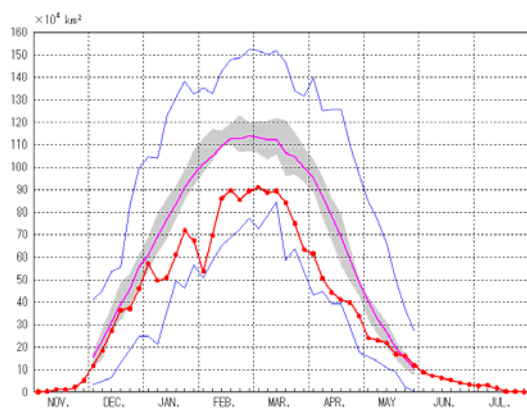


Fig. 6 Time series of sea ice extent in the Sea of Okhotsk from November 2004 to July 2005 (pink line - JMA's 1971-2000 climatology; red line - 2004-2005 analysis; blue lines - maximum/minimum of sea ice extent since 1971; grey area - within the normal range).

### Sea ice in the Sea of Okhotsk

The extent of sea ice in the Sea of Okhotsk was below normal (30-year averaged values from 1971 to 2000) in late December 2004 and from mid-January 2005 to early May 2005 (Fig. 6). On February 5, the sea ice area was  $53.8 \times 10^4 \text{ km}^2$ , which was about half of the normal area, and the second lowest value since 1971 (the lowest value on February 5 was  $50.75 \times 10^4 \text{ km}^2$  in 1996). The sea ice area reached its maximum on March 5 at  $91.13 \times 10^4 \text{ km}^2$ , which was about 74% of the normal area, and the second lowest value since 1971 (the lowest value was  $85.81 \times 10^4 \text{ km}^2$  in 1984).



Mr. Toshiyuki Sakurai ([tsakurai@met.kishou.go.jp](mailto:tsakurai@met.kishou.go.jp)) is a scientific officer of the Office of Marine Prediction at the Japan Meteorological Agency (JMA). He is working as a member of a group in charge of oceanic information in the western North Pacific. Using a new "Ocean Comprehensive Analysis System" (in operation since January 2001), this group produces surface and subsurface temperature, salinity and current maps with  $0.25 \times 0.25$  resolution in waters adjacent to Japan. Monthly averaged fields obtained from the system are included in the "Monthly Ocean Report" published by JMA. Mr. Sakurai is now involved in developing a new daily analysis system for sea surface temperature in the global ocean, using in situ observations and data from several satellites with infrared and microwave sensors.

## Latest and upcoming PICES publications

### PICES Scientific Report Series, 2005

- King, J. (Ed.) 2005. Report of the Study Group on Fisheries and Ecosystem Responses to Recent Regime Shifts. *PICES Sci. Rep.* No. 28, 162 p.
- Jamieson, G. and Zhang, C.I. (Eds.) 2005. Report of the Study Group on Ecosystem-Based Management Science and its Application to the North Pacific. *PICES Sci. Rep.* No. 29, 72 p.
- Brodeur, R. and Yamamura, O. (Eds.) 2005. Micronekton of the North Pacific (Working Group 14 Final Report). *PICES Sci. Rep.* No. 30, 115 p.
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- Marine Ecosystems of the North Pacific. 2004. *PICES Spec. Publ.* No. 1, 280 p.
- Perry, R.I. and McKinnell, S.M. (Eds.) 2005. Marine Life in the North Pacific: The Known, Unknown and Unknowable. *PICES Spec. Publ.* No. 2, 46 p.

### Special issues of primary journals, 2005-2006

- Linkages between open and coastal systems (Guest Editors: S. McKinnell and G. McFarlane) - *Deep-Sea Research II*. 2005. Vol. 52, Nos. 5-6, pp. 665-843.
- Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else? (Guest Editors: G. Hunt and S. McKinnell) - *Progress in Oceanography* (May/June 2006).
- Hot spots and their use by migratory species and top predators in the North Pacific (Guest Editors: W. Sydeman, A. Bychkov, R. Brodeur, C. Grimes and S. McKinnell) - *Deep-Sea Research II* (May/June 2006).
- Selected papers on NEMURO and NEMURO.FISH models (Guest Editors: S.I. Ito, M. Kishi, B. Megrey and F. Werner) - *Ecological Modelling* (2006).

### Other publications, 2005

- PICES Advisory Report on Fisheries and Ecosystem Responses to Recent Regime Shifts in the North Pacific. 2005, 12 p.
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## Recent trends in waters of the subarctic NE Pacific

By William Crawford and Marie Robert

### Warm near-surface waters

Near-surface waters of the northeast Pacific Ocean have been unusually warm since the summer of 2004. Figure 1 reveals this warming through a sequence of plots of temperature anomalies for the summers of 2004 and 2005, plus winter 2005. The summer temperatures have warmed significantly since 2001, with almost no observations of colder-than-normal temperatures in 2004 and 2005.

