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REPORT OF OPENING SESSION

The Opening Session was called to order on October 13, 2003, at 9:00 a.m. The Chairman, Dr. Vera Alexander, welcomed delegates, observers and researchers to the PICES Twelfth Annual Meeting, and noted that due to unforeseen circumstances, the officials from the People's Republic of China were not present at the Opening Session.

Welcome address on behalf of the Government of the Republic of Korea

Dr. Alexander asked Mr. Young-Nam Kim, Acting Minister of the Ministry of Maritime Affairs and Fishery, to welcome participants on behalf of the host country (*OP Endnote 1*).

Remarks by representatives of Contracting Parties and the Chairman of PICES

Dr. Alexander called upon Dr. Laura Richards (Regional Director of Science, Pacific Region, Fisheries & Oceans Canada) to make a statement on behalf of the Canadian Government. Dr. Richards addressed the session and her remarks are appended to the report in *OP Endnote 2*.

Dr. Alexander invited Dr. Tokimasa Kobayashi (Director, Resources Enhancement Promotion Department, Fisheries Agency, Japan) to speak on behalf of the Japanese Government. Dr. Kobayashi addressed the session and his remarks are appended to the report in *OP Endnote 3*.

Dr. Alexander then asked Dr. Lev N. Bocharov (Director, TINRO-Center, State Committee of Fisheries, Russian Federation) to speak on behalf of the Russian Government. Dr. Bocharov addressed the session and his remarks are appended to the report in *OP Endnote 4*.

Dr. Alexander called upon Dr. Richard J. Marasco (Director, Resource Ecology & Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service, U.S.A.) to make a statement on behalf of the U.S. Government. Dr. Marasco addressed the session and his remarks are appended to the report in *OP Endnote 5*.

Dr. Alexander invited Mr. Choon-Sun Kim (Director General, Marine Policy Bureau, Ministry of Maritime Affairs and Fisheries, Republic of Korea) to speak on behalf of the Korean Government. Mr. Kim addressed the session and his remarks are appended to the report in *OP Endnote 6*.

Dr. Alexander thanked Mr. Young-Nam Kim, Mr. Choon-Sun Kim and all the delegates for their remarks and spoke on behalf of PICES. The text of her address is appended to the report in *OP Endnote 7*.

Wooster Award presentation ceremony

Dr. Alexander invited Dr. Ian Perry, the Science Board Chairman, to conduct the Wooster Award presentation ceremony.

Dr. Perry reminded the audience that in October 2000, PICES announced a new award that will be given annually to an individual who has made significant contributions to North Pacific marine science, such as understanding and predicting the role of human and climate interactions on marine ecosystem production. The award was named in honour of 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 consists of a commemorative plaque and travel support to attend the following PICES Annual Meeting in order to receive the award. A permanent plaque identifying Wooster Award winners resides at the PICES Secretariat in Sidney, British

Columbia, Canada. Dr. Perry also noted that the late Professor Michael M. Mullin (U.S.A.) and Dr. Yutaka Nagata (Japan) were honoured with the Wooster Award in 2001 and 2002, respectively, and quoted the following citation from Science Board for the 2003 Wooster Award:

The Wooster Award is to be given annually to an individual who:

- *has made significant contributions to North Pacific marine science;*
- *has achieved sustained excellence in research, teaching, administration or a combination of these in the area of 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.*

PICES Science Board is pleased to confirm Dr. William (Bill) Pearcy as the recipient of the 2003 Wooster Award.

Dr. William Pearcy is a world-renowned authority on many aspects of biological oceanography, in particular his extensive work on fishes and squids in the North Pacific. He has made significant contributions to many areas of marine research, including fisheries oceanography, the ecology of deep-sea and open ocean fishes and squids, the trophic dynamics of marine fishes, and pollution and trace metals in the marine environment. He is perhaps best known recently for his contributions to understanding all aspects of Northeast Pacific salmon during their ocean phase. He has over 150 publications in many of the major scientific journals, including Science *and* Nature. *He has demonstrated sustained excellence in teaching during his years as a professor in the College of Oceanic and Atmospheric Sciences at Oregon State University, where he was major advisor for over 30 graduate students and a committee member for at least 50 more. He has served on numerous international committees, including those of PICES. He was involved with PICES and its committees very early on, and he gave the keynote address at the 1997 PICES Annual Meeting on his work on salmon in the North Pacific. Since his retirement, he has worked tirelessly on a State panel to examine ways to restore natural runs of salmon to Oregon. Science Board is very pleased to name him as the recipient of the PICES Wooster Award for 2003.*

Then Dr. Alexander read a note from Dr. Warren Wooster:

I cannot remember when I first met Bill Pearcy, but twenty years ago we first interacted on the question of environmental variability and its effects on fisheries. In May 1983, we convened a workshop at the University of Washington to review existing knowledge on ocean and fish variability and to develop a strategy for investigation of the interactions. In November that year, Bill Pearcy at Oregon State University held another workshop, on the influence of ocean conditions on the production of salmonids in the North Pacific. These two workshops and the resulting publications focused attention on the importance of environmental influence on marine ecosystems.

Bill Pearcy has been a pioneer in what I like to call "salmon oceanography". Students of these charismatic fish have had a curious fixation on the fresh water phase of their life, after which the fish just disappeared into the black box we call the ocean. As an oceanographer, Bill knew that life in the black box was important to salmon, and was interesting, and complex, as he, with his students and colleagues have successfully demonstrated. This work has exemplified the spirit of PICES where fishery science is intimately linked with the other disciplines necessary for ecosystem studies - meteorology and climatology, oceanography of the several flavors (physical, chemical, biological) and ecology in the broader sense. Of course, as the Science Board citation makes clear, Bill Peary's interests are by no way limited to salmon or even to fish. His scientific perspective, both broad and deep, makes him a worthy recipient of the PICES Wooster Award for 2003.

Dr. Alexander presented a commemorative plaque to Dr. George Boehlert who read a brief acceptance from Dr. William Pearcy.

This is indeed a great honor! And I deeply regret not being here. Grape harvest and a visit from distinct friends have intervened.

This is not just a prestigious honor for me - it is for all my colleagues, students and friends that have inspired, collaborated and helped me throughout my years in science. This includes many PICES scientists, including many here today. It includes colleagues on PICES and SCOR Working Groups, and my Japanese friends from the University of Tokyo and Hokkaido University, and the crews aboard many cruises of the Oshoro Maru.