Anomalies are computed relative to a climatology of median values for all observations in the U.S.A. and Canadian data archives<sup>1</sup>. Briefly, within-year median values are computed first, then intra-annual medians. Shelf, slope, and mid-gulf climatologies are computed separately. Summers of major El Niño and La Niña years are excluded. Summer is defined as August 1 – September 30; winter is January 1 to March 31. Data from coastal observations of the summer of 2005 were not available at press time, but Line-P and Argo profiles provided many deep-sea and some coastal observations for this summer.

Temperatures at 10-m depth were selected to enable better comparison between ship-based and Argo measurements. Argo profiles report at only one depth between ocean surface and 10-metres, so the ocean surface observation is always an extrapolation from a deeper layer, whereas the temperature at 10-m depth is an interpolation of measurements between two depths. The Canadian Coast Guard Ship (CCGS) *John P. Tully*, the base for most deep-sea observations in these plots, collects profile observations off its stern where surface waters are normally mixed in the upper 5 to 8 metres. Measurements at 10-m depth are less impacted by this mixing.

The summer of 2004 was warmest ever<sup>1</sup> observed along Line-P. The comparable calculations for the summer of 2005 are not yet available, but Figure 1 indicates it was warm. A look at depth distribution of temperature and salinity anomalies along Line-P is provided in Figure 2. Warm surface waters extend to about 50-m depth. These surface waters are also fresher.

### Spring of 2005 a disaster for seabirds

Unprecedented numbers of dead seabirds were found along the US west coast from California to Washington in spring, and chick survival was a record low from California to northern Vancouver Island (Canada). The cause is suspected to be reduced food supply in winter and spring due to the absence and delay of upwelling winds along this coast. Figure 3 indicates warm waters on the west coast of Vancouver Island all through the first six months of 2005. Warmer temperatures are an indicator of enhanced

downwelling or reduced upwelling on the continental shelf. Normally, in the spring and summer, winds blow southward along the Pacific Coast and push warmer surface