And I especially thank my loyal friend, Papa Wooster, father of PICES, for this award and for a number of other reasons. Warren prompted me to give the lectures for his series on recruitment fishery oceanography at the University of Washington. This resulted in my little book on "Ocean Ecology of North Pacific Salmonids", published in this series by Washington Sea Grant. He also encouraged my participation in workshops and subsequent publications in "Interannual Variability of the Environment and Fisheries of the Gulf of Alaska and the Eastern Bering Sea" (1983) and "El Niño North, Niño Effects in the Eastern Subarctic Pacific Ocean" (1985). The 1982-83 El Niño was a nail in the coffin that the ocean had an unlimited carrying capacity for salmonids and as a result stimulated a surge in research on the importance of the ocean lives of anadromous salmonids—research that is prolific today.

I consider Warren to be the venerable, world renowned fishery oceanographers of the 20th and now the 21st centuries. He has made grand contributions to the world organization and community of oceanographers and marine biologists. He is an inspiration for all of us. Banzai, Warren!

PICES "Year-in-Review" 2003

Dr. Perry reviewed PICES' scientific accomplishments since the Eleventh Annual Meeting (*OP Endnote 8*).

Keynote lecture

The Science Board Chairman introduced the keynote speaker, Prof. Suam Kim (Pukyong National University). Prof. Kim gave a keynote lecture titled "Application of otolith chemistry to interpret some issues on oceanic variability and fisheries". The abstract of his presentation is appended to the report in *OP Endnote 9*.

The Opening Session closed at 11:00 a.m.

OP Endnote 1

Welcome address on behalf of the Government of the Republic of Korea by Mr. Young-Nam Kim

Madam Chairman, distinguished delegates, ladies and gentlemen:

I am honored to make this welcoming address to you at the Twelfth Annual Meeting of PICES. On behalf of the Government of the Republic of Korea, let me extend a warmhearted welcome to each and every one of you participating in this event.

The importance of the oceans is emphasized in the 21st century, because the oceans are regarded as the solution to humankind challenges, such as possible scarcities of food and resources and threats to the environment. It goes without saying that we should continue to conduct research on the oceans and develop marine science and technology. At the same time, we need to manage our marine affairs in order to reduce pollution levels and ecological destruction. This involves instituting proper controls over the use and development of marine resources.

Also, we need to establish a system that facilitates joint international research and cooperation. That is essential if we are to efficiently manage oceanic issues such as protecting the environment, and conserving and developing marine resources. But we can be optimistic about these challenges when we reflect on the activities fostered by PICES since its establishment in 1992. The Organization has set examples for others to follow.

The PICES member countries have come a long way in collecting and exchanging information on the marine environment in the North Pacific. At the same time it has collected valuable information through joint international research on marine life, ecological system and changes in the global climate.

I would like to take this opportunity to express my sincere respect and gratitude for the member countries and scientists. They have made many valuable contributions to the development of PICES, despite many difficulties that came along with that progress.

My Ministry plans to continue to increase our investment in the marine science sector and push ahead with diversified policies conducive to sustainable use and conservation of the oceans. We are also committed to faithfully fulfilling our obligations as a member country by positively taking part in the various activities of PICES, including joint international research. I hope that this Annual Meeting will facilitate the exchange of useful information and ideas.

Finally, I would like to thank the officials concerned, including the PICES Secretariat, who spared no effort in setting up this Annual Meeting.

I hope your stay in Korea will be a pleasant and rewarding experience. Thank you.

OP Endnote 2

Remarks at the Opening Session by Dr. Laura Richards (Canada)

Madame Chairman, distinguished guests and colleagues:

On behalf of Canada and the Canadian delegation, I would like to thank the Government of the Republic of Korea, the Ministry of Maritime Affairs and Fisheries and the Korea Ocean Research and Development Institute (KORDI) for inviting us here to Seoul.

It is my great pleasure to offer best wishes to KORDI on the occasion of KORDI's 30th anniversary. This is a special year since it marks the 40th anniversary of Canada's formal diplomatic relations with the Republic of Korea. We also look forward to working with Korea as a new member this year of the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean.

Last week, I had the honor of visiting Pukyong National University and the National Fisheries Research and Development Institute in Busan, where I was able to see, first hand, Korea's remarkable progress in marine science. This progress bodes well for our continuing work together within PICES.

International collaboration is essential for addressing global problems like climate change and the sustainability of marine ecosystems. I know that all of you are aware of the need for strong international collaboration. The progress that PICES has made on the North Pacific Ecosystem Status Report is a testament to the willingness to collaborate within PICES.

Earlier this year at the interim Governing Council meeting, we agreed to develop a strategic plan to help us prepare for an organization well placed for the future. I look forward to these discussions over the next week. Let's build on our successes to ensure a vibrant PICES organization!

OP Endnote 3

Remarks at the Opening Session by Dr. Tokimasa Kobayashi (Japan)

Chairperson, distinguished delegates, guests, colleagues, ladies and gentlemen:

First of all, on behalf of the Japanese delegation, I would like to express sincere thanks to the Government of the Republic of Korea, the Ministry of Maritime Affairs and Fisheries, the Local Organizing Committee, and all those who have worked so hard to host this meeting and organize all the events. We are sure that all your diligent and excellent efforts will make this meeting a great success.

I want to say how pleased we are to participate in this PICES Twelfth Annual Meeting in Seoul, and to give our thanks for providing us with this wonderful opportunity to interact with all PICES colleagues.

Over the time past, since PICES was established in 1992, the Organization has been challenging important issues on marine science by establishing the functional standing scientific committees, task teams, working groups, and *ad hoc* groups. The activities of PICES have multiplied and extended in depth through developing collaborations with many international scientific organizations. And of course, I would like to emphasize that the efforts of member countries of PICES have pushed up its activities and make PICES a splendid and flexible body.

Last year, in the opening remarks, I mentioned that the role of fisheries production is getting bigger and bigger for human beings, and more suitable and sustainable utilization of marine living resources is required. Recently a shocking report was released that marine living resources, particularly industrially important species have decreased to one tenth in the last fifty years in the world. Under this situation PICES is expected to lead the scientific investigation on this issue to clarify the mechanism of fluctuation of marine living resources from the scientific view, particularly based on the relationship between the ocean environmental change and the marine ecosystem in the North Pacific and its adjacent seas. And it is also expected to promote the research on the human activities that may affect marine ecosystem and living resources such as over fishing or excessive protection. I believe that to grapple with these issues will be a scope of PICES activities when we consider the PICES Strategic Plan.

In Japan, reformation of the national scientific organization has been proceeding, and national universities are going to be outstanding executive agencies, independent from direct connection with the government, from next April. And just 12 days ago, the Japan Fisheries Research Agency has combined two corporations, such as the Japan Marine Resources Developing Center and the Japan Sea Farming Association. By taking advantage of this opportunity, Japan would also like to encourage the mutually beneficial collaboration through many joint activities with PICES member countries.

Finally, I am sure this Twelfth Annual Meeting will be highly successful through the efforts of all of the participants who will be working together. Thank you for your attention.

OP Endnote 4

Remarks at the Opening Session by Dr. Lev N. Bocharov (Russian Federation)

Distinguished Acting Minister, Mr. Young-Nam Kim, distinguished Madam Chairman, Vera Alexander, esteemed participating national representatives, esteemed members of the local Meeting organizing committee, participants, ladies and gentlemen:

First of all let me thank you on behalf of the Russian delegation for the opportunity to take part in this Annual Meeting, and also for the opportunity to visit Seoul once again, in this beautiful country of Morning Freshness.

I would like to emphasize the excellent work of the Local Organizing Committee (Ministry of Maritime Affairs and Fisheries and KORDI), and appreciate their tremendous efforts made to successfully host this meeting.

Over the past eleven years, the scope of PICES activities has multiplied. Extensive and elaborate work is being done now even between the Annual Meetings. PICES is being more and more attentively regarded by the international scientific community. The proof is the presence of many observers from international scientific and public organizations concerned with the exploration of the Oceans, who are here today.

I am very glad to see here the scientists who recently visited Vladivostok in June 2003, and took part in the Third PICES Workshop on "The Okhotsk Sea and adjacent areas". More than a hundred scientists from Russia, Canada, United States of America and Japan participated in it. During this last workshop, many questions about the recent state of the Okhotsk Sea's ecosystems were discussed.

I would like to make a special note of the tight cooperation between PICES and the North Pacific Anadromous Fish Commission. Complex research work in areas including the Bering Sea is conducted under NPAFC's BASIS Program, and I believe close cooperation between PICES' CCCC Program and NPAFC's BASIS Program will be mutually beneficial to both organizations.

In the opinion of the Russian delegation, the integration of scientists' efforts from various countries in important ocean research projects is very crucial. It is also essential to integrate efforts of international organizations in this context. The World Ocean is great and many-sided. Here is enough work for everyone.

We have a lot of tasks to accomplish during this Annual Meeting. It will take too much time to list them now. Let's keep the time and our strength for finding successful solutions. Good luck to the Meeting and thank you.

OP Endnote 5

Remarks at the Opening Session by Dr. Richard Marasco (U.S.A.)

Chairperson, distinguished delegates, ladies and gentlemen:

On behalf of the United States and the United States delegation, I would like to thank the Government of the Republic of Korea, MOMAF and KORDI for inviting us to Seoul. The United States delegation is very appreciative of both our hosts' efforts to organize this meeting and their wonderful expressions of hospitality.

The theme of this PICES Twelfth Annual Meeting "Human dimensions of ecosystem variability" is a very timely one. That humans are components of the ecosystems they inhabit and use seems obvious, but it is often overlooked. Frequently, in discussions of ecosystems the world is divided into "the ecosystem" and "the users of the ecosystem". Such a division is artificial and can lead to the absurd conclusion that the best way to achieve sustainability of an ecosystem is to keep people out of it. Humans are integral parts of the ecosystems they inhabit and use. Their actions on land and in the oceans affect the ecosystems, just as changes in those ecosystems affect humans.

Society over the last two decades has increasingly recognized the importance of marine ecosystems, the need to sustain them, and the vital links between terrestrial and marine

systems. The value of the world's ecosystem services has been estimated at 16 to 54 trillion dollars U.S. per year, with over half of the value being derived from marine ecosystems.

During the first decade of the 21st century, a large challenge will be to implement a truly integrated ecosystem management approach for living marine resources. Within this context, the United States is working to achieve a balance between the use and protection of coastal and marine resources to ensure their health, sustainability, and vitality for today's and tomorrow's generations. To achieve this difficult goal, it is necessary to predict how the levels of goods and services provided by an ecosystem might change when a variety of ecosystem characteristics change naturally or are altered by human action. Such predictions need more field information and better models.

The PICES Science Board Symposium this year directly addresses this theme of "human dimensions of ecosystem variability" and highlights the scientific efforts the international community is making to understand and separate climate variability from human-induced sources. Other topic sessions and workshops will also provide more detailed examinations of various aspects of human and climate influences on ecosystems of the North Pacific. The North Pacific Ecosystem Status Report will provide an important summary of the status and trends of our marine ecosystems and will help us move towards a common understanding of the factors influencing ecosystem change. It is important that PICES scientists continue these efforts to provide advice that will assist PICES member nations in designing management strategies that take ecosystem factors into account. A traditional Asian coastal proverb used to guide traditional fishing activities still applies today, "Where there is water there is fish; if we take care of the water, the fish will take care of us.

Thank you.

OP Endnote 6

Remarks at the Opening Session by Mr. Choon-Sun Kim (Republic of Korea)

Chairperson, distinguished delegates, ladies and gentlemen:

I am deeply honored to speak on behalf of the Korean delegation. As you may know, this is the second Annual Meeting of PICES to be held in Korea.

I would like to express a warmhearted welcome to all of you on behalf of the Government of the Republic of Korea and the Korean delegation. And I would like also to thank those at the PICES Secretariat for their efforts in setting up this Annual Meeting.

In the past decade, PICES has made great strides in enhancing the marine research conducted by its member countries. Much good work has been done through the Annual Meetings, workshops and symposia, as well as the facilitation of international cooperation in marine affairs. Through such activities of PICES, humankind is now in a much better position to understand the oceans and matters related to them.

However, this summer, as typhoon "Maemi" inflicted severe damage on Korea's southeastern coast, I realized how the sea remains a mostly unknown world. Korea suffered considerable loss of life and property, despite our best efforts to minimize the losses. This experience makes us remember that we have a long way to go in understanding marine phenomena and taking proper measures to deal with them.

In this regard, the future activities of PICES should be carried out so that we can meet the new demand for marine research. We will need to set up programs to ensure sustainable marine development. We will need to focus on the sector of operational oceanography that

comprises the provision of oceanic and meteorological materials.