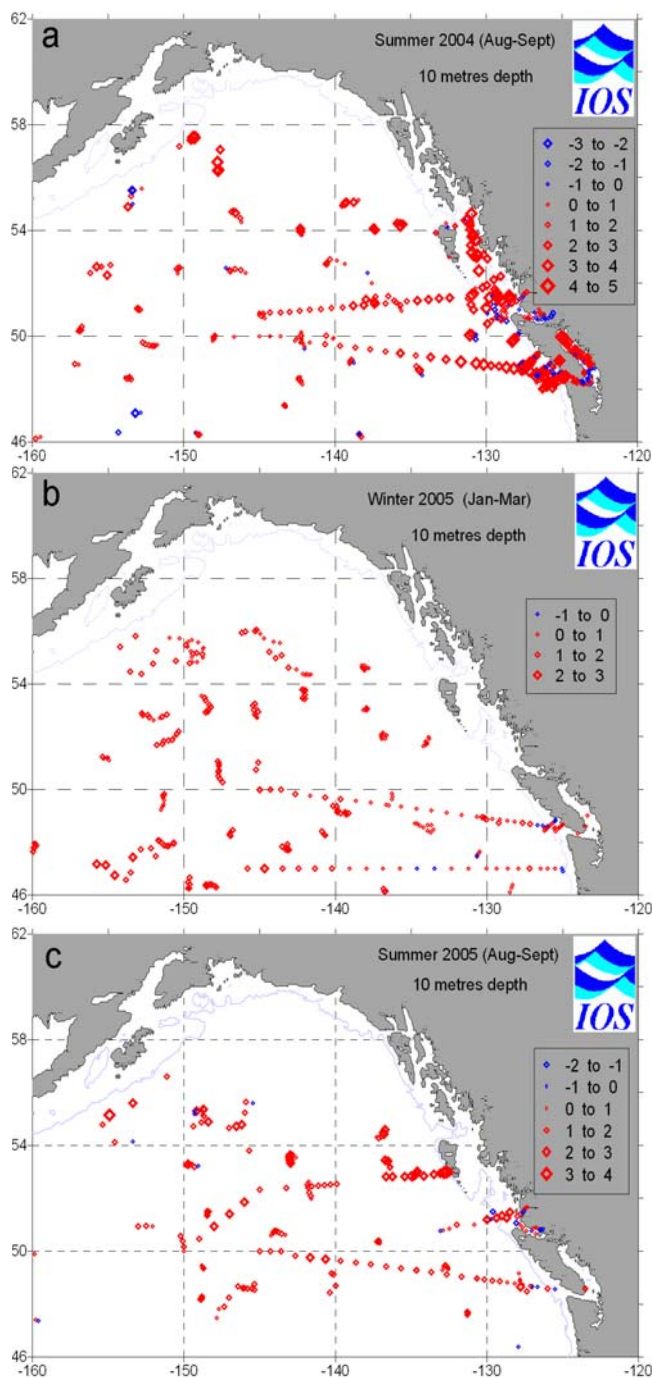


Fig. 1 Maps of temperature anomalies at 10-m depth in (a) summer 2004, (b) winter 2005, and (c) summer 2005. Observations in 2004 and 2005 are mainly ship-based CTD profiles and Argo measurements.



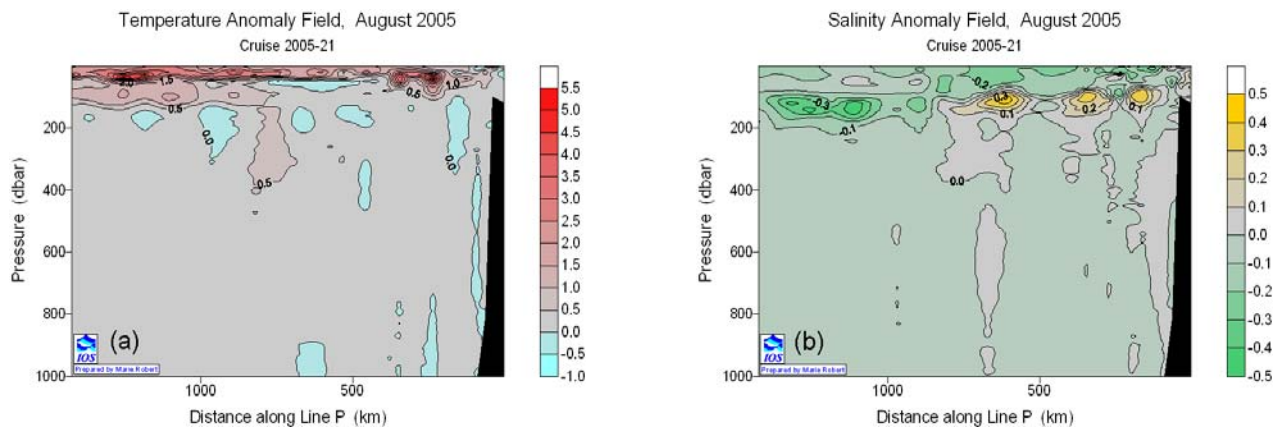


Fig. 2 Anomalies of (a) temperature and (b) salinity measured along Line-P by the CCGS John P. Tully. Units are degrees C for temperature and psu for salinity.

waters away from shore, allowing colder, nutrient-rich water to well up to the surface and support phytoplankton blooms, which in turn stimulate a food chain that provides food for seabirds. Upwelling winds turned on in mid-July 2005, and subsequent oceanographic cruises found ample plankton on the continental shelf, whose arrival was too late for seabird chicks hatched in spring.

Several ship-based surveys along the Washington coast and southern British Columbia coast reported fewer numbers of juvenile salmon in some stocks than in previous years. We might expect these stocks to be reduced in numbers when they return to spawn.

<sup>1</sup> Crawford, W.R., J. Galbraith, N. Bolingbroke. Anomalies of Line-P ocean temperatures since 1950. *J. Geophys. Res.*, submitted in August 2005.

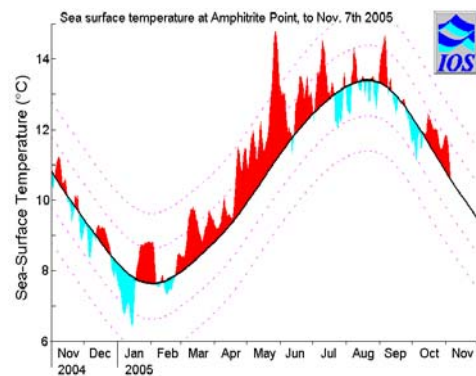


Fig. 3 Temperatures at Amphitrite Point on the west coast of Vancouver Island, Canada. Red and blue shading denotes anomalies from long-term temperatures. Dashed lines denote 1 and 2 standard deviations from the annual cycle.



Dr. William Crawford ([crawfordb@pac.dfo-mpo.gc.ca](mailto:crawfordb@pac.dfo-mpo.gc.ca)) works as a research scientist for Fisheries and Oceans Canada at the Institute of Ocean Sciences (IOS). Bill leads the State of the Ocean Section of IOS, researching the movement and impacts of moving water masses in the Gulf of Alaska and Canadian coastal waters. He has chaired the Canadian Fisheries and Oceanography Working Group for the past two years, editing its annual State of the Ocean Report. This report compiles changes in marine temperatures, salinity, nutrients, seabirds, phytoplankton and fish in Canadian West Coast waters. Bill is a member of the PICES CFAME Task Team, serves as the Canadian member of the Pacific Panel of CLIVAR, and is one of two Canadian representatives on the International Association of Physical Oceanography.



Marie Robert ([robertm@pac.dfo-mpo.gc.ca](mailto:robertm@pac.dfo-mpo.gc.ca)) is a physical oceanographer working at the Institute of Ocean Sciences, Fisheries and Oceans Canada. She is responsible for the Line-P program, coordinating research activities of this project, leading the cruises and creating on-line products. She was also involved in the Subarctic Ecosystem Response to Iron Enrichment Study (SERIES project), part of Canadian-SOLAS. Marie also designed and created the website for Deep-Sea Research Part II: Haida Eddies special issue.

## The Bering Sea: Current status and recent events

By Jeffrey M. Napp

### *Current status of the Bering Sea ecosystem*

“It was a dark and stormy night...” I do not know how many of you remember the Peanuts comic strip by Charles Schultz that was syndicated and translated into many different languages for newspapers around the world. Schultz’s character, Snoopy, was a dog, who in this particular instance, wanted to be a famous writer of fiction. He was always trying to start a mystery novel and wanted to do so with great flair. “Dark” and “stormy” were meant to foreshadow something ominous and foreboding. Storminess, however, may have a bad rap – in the eastern Bering Sea (as in other large highly stratified continental shelves) storminess has a beneficial quality – it replenishes nutrients and continues “new” production. The eastern Bering Sea used to be much more stormy than it is today. Wind data from St. Paul Island and from NOAA’s Mooring 2 in the southeastern middle shelf (56.88°N, 164.03°W) have shown that the spring and fall are much less stormy now than in the 1970s and 1980s, resulting in a much longer summer quiescent period. While those of us who venture out on ships in the Bering Sea have welcomed this change, it is most likely not without consequences to the ecosystem and its living marine resources. During this past year, however, the Bering Sea experienced increased storm activity in the spring and fall. An early calm period allowed the water column to stratify, and the spring phytoplankton bloom occurred in early May, several weeks earlier than in recent non-ice years. However, unlike other recent years where the bloom rapidly dissipated after sending excess production to the seafloor, storms and mixing rebooted the system, and high levels of phytoplankton were observed after two storms immediately following the initial bloom. Thus, this year we anticipate that total annual production was higher and the contribution of the spring production to annual production may have been greater. Fall wind mixing also seemed earlier this year, with several NOAA programs experiencing more difficult working conditions and more days lost to weather. The impacts of the storm on the food web and upper trophic level productivity have yet to be assessed, but events in 2005 do provide a good contrast to what has happened in recent years.

Water temperatures continue to be warmer on average than the long-term mean (Fig. 1), and sea ice did not penetrate the southeastern portion of the shelf in the winter of 2004/2005. The summer groundfish survey by NOAA’s Alaska Fisheries Science Center proceeded faster than usual due to exceptionally good weather, and scientists remarked that there seemed to be more young cod this year than in the recent past.

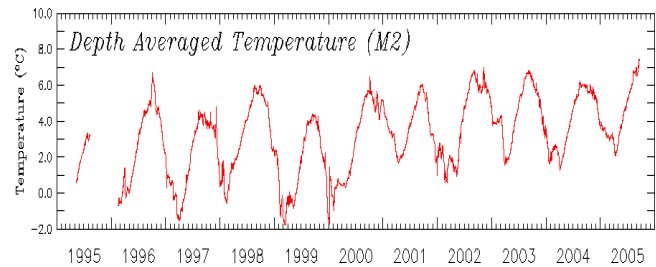


Fig. 1 Average water column temperature in the southeastern Bering Sea from 1995 – 2005 as measured at the Mooring 2 site. Source: P.J. Stabeno, NOAA – PMEL.