I want to take this opportunity to promise, on behalf of the Government and the people of the Republic of Korea, that we will actively participate in the Annual Meeting and programs dealing with the future directions and activities of PICES. I sincerely hope that this Annual Meeting in Seoul will be an arena for all of you to freely exchange your opinions and information.

Again, I welcome each and every one of you to Seoul and hope you will have opportunities to enjoy the best season of the year in Korea. Thank you.

OP Endnote 7

Welcome Address by Dr. Vera Alexander, Chairman of PICES

Acting Minister, Mr. Young-Nam Kim, distinguished participants, ladies and gentlemen:

I am here to welcome the PICES community to the Organization's Twelfth Annual Meeting, to thank our hosts for their hospitality and hard work, and to celebrate the progress that PICES has been making in advancing our understanding of the North Pacific Ocean system.

I feel very humble. The confidence and trust placed in me by the PICES delegates requires, in turn, a high degree of responsibility. Not only to them, but also to our PICES ancestors. Let me spend a few minutes on this topic. Even since the celebrated Tenth Anniversary Meeting, PICES has been making progress. For example, we are about to produce a Status of the North Pacific Ecosystem report, a living document that will evolve along with PICES scientific advances. We are developing a Strategic Plan. Yet it all hangs on the momentum afforded by the founders, and, in particular, Dr. Warren Wooster, who had the dream. It is now up to us to fulfill this dream. Let me put it into my own words:

The vast Pacific Ocean laps against the shores of all PICES nations, which are magically united together to pursue its secrets – the details on how and why it functions. This powerful union produces results far beyond the reach of individual nations, and yet produces the information each and every one will need to manage its marine affairs.

Herein lies the relevance of PICES. Our understanding of the factors that control fish stocks, recruitment, ecosystem structure and function, responses to climatic variability and the driving forces and scales of change themselves is being turned upside down. We are undergoing a regime shift in knowledge - essential knowledge to our contracting parties. The human and economic benefits are enormous. I separate the two, because they are not always synonymous.

Dr. Warren Wooster and many others, some with us today, spent more than ten years incubating and hatching PICES, and as the first Chairman, he guided it through its early development. His excellent leadership was followed by Chairmen who perpetuated and advanced the development – first Dr. William Doubleday, and, most recently, Dr. Hyung-Tack Huh. PICES has been blessed with excellent leaderships at all levels – Governing Council, Science Board, F&A, Committees, Working Groups. We have an excellent Secretariat. The future looks rosy.

PICES is a scientific organization, and I believe that the most important activities are those carried out by the Scientific Committees, their Working Groups, but also the proceedings during the scientific sessions at the Annual Meeting. The Science Board plays the role of consolidating this activity as well as leading it. The job of the Governing Council is to make these activities possible through oversight and

responsible management. It is our responsibility to see that the work of PICES proceeds smoothly and effectively. Delegates must work together towards this end, always keeping in mind the purpose of PICES.

As we continue developing strategy for the future, we will keep in mind that the contracting parties, the PICES nations, deserve an organization that is responsive and relevant, one that provides knowledge and understanding in a timely way.

OP Endnote 8

PICES "Year-in-Review" 2003 by Dr. Ian Perry, Chairman of Science Board

PICES continued its high rate of productivity in 2003, with publications, meetings, and extended contacts with other international marine science organizations. Primary publications were produced with papers presented at PICES meetings over the past two years: in the *Canadian Journal of Fisheries and Aquatic Sciences* from the 2001 FIS Topic Session on "Migration of key ecological species in the North Pacific Ocean"; in *Deep-Sea Research II* on "North Pacific biogeochemical processes"; in *Journal of Oceanography* from the 2002 Symposium on "North Pacific transitional areas"; in *Progress in Oceanography* from the 2001 BIO Topic Session on "Plankton size classes, functional groups and ecosystem dynamics" which was dedicated to the memory of the late Prof. Michael Mullin; and in *Marine Environmental Research*, with the studies from the 1999 MEQ Practical Workshop on "Interdisciplinary assessment of marine environmental quality in Vancouver Harbour". Two reports were published in the PICES Scientific Report Series, from Working Group 13 on *CO_2 in the North Pacific* to summarize the research and technical activities that have been conducted by member nations of PICES, and to synthesize CO_2 data and provide a comprehensive picture of the anthropogenic CO_2 distribution in the North Pacific; and from BASS and MODEL Task Teams of the CCCC Program to summarize efforts on trophic modelling of the Subarctic Pacific Basin ecosystems. An external review of the PICES publication program counted 65 publications (14 peer-reviewed) in six different publication series over the history of PICES, and concluded that this was exceptional, in particular for such a small Secretariat staff.

In addition to the Twelfth Annual Meeting in Korea this year, PICES co-sponsored 5 "significant" other meetings (in which "significant" is defined as lasting more than 3 days). These included a MODEL workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model", which took place in Japan and was co-sponsored by the Nakajima Foundation; a 5-day inter-comparison workshop on "Underway and drifting/moored pCO_2 measurement systems" also in Japan, which was co-sponsored with other Japanese agencies; a major symposium on "The role of zooplankton in global ecosystem dynamics: comparative studies from the world oceans", held in Spain with the co-sponsorship of GLOBEC and ICES; the 3rd PICES workshop on "The Okhotsk Sea and adjacent areas", held in Russia; and a workshop on "The development of the North Pacific Ecosystem Status Report", held in Canada. In addition, a number of shorter workshops were convened, several in conjunction with the Annual Meeting in Seoul. These are identified in the Report of Science Board later in this Annual Report.

The North Pacific Ecosystem Status Report Working Group continued to develop its report, and a draft was presented at the Annual Meeting for review and comments by the various PICES Scientific Committees and CCCC Program, and PICES scientists at large. One of the issues identified in this report is that of data availability and exchange. TCODE has been active in this regard, supporting and encouraging scientists to submit information about their data ("meta-data") to the North Pacific Ecosystem Metadata Base (http://www.pmel.noaa.gov/np).

In April 2003, PICES held its first ever joint meeting of Science Board and Governing Council. The report of this meeting is published elsewhere in this Annual Report. To highlight two items: the position of Vice-Chairman of Science Board was created, with the duties of assisting the Science Board Chairman in representing PICES at meetings, preparation of meeting materials, and in decisions that must be made between meetings of Science Board. Dr. Vladimir Radchenko (Russia) was elected as the first Vice-Chairman of Science Board. A Study Group on *PICES Strategic Issues* was formed consisting of members from both Science Board and Governing Council, and charged with developing a draft Strategic Plan which will map the future directions for PICES, and eventually lead to development of an Action Plan. This draft Strategic Plan is noteworthy by advocating an "advice" function for PICES: not advice about "tactical" short-term issues such as fisheries management quotas, but advice about "strategic" issues such as productivity regimes. In fact, PICES received a formal request for such advice in September of this year.