### **BASIS**

The Bering Aleutian Salmon International Study (BASIS) is an international research program sponsored by the North Pacific Anadromous Fish Commission (NPAFC). Participants are: Canada, Japan, the Republic of Korea, the Russian Federation, and the United States of America. Japan, the Russian Federation and the United States have conducted BASIS surveys since 2002, and have provided quasi-synoptic sampling of a large portion of the Bering Sea. In addition to surface trawls for salmon, each member country conducts a variety of “other” sampling. This ancillary sampling has become a valuable source of ecosystem information because of the large areas covered and the timing of the surveys. For example, on the eastern side of the Bering Sea, the Auke Bay Laboratory of NOAA’s Alaska Fisheries Science Center carries out its BASIS surveys in late summer/early fall (August, September, early October), a time when very few other programs are making observations. In addition to reporting salmon catch, they also report the abundance of juvenile walleye pollock captured in the salmon trawl, and hydrography and plankton concentrations. Based on a cursory look at the trawl data, in 2005, the young-of-the-year pollock were distributed more uniformly in the northern half of the sampling grid (north of Nunivak Is.) than in 2004 (Fig. 2). In the southern half of the survey, they were most abundant in the middle and outer shelf domains in 2005, as opposed to 2004, when the maximum abundances were in the vicinity of the 50 m isobath (Inner Front). Total CPUE for the two years was similar, and the pollock lengths from the trawl were slightly larger in 2005 than in 2004. Juvenile sockeye salmon catches were higher and more broadly distributed across the shelf (not shown). Anecdotally, the numbers of Pacific cod caught in these trawls may have increased in 2005 over 2004, and the total biomass of jellyfish caught by the trawl was similar to that in 2004, with the notable absence of the very large jellyfish catches that were obtained at a few stations in 2004.



BASIS scientists also commented that the fall storm season seemed to have started earlier in 2005 than in either 2003 or 2004.

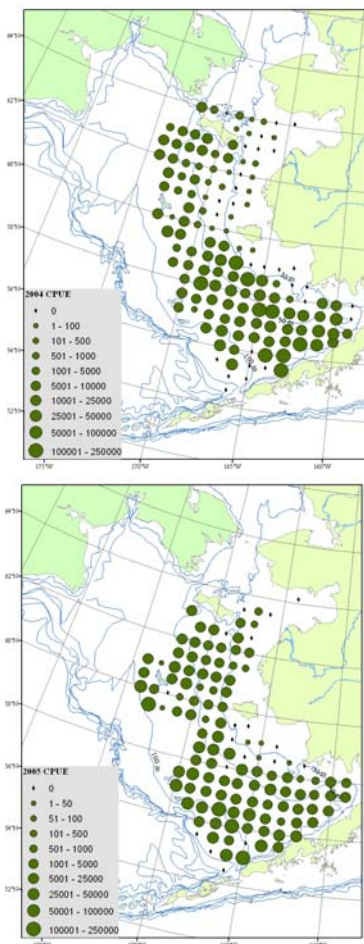


Fig. 2 BASIS catch per unit effort (CPUE) of young-of-the-year walleye pollock. Top panel - 2004; Bottom panel - 2005. Source: J. Murphy (AFSC).

### Future research

Expectations for future research in the eastern Bering Sea are running high with recently

completed calls for proposals from two U.S. funding entities, the North Pacific Research Board (NPRB) and the Arctic Section of the Office of Polar Programs, National Science Foundation (NSF). The NPRB solicitation of proposals was for retrospective work and modeling work, although other areas were included. NPRB will develop its integrated ecosystem research plan for the Bering Sea in the coming year. Next year's call for proposals will target those areas specified by the research (e.g., field-oriented process studies). The NSF call was for a 3-year field program, beginning in spring 2007 and running through 2009. Proposals were to include funds for a write-up and synthesis year in 2010. The NSF announcement of opportunity was in support of the Bering Ecosystem Study (BEST) Program. The successful proposals for both NPRB and BEST will be announced in spring 2006. BEST is a U.S. component of the GLOBEC regional program, Ecosystem Studies of Sub-Arctic Seas (ESSAS) [See the article in this issue of PICES Press on the PICES-GLOBEC workshop on the sub-arctic seas scheduled for June 2006 in St. Petersburg, Russia. More information on BEST can be found at: <http://www.arcus.org/Bering/index.html>. The ESSAS website is: <http://www.pml.ac.uk/globec/structure/regional/essas/essas.htm>.