PICES continues to build strong relationships with other international marine science organizations by attending their meetings and promoting collaborative activities. These include the International Council for the Exploration of the Seas (ICES), the Intergovernmental Oceanographic Commission (IOC), the International Geosphere-Biosphere Program (IGBP), the Scientific Committee on Oceanic Research (SCOR), the North Pacific Anadromous Fish Commission (NPAFC), and the Climate Variability (CLIVAR) program of the World Climate Research Program (WCRP).

The current success of PICES is built upon

scientific excellence such as publications, working group activities, workshops and symposia;

scientific capacity, including the willingness and commitment of the scientists and others interested in the North Pacific (and elsewhere) to devote time and effort to the work of PICES, and a strong PICES Secretariat; and

scientific advice which, as mentioned, is not short-term advice on fisheries management issues such as quotas, but advice on broad issues of concern to North Pacific marine science, whether specifically requested or not.

A PICES built fully on these three pillars will be a substantial, active, and exciting organization now and into the future.

OP Endnote 9

Application of otolith chemistry to interpret some issues on oceanic variability and fisheries
Extended abstract of the keynote lecture by Prof. Suam Kim (Pukyong National University)

Recently, the issues on climate change become not only scientific interests but also societal, economical and political importance. In the last 50 years, air-temperature in Seoul has increased. The rate of increase was 0.23 degree Celsius per decade, and the sharpest increase is since the 1980s. Temperature increase is not a phenomenon confined to Korea only. The temperature record since the mid-19th century indicated the increasing pattern of world air-temperature. Such climate changes have caused the changes in terrestrial as well as marine ecosystems. For example, growth, species composition, distribution, and abundance are always changing due to abiotic variability. Scientists have searched any evidence for detecting climate and ocean changes, and fish otolith was regarded as one of the best tools to interpret oceanic variability.

With the advance of instrumental technology, chemical analysis of fish otolith has been in the spotlight of ocean sciences. Otolith is the stone-like material in the inner ear that plays a role in the balancing and hearing sense of animals. The major component of an otolith is calcium carbonate, but some minor and trace elements including stable isotopes occupy around 3% of

the otolith. It grows continuously from birth. Because its components, mainly derived from water, are chemically inert after formation, scientists use the micro-chemistry of the otolith as a chronological recorder. Thus otolith contains information about the whole life of the animal as an environmental recorder and timekeeper. The changes in chemical composition might reflect the environmental variability of the animal's habitat and its behavioral characteristics.

Otolith chemistry research can be broken down into two fields: isotope analysis and trace element analysis. Stable carbon isotopes are generally precipitated in isotopic disequilibrium with the ambient seawater, but are influenced by metabolic processes, somatic growth and food changes. It is well known in marine science that the difference in stable isotope contents in otolith indicates the difference in oceanic productivity, status in trophic level, spawning grounds, and habitat temperature. Also, stock identification, fish migration route, and physiological changes with age can be inferred by the changes in the trace element ratios. In particular, strontium has a good potential to reveal information about fish habitats. Recent advances in Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS) have allowed fine scale examination of trace elements in otolith. Pacific salmon are noted for their extensive ocean migrations and successful homing to their natal rivers. Salmon are important to the economies, cultural activities, and heritage of the people of the North Pacific Rim. Chum salmon otoliths were collected from four sites along the Pacific Rim: Korea, Japan, Canada, and the USA during 1997-1999. Whole otoliths of adult salmon were ground, and the oxygen and carbon stable isotope analysis indicated that those four stocks had different values of stable isotopes. In general, the Asian and the American salmon can be separated by isotope values. The Asian salmon always shows a high oxygen stable isotope and a low carbon stable isotope. Because the high oxygen stable isotope means low habitat temperature, the habitat temperature of Asian salmon is lower than that of American salmon. For carbon stable isotope, there are some different views in interpreting. However, if we could accept its difference as productivity difference, we might say that the habitat of American salmon is more productive than that of Asian salmon. Also, the content of stable isotope varies with life stage. In addition to the adult salmon otolith, we collected fry otolith at hatchery and juvenile otolith from scientific cruises at sea. Stable isotopes tend to increase as they grow.

The laser-beam technology with ICPMS shows the profiles of elemental concentration in otolith. Profile starts from the nucleus of the otolith to the rim. From this profile, the age and residence areas of salmon might be identified. Some elements showed the increasing trend with age, but others were in opposite. For chum salmon, strontium and zinc showed the reverse way in cyclic pattern.

Research results at spawning areas indicated that each hatchery's water has a different concentration of trace elements, and the chemical composition of water seemed to influence fry otolith. The relationship between strontium concentrations in freshwater and otolith at each hatchery was noted. Also, some amounts of otolith extracted from the nucleus of adult chum salmon were chemically analyzed. The result of statistical test with 23 elements on otolith nuclei identified each stock.

Walleye pollock, as a single species, is the most abundant commercial species in the world, therefore important ecologically and economically. Pollock otoliths were collected during the early winters of 1997-2000. Whole ground otolith showed different values of oxygen stable isotope. Otolith collected in 1998 had the highest, and those from 1997 had the lowest values. The water temperature at the resident area of pollock population was high in 1997, and low in 1998, which correspond with the isotopic values. Chemical analysis with fractions detached from each age-band of otolith also indicated the same result: the cold

temperature of 1998 caused the higher oxygen isotope, and vice versa.

As a concluding remark, otolith chemistry has only just started, however it shows a lot of promise for ocean and fishery sciences. Through micro-chemistry research of otolith, as Professor Warren Wooster said, we might find meaningful ways to bring oceanography and fisheries together, and the meaningful way developed in the form of studying the effect of climate variation on marine ecosystem inhabited by fish.

Acknowledgements: I would like to thank my friends in Canada, Japan, Korea and the United States who helped with this research. Also, this research cannot be conducted without my students (Sukyung Kang, Dong-Hwa Sohn and Yoon-Sun Yang) involvement. I appreciate their efforts on this research. Also, I appreciate supports from the Korean and the United States Governments.

REPORT OF GOVERNING COUNCIL MEETING

The Governing Council met from 9:00-13:00 on October 15, October 17 and October 18, under the chairmanship of Dr. Vera Alexander. Dr. Alexander S. Bychkov served as rapporteur. All Contracting Parties but the People's Republic of China were represented at the three sessions (*GC Endnote 1*). The Chairman of the Science Board, Dr. R. Ian Perry, was in attendance during the last session.

Agenda Item 1. Opening remarks

At the first session, the Chairman welcomed the delegates and noted that for this Annual Meeting, Mr. Robin Brown represented Dr. Joan Kean-Howie (Canada).

Agenda Item 2. Adoption of agenda

The Chairman welcomed members and called the meeting to order. The agenda was reviewed and adopted as presented, with the addition of several items under "Other business" (*GC Endnote 2*). This report summarizes the treatment of each agenda item during the course of the three sessions.

Agenda Item 3. Preliminary Report on Administration

The Executive Secretary summarized the activities of the Organization and the Secretariat since PICES XI (*GC Endnote 3*).

Agenda Item 4. Report of 2003 interim Science Board/Governing Council meeting

At PICES XI, Council strongly supported a proposal by Science Board to hold an interim Science Board meeting, with the participation of Governing Council, in spring 2003 (Decision 02/A/4(iv)). The two senior bodies of PICES met jointly, for the first time in the over 10-year history of the Organization, from April 7-9 (noon), 2003, in Victoria, Canada. The meeting was a success, and met its objectives of engaging both groups in discussions of broad and long-term importance to PICES. It is hoped that the actions taken during this meeting will provide guidance to the many initiatives of PICES, and will result in new directions and further involvement in PICES activities of scientists from all our member countries.

An exclusive Council meeting was convened on the last day, in the afternoon of April 9, 2003, and all Contracting Parties were represented at this meeting. The Executive Secretary was instructed to include the report of this interim Council meeting as a part of the 2003 Annual Report (*GC Endnote 4*).

The reports of both meetings and summaries of recommended actions were circulated to the participants and Science Board and Council members in early May 2003. An article entitled "PICES Science Board and Governing Council hold their first joint meeting" was prepared by Dr. Ian Perry, and published in PICES Press in July 2003 (Vol. 11, No. 2).

Following the success of the 2003 interim Science Board/Governing Council meeting, a second inter-sessional Science Board meeting for 2004, with possible participation of Council members, was recommended and approved (Decision 03/A/5(iv)). The necessity of having an exclusive interim Council meeting at the same time will be decided at a later date by correspondence.

Agenda Item 5. Membership and observers from other countries

The Secretariat did not receive proposals from any country to accede to the PICES Convention in 2003.

<u>Mexico</u>
At the 2003 interim meeting, Council discussed future actions to accelerate the process in having

Mexico accede to the PICES Convention and approved the following actions:

- To continue contacts with the Mexican National Oceanographic Committee, including a meeting of PICES representatives with Ing. Marco Polo Bernal, Subsecretario de Educación e Investigación Tecnológicas and national Mexican representative on the Intergovernmental Oceanographic Commission (IOC), at the 22nd Session of the IOC Assembly;
- To encourage the Directors of Mexican marine research institutes represented at the joint meeting in La Paz, to send letters to the National Oceanographic Committee expressing their interest for Mexico to join PICES;
- To send a formal letter inviting Mexico to join PICES through the Embassy of Mexico in Canada;
- To explore the practical value of another visit of a PICES delegation to Mexico.

The Executive Secretary reported on the implementation of these recommendations. The PICES Chairman (Dr. Vera Alexander), the former PICES Chairman (Dr. Hyung-Tack Huh), representatives from the Canadian (Dr. Joan Kean-Howie) and US Governments (Ms. Elizabeth Tirpak), and the Executive Secretary (Dr. Alexander Bychkov) met with Ing. M.P. Bernal at the IOC Assembly in June 2003, to discuss mutual benefits of Mexico joining PICES. It was then agreed that formal letters be sent by PICES, Canada and the United States, to high-level Mexican government officials to start the procedures.

On July 24, the PICES Chairman wrote a letter to Ing. M.P. Bernal encouraging Mexico to join the Organization and inviting official observers to PICES XII. Supporting letters were also sent by Canada's delegate to PICES, Dr. Kean-Howie, to Ing. Bernal in late July, and by Ms. Margaret F. Hayes of the US State Department to Mr. Gerardo Lozano (Director of Mexican Institute for International Cooperation, Secretariat of Foreign Relations) in mid-August. Subsequent to these letters, the Secretariat sent a complete package with a copy of the PICES Handbook, which contains the PICES Convention and other important official documents, to both Ing. Bernal and Mr. Lozano. No response was received and no official observers from Mexico came to PICES XII, even though several Mexican scientists attended the meeting.

Council members believe that the Mexican scientific community has a strong interest for Mexico to join PICES. The lack of official response from Mexico was not considered as a sign of failure, and it was suggested that efforts in bringing Mexico to PICES should continue. Council instructed the Chairman and the Executive Secretary to further pursue actions recommended at the 2003 interim meeting. National delegates were requested to facilitate the process in having Mexico accede to the PICES convention through bilateral discussions between Mexico and their countries.

Democratic People's Republic of Korea

At PICES XI, the Republic of Korea advocated that the Annual Meeting in Seoul is a perfect opportunity to involve scientists from the D.P.R. Korea in PICES activities. At the 2003 interim meeting, due to the current political tension in the region, Council agreed to defer sending invitation letters to the D.P.R. Korea until a more appropriate time.

Agenda Item 6. Relations with relevant international organizations

The Science Board Chairman and Executive Secretary reported on communication with the relevant organizations and programs since last year's meeting (details can be found in *GC Endnote 3*). Council noted a steady progress in the integration and coordination of activities with other international organizations and major international programs of regional and global scale, and commended Science Board and the Secretariat for their efforts.

Council reviewed and approved the revised Standing List of International Organizations and Programs as recommended by Science Board (*SB Endnote 10*), and agreed with the identified priorities for interaction in 2003-2004 (Decision 03/S/6).