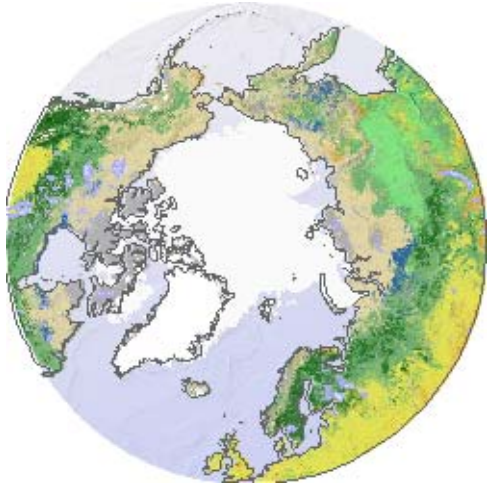
Researchers working in the eastern Bering Sea have become increasingly concerned at the effects of loss of sea ice in that region. Within the last year several meetings have been held among interested parties to share ecosystem observations and discuss ways of coordinating research in the region. Participating in the discussions were representatives of: Alaska Ocean Observation System (AOOS), Bering Ecosystem Study, NOAA's Alaska Fisheries Science Center (AFSC), NOAA's Pacific Marine Environmental Laboratory (PMEL), North Pacific Research Board, University of Alaska, U.S. Fish & Wildlife Service, U.S. Geological Survey, and U.S. Arctic Research Commission. The group continues to meet and will soon have several products available for the community (an overview paper and website listing cruises, field camps and aerial surveys). Note that NOAA researchers plan to lead an oceanographic cruise to the ice edge in the spring of 2006, to begin collecting data to better understand the role of sea ice in the eastern Bering Sea ecosystem. Proposed sampling on the cruise includes hydrography, ice cores, phyto-, zoo-, and ichthyoplankton, fisheries hydroacoustics, seabird surveys and marine mammal surveys and tagging.

*Acknowledgement: Many thanks to the following people who helped create this report: Drs. Lisa Eisner (AFSC) and George Hunt, Jr. (Univ. Washington), and Kristin Ciciel, Stan Kotwicki, Angela Middleton, and Jim Murphy (AFSC).*



*Dr. Jeffrey (Jeff) Napp (Jeff.Napp@noaa.gov) is a Biological/Fisheries Oceanographer at the Alaska Fisheries Science Center of NOAA-Fisheries. He is Head of the Recruitment Processes Program at the Center and co-leader (with Dr. Phyllis Stabeno) of NOAA's Fisheries Oceanography Coordinated Investigations (FOCI). His own research is focused on physical and biological processes at lower trophic levels that affect recruitment variability in fish populations. He was active as Principal Investigator in both Bering Sea (NOAA's Bering Sea FOCI, Southeast Bering Sea Carrying Capacity) and Gulf of Alaska (FOCI, GLOBEC) Programs, and currently serves on a Science Steering Committee to implement a U.S. science initiative for the Bering Sea (BEST: Bering Ecosystem Study). Jeff is the current Chairman of the PICES MONITOR Technical Committee.*

## PICES and GLOBEC to sponsor workshop on sub-arctic seas



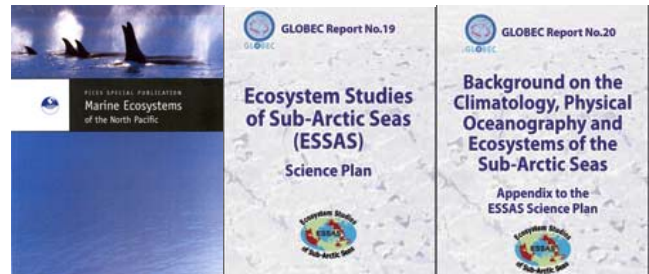
PICES and GLOBEC International will jointly sponsor a workshop to compare four sub-arctic marine ecosystems, those of the Okhotsk Sea/Oyashio region, the Bering Sea, the Newfoundland/Labrador Shelf and the Barents Sea. The workshop will be held in St. Petersburg, Russia, from June 12-14, 2006, and will provide a foundation for the new GLOBEC regional program, Ecosystem Studies of Sub-Arctic Seas (ESSAS), which is to develop an understanding of how climate variability, at a number of temporal scales, will influence the sustainable productivity of the sub-arctic seas.

PICES and ESSAS share the goal of developing comparative studies of the sub-arctic seas and understanding how climate variability will affect their productivity and ability to support sustainable commercial and subsistence harvests. The goals of the workshop will be:

- To lay the groundwork for developing the data sets needed to achieve the appropriate comparisons; and
- To commence developing the teams necessary to synthesize available data and develop models for predicting the effects of climate variability on these ecosystems.

It is expected that the workshop will build upon extant syntheses and on-going and planned synthesis efforts. For example, the synthesis in the PICES North Pacific Ecosystem Status Report (PICES Spec. Publ., No. 1; [http://www.pices.int/publications/special\\_publications/NP\\_ESR/2005/npesr\\_2005.aspx](http://www.pices.int/publications/special_publications/NP_ESR/2005/npesr_2005.aspx)), and the ESSAS Science Plan and the Appendix to the ESSAS Science Plan (GLOBEC Reports Nos. 19 and 20; <http://www.pml.ac.uk/globec/structure/regional/essas/essas.htm>) that assembled data from each of the sub-arctic seas should provide much basic information. Additionally, papers such as those by Aydin *et al.*, examining the similarities and differences between the eastern and western Bering Sea (Aydin, K.Y., Lapko, V.V., Radchenko, V.I., and Livingston. P.A. 2002. A

Comparison of the eastern Bering and western Bering Sea shelf and slope ecosystems through the use of mass-balance food web models. *U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-130*, 78 p.), Hunt and Megrey's comparison of the Bering and Barents Sea ecosystems (Hunt, G.L., Jr. and B.A. Megrey. 2005. Comparison of the biophysical and trophic characteristics of the Bering and Barents Seas. *ICES J. Mar. Sci.*, 62: 1245-1255), and the recent work by Ciannelli *et al.* (In Press) comparing the Barents Sea and the Gulf of Alaska systems, will provide a solid basis for moving forward with the analyses of these ecosystems. The workshop will also take advantage of advances made in a planned PICES January 2006 workshop on developing indices for North Pacific comparisons, and the results of workshops in the Norwegian funded program, Norway-Canada Comparisons of Marine Ecosystems (NORCAN), to be held in the autumn of 2005 and the late spring of 2006. The NORCAN workshops will develop specific plans for comparisons between the Barents Sea and the Labrador Shelf, including the use of biophysical models, and will initiate research on physical forcing, zooplankton dynamics and climate impacts on fish populations in these sub-arctic seas.



Many of the synthesis products available to date have provided excellent compendia of information about a particular sub-arctic ocean basin, but few have explicitly compared mechanisms and responses to climate forcing across basins or between Atlantic and Pacific systems. If the comparative method is to be used successfully, it will be necessary to identify important underlying structuring features of the ecosystems and how climate forcing, acting on those mechanisms, will result in ecosystem change. It will also be necessary to develop data sets that can be used in predictive modeling efforts. These data sets will have to be sufficiently closely aligned that inter-regional comparisons will be fruitful. Although all ecosystems are unique, there must be a search for basic elements common to many, if not all, that can be usefully employed in a comparative approach.

The proposed workshop will be a significant step in achieving the goals of the PICES CFAME (Climate Forcing and Marine Ecosystem Response) Task Team of putting "Particular emphasis on testing ecosystem-level

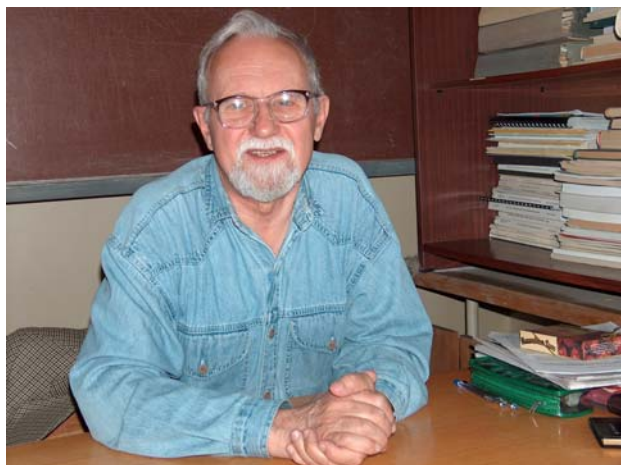


hypotheses, through review and examination in a collaborative environment, of (i) comparisons between regional and/or basin ecosystems, (ii) linkages in time, space, or seasonality between climate and ecosystems, and (iii) responses of regional ecosystems to basin-scale forcing.” The workshop will, through its review of the existing syntheses of North Pacific data sets and comparisons with data from North Atlantic systems, provide a solid basis for the development of revisions and updating of the first version of the PICES North Pacific Ecosystem Status Report.

The workshop will consist of a very few talks about the different regions on the first day, and then a series of

discussions, some in breakout groups, focusing on the mechanisms by which climate variability affects the sub-arctic seas. To promote open discussions, the number of participants will be limited. People interested in attending the workshop should contact George Hunt (geohunt2@u.washington.edu), with a brief statement of interest, by March 1, 2006. The co-conveners (George Hunt and Ken Drinkwater), with the aid of the ESSAS Scientific Steering Committee, will develop a list of invited attendees, and will then notify applicants of the availability of space and their acceptance for the workshop. It is hoped that the process of selecting invitees will be completed by March 15, 2006, to facilitate the making of travel arrangements.