Letters of invitation to attend the Twelfth Annual Meeting were sent to inter-governmental and non-governmental organizations/programs on the agreed 2002 Standing List, and the following confirmed their intention to send observers:

Climate Variability and Predictability Program (CLIVAR)	Dr. Kelvin Richards
Global Ocean Ecosystem Dynamics (GLOBEC)	Dr. Francisco Werner
Global Ocean Observing System (GOOS)	Dr. Thomas Malone
Gulf Ecosystem Monitoring Program (GEM)	Dr. Phillip Mundy
International ARGO Science Team (IAST)	Dr. Kuh Kim
International Council for the Exploration of the Sea (ICES)	Dr. David Griffith
Intergovernmental Oceanographic Commission (IOC)	Dr. Henrik Enevoldsen
International Wailing Commission (IWC)	Dr. Hidehiro Kato
Northwest Pacific Action Plan (NOWPAP)	Dr. Keiko Ide
North Pacific Anadromous Fish Commission (NPAFC)	Dr. Richard Beamish
North East Asian Regional GOOS (NEAR-GOOS)	Dr. Vyacheslav Lobanov
North Pacific Research Board (NPRB)	Dr. Phillip Mundy
Sir Alister Hardy Foundation for Ocean Science (SAHFOS)	Dr. Sonia Batten
Scientific Committee on Oceanic Research (SCOR)	Dr. Akira Taniguchi
IOC Sub Commission for the Western Pacific (WESTPAC)	Dr. Hyung-Tack Huh

Time was reserved at the Governing Council meeting for representatives of ICES, NPAFC and SCOR, to express their views on potential areas of collaboration with PICES.

ICES

At the recommendation of Council (Decision 01/S/6(ii)), Science Board developed potential areas of cooperation between the two organizations, and at the 2002 ICES Annual Conference, Dr. R. Ian Perry presented a PICES proposal that included four "themes" (teleconnections, ecosystem reporting, ecosystem-based approaches to the management of marine resources, and harmful algal blooms) which might be of interest for enhanced interactions between ICES and PICES. These themes were further discussed by the Scientific Committees and the CCCC Program at PICES XI (October 2002), and throughout the entire year, and specific recommendations were summarized in the attached document submitted to ICES in June 2003 (see *GC Endnote 3* for details).

In his presentation, Dr. David Griffith, General Secretary of ICES, informed Council that the suggested "themes" and specific proposals are seen by ICES as excellent opportunities for fruitful cooperation. He provided additional information on ICES' activities related to the "themes", and extended an invitation for PICES to (1) co-sponsor a symposium on "Marine bioinvasions" in spring 2006; (2) co-convene theme sessions on "Fishery, ecology, and life history of small pelgic fish" and "Comparing and contrasting the scientific strategies and output of regional ecosystem pilot projects" at the ICES Annual Science Conference in September 2005; (3) actively participate in a number of CCC workshops; and (4) jointly organize a Young Scientists Conference or Workshop that would bring together "early career" scientists from around the globe. All these proposals were directed to Science Board for discussion and recommendations.

Council noted the impressive progress in the integration and coordination of activities between PICES and ICES. To further facilitate this cooperation, it was suggested that the feasibility of having an interim meeting of PICES Science Board and ICES Consultative Committee be considered.

NPAFC

PICES and NPAFC signed a Memorandum of Understanding in 1998 that identified ways in which both organizations could work cooperatively to improve the understanding and stewardship of North Pacific marine ecosystems. Dr. Richard Beamish, Chairman of NPAFC's

Committee on Scientific Research and Statistics, informed Council about on-going and planned joint activities (see *GC Endnote 3* for details). He also provided some insights of the BASIS (Baring-Aleutian Salmon International Survey) Program of NPAFC, which is a 5-year study of factors affecting Pacific salmon production in the Bering Sea. This program involves cooperative use of ships and timely exchange of data. PICES was invited to consider participating in BASIS discussions.

Council thanked NPAFC for their contribution to the North Pacific Ecosystem Status Report, and invited NPAFC to present a report on the status of North Pacific salmon at each PICES Annual Meeting. Council also agreed to co-sponsor a joint NPAFC-PICES Symposium on "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems" to be held in fall 2005, in conjunction with the NPAFC Annual Meeting in Korea (Decision 03/S/1).

SCOR

Dr. Akira Taniguchi (Vice-President of SCOR) reviewed and discussed existing and future cooperation between the two organizations. He informed Council that the report from PICES at the 36th SCOR Executive Committee meeting was well received and clearly indicated the important role of PICES in bringing a regional perspective to SCOR's global activities. He specifically mentioned PICES' contribution in GLOBEC and JGOFS projects, in organizing the Symposium on "Quantitative ecosystem indicators for fisheries management" to be held in spring 2004, and in improving the quality of oceanic CO_2 measurements and resolving CO_2 data synthesis issues (see *GC Endnote 3* for details). Dr. Taniguchi also advised that SCOR hoped that PICES will play an important role in the implementation of SOLAS, GEOHAB and IMBER.

Council thanked SCOR for their continuing support of PICES activities and providing travel grants for scientists from countries with "economies in transition" to attend annual and special meetings of PICES.

Agenda Item 7. Report of Study Group on *PICES Strategic Issues*

Last year, the PICES Review Committee identified the importance of developing a long-term "vision" or Strategic Plan for the Organization. At the 2003 interim meeting, Council and Science Board recognized the value of such a plan and agreed that a Study Group on *PICES Strategic Issues* should be formed under the direction of the Governing Council (Decision 03/S/5(iv)) to develop a Strategic Plan which has the following elements:

- A PICES vision statement;
- The purposes of PICES (including identifying the emerging issues in marine science of interest to PICES member countries);
- Long-term goals;
- Steps to implement the vision, purposes, and goals of PICES (which would consider regional as well as thematic approaches).

This task will be accomplished by:

- Reviewing Strategic Plans and Vision Statements of similar organizations;
- Examining the existing Strategic Plans of the Scientific and Technical Committees of PICES;
- Requesting input from Governing Council and Science Board members for regional issues.

The membership of this Study Group consists of Dr. Vera Alexander (Chairman), Dr. Ian Perry and Dr. Vladimir Radchenko representing Science Board, and Dr. Laura Richards (Canada), Mr. Qian-Fei Liu (China), Dr. Tokimasa Kobayashi (Japan), Dr. Hyung-Tack Huh (Korea) and Dr. George Boehlert (U.S.A.) representing Governing Council. It is expected that the Study Group will work primarily by correspondence.

Dr. Alexander reported on the status and activities of the Study Group. The first draft of the PICES Strategic Plan was distributed in September 2003. This document designates the PICES Mission with five central themes: (A) Building a foundation of science; (B) Producing the scientific basis for decision-making;

(C) Fostering partnerships; (D) The added value of PICES; and (E) Informing the public; and specific goals, identified within each of these themes. It also includes an implementation strategy with several next steps.