## Professor Mikhail N. Koshlyakov - 75



*Professor Mikhail Koshlyakov in his office at the P.P. Shirshov Institute of Oceanology (Moscow, Russia, 2005).*

In November 2005, friends and colleagues of Professor Mikhail N. Koshlyakov at the P.P. Shirshov Institute of Oceanology (Russian Academy of Sciences) and beyond, celebrated his 75<sup>th</sup> birthday. Being most famous for his contribution to the discovery of mesoscale (synoptic) eddies, that largely changed physical oceanography of the 20<sup>th</sup> century, Mikhail Koshlyakov is an ideologist, initiator, organizer and participant of many field experiments. Among them is a unique set of polygon study areas (including the Soviet component of the US/USSR POLYMODE project), which, first, proved the very existence of mesoscale oceanic eddies all over the world oceans and, later, provided knowledge on important dynamics of their interaction with fronts and large scale

currents. In 1997, Professor Koshlyakov received the highest oceanographic award of the Russian Academy of Sciences - the Prize of Admiral S.O. Makarov.

Since the very beginning of the World Ocean Circulation Experiment (WOCE), Professor Koshlyakov played an important role in advancing national participation in this epic international project. He was a member of the WOCE International Working Group on the Southern Ocean (1990-93), a member of the WOCE International Scientific Steering Committee (1993-97), and Chairman of the Russian National WOCE Committee (1993-97). In 1992, the cruise of R/V *Akademik Ioffe* under his leadership carried out one of the most difficult hydrographic surveys in the Southern Ocean.

Until recently, Professor Koshlyakov was Head of Laboratory of Marine Currents at the P.P. Shirshov Institute of Oceanology. After stepping down from this position, he keeps working productively on the dynamics of and water mass formation in the Southern Ocean. For nearly forty years, his lectures at the Moscow Institute of Physics and Technology have continued to inspire undergraduate students to choose oceanography for their life-time career. Many of his former students are now working in leading oceanographic institutions of Russia, republics of the Former Soviet Union, Canada, the United States, France and other countries. Contributors to the “*Oceanology*” journal know him as a highly professional and friendly Deputy Editor.

A more complete biography of Professor Koshlyakov is in preparation for the next issue of the PICES Press.

## Obituary - Dr. Al Tyler



*Al and Nancy at their Salt Spring Island home.*



*Old friends: Al and Vera.*



*Al and Nancy on their scotch whisky tour in Scotland.*

On September 7, 2005, PICES suffered the loss of a loyal friend, with the unexpected death of Al Tyler. Al died peacefully in his sleep at his home on Salt Spring Island, British Columbia. He was thoroughly enjoying his new life there, engaging in all his favorite pastimes. Prior to his retirement in 1992, he had served as Associate Dean of the School of Fisheries and Ocean Science at the University of Alaska Fairbanks for ten years, and during that time we had developed not only a smooth and effective working relationship, but Al and Nancy and I had also developed a strong friendship. I had visited them on the island only a few weeks before Al's death.

Al took part in many PICES Annual Meetings, and served as the Chairman of the Bering Sea Working Group (Working Group 5), producing a hard cover book on "Dynamics of the Bering Sea." Published by PICES in 1999, this book was a timely milestone in the synthesis of rapidly accumulating research results.

Al was born in Philadelphia and spent his young years there, ultimately going to the University of Pennsylvania, where he met and married Nancy. They moved to Canada for the completion of his doctoral work. His highly productive career included ten years with the Department of Fisheries and Oceans Canada at Nanaimo, and ten years at the Oregon State University, before joining the University of Alaska Fairbanks. During these decades, Al

conducted research and published many significant papers, and served as mentor for many younger colleagues. I recall, however, that he was happiest when working with students. He took a personal interest in their progress, and, even though his position with us did not require it, taught popular and innovative fisheries courses, bringing in experts to lecture from as far and wide as China and Japan. At the time of his death, he was completing a textbook on fisheries, designed to bring into the curriculum all aspects of fisheries rather than just the biological.

Al had many interests. One I shared with him was a love of really fine single malt scotch whisky. One spring, Al and Nancy and I spent two weeks in Scotland exploring this interest. He was also an excellent chef, specializing in Indian curries. He had done some serious studying on the subject, and produced a wonderful little cookbook. He was also a talented painter. With retirement, he finally was able to enjoy all these activities, as well as daily hikes and bird walks. Sadly, this period of his life was cut short. He will be greatly missed.

In addition to his wife, Nancy, Al is survived by his daughter Ellen and husband Halfdan; daughter Jeanne and partner Patrick; son Paul and partner Jacqueline; and grandchildren Mikael and Hildur.

*Vera Alexander  
Chairman, PICES*

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