The draft PICES Strategic Plan was briefly discussed by the Standing Committees and the CCCC Program at PICES XII. Specific comments were requested by November 20. The next draft is anticipated by spring 2004, and will be reviewed at the interim Science Board/Governing Council meeting (if approved). The final product is expected by the next Annual Meeting.

It was noted that once the PICES Strategic Plan has been developed, the Scientific and Technical Committees of PICES will be asked to discuss and examine this plan to determine how it might be implemented by each Committee. The current Committee Strategic Plans will need to be revised. It was suggested that there should be an open discussion on the PICES Strategic Plan and its implementation in one of evenings at PICES XIII, and a Topic Session, perhaps at PICES XIV.

Agenda Item 8. Report of Study Group on *PICES Capacity Building*

At PICES XI, Council established a Study Group on *PICES Capacity Building* under the direction of the Science Board to develop a capacity building strategy and an implementation plan for the Organization (Decision 02/S/5 and *2002 GC Appendix B*).

A draft report of the Study Group was presented and extensively discussed at the interim Science Board/Governing Council meeting in April 2003. The final draft was circulated to the Chairmen of the Standing Committees and the CCCC Program on August 21, 2003, with a request to have this item included in their agenda at PICES XII for discussion.

Council reviewed the document and comments from various PICES groups, and supported key elements that have been included in the PICES capacity building initiative. It was noted that PICES is already involved in various capacity building activities, and that the current budget limits any additional demands placed on the Organization. The funding issue was widely recognized, and the discussion that followed focused on potential monetary sources for this initiative, such as *(i)* increasing the annual dues, with increases going directly towards PICES capacity building; *(ii)* special allocations from member countries, government agencies and private foundations; and *(iii)* partnering with some other entities (ICES, IOC, WESTPAC, etc.) to jointly support capacity building activities in the North Pacific, or jointly apply for funding for educational/training/outreach projects. It was unanimously agreed that Council and Science Board need to evaluate the priority of capacity building proposals, in relation to resources available. In addition, Council members were asked to provide information on funding opportunities for capacity building within their member countries.

At PICES XII, Science Board had only a brief discussion of the Study Group report, and further comments were requested by the end of November. Subsequently, Science Board approved the report (*SB Endnote 14*) by correspondence in November 2003. The Study Group members were commended for their work, and the Study Group was disbanded (Decision 03/S/4).

Agenda Item 9. PICES Intern Program

The PICES Intern Program was approved in 1999 (Decision 99/A/7) and commenced in 2000. In 2000-2003, young scientists from three countries worked as interns at the Secretariat: Mr. Gong-Ke Tan (First Institute of Oceanography, State Oceanic Administration, People's Republic of China), Dr. Jung Hwa Choi (Pukyang National University, Republic of Korea) and Ms. Natalya Bessmertnaya (TINRO-Center, Russian Federation). Mr. Chuanlin Huo (National Marine Environmental Monitoring Center, State Oceanic Administration, People's Republic of China) started his term in May 2003 and is expected to continue until April 2004. Council reviewed the results from the first four years of the Program and concluded that the

Organization and member countries are benefiting from the Program, and that it should be continued.

Guidelines for application/selection procedure

At the 2003 interim meeting, Council approved the following changes to the *Guidelines for application and selection procedure* section for the Intern Program (*GC Endnote 4*):

- To advertise the Intern Program on the PICES web site;
- To encourage national delegates to take additional measures to advertise the Intern Program within their countries;
- To require that applicants also send a copy of their application to the PICES Secretariat.

The revised document was posted on the PICES web site in early May 2003.

2004 PICES Internship

No nominations for the 2004 PICES Internship were received by the date of the first Governing Council meeting at PICES XII (October 15, 2003), but Korea indicated a desire to submit nominations. Council approved to have the deadline for applications extended to December 31, 2003 (Decision 03/A/8(i)).

Financing for the Intern Program

The Intern Program has not been budgeted for, and over the years has been financed solely by voluntary contributions. Council commended Canada and the United States for their contributions ($10,000 and $17,200, respectively) to the Trust Fund to support the 2003 Intern Program, and instructed the Executive Secretary to send letters inviting member countries to provide voluntary contributions to support the Program in 2004 and beyond (Decision 03/A/8(ii)).

At PICES X, Council approved the use of registration fees collected from the Annual Meetings to finance the Program (Decision 01/A/4(iv)), but noted that this will limit the ability of the Organization to support high priority projects identified by Science Board. Council confirmed that this practice should continue, and supported the recommendation of transferring a part of the fees from PICES XII ($11,600) to the Trust Fund to finance the 2004 Intern Program (Decision 03/A/3(iii)).

At PICES XII, F&A reviewed the level of stipends for the interns and discussed whether this stipend is sufficient to cover the cost of living in Canada. It was recommended that the stipend be kept at the current level of $2,000 per month, and given the modest stipend, F&A advised Contracting Parties to consider whether personal circumstances of interns warrant supplementation. Council supported this recommendation (Decision 03/A/8(iii)).

The Study Group on *PICES Capacity Building* suggested extending the Intern Program. Reviewing this recommendation at the interim meeting, Council agreed that the extended Intern Program that includes scientific interns in addition to administrative interns might be valuable, and funding opportunities for such an extension have to be explored by national delegates and the Secretariat. In the mean time, it was recommended that Contracting Parties give equal consideration to both administrative and scientific staff when making nominations (Decision 03/A/8(iv)).

Agenda Item 10. PICES Visiting Scientist Program

The PICES Visiting Scientist Program was approved at PICES X (Decision 01/A/6), and was seen as an opportunity to improve the functioning of the Organization without increasing annual contributions. The Program was not budgeted for, and it was expected that national agencies from member countries and/or international science organizations will contribute human resources to support key projects of the Organization which are also of specific interest for that agency/organization. The secondment of experienced scientists was suggested as the most reliable approach. The anticipation was to commence the Visiting Scientist Program in 2002, and link it to the development of the North Pacific Ecosystem Status Report. While attractive to PICES, the

Visiting Scientist Program has not drawn interest elsewhere, and no national agency/organization has taken advantage of the Program to date.

Council requested Dr. Laura Richards and the Secretariat to work together to re-write the description of the Visiting Scientist Program using suggestions from the 2003 interim Council meeting (*GC Endnote 4*). National delegates were asked to watch out for possible candidates for the Program in their countries. Council also supported the F&A recommendation that Science Board develop specific project proposals for the Program that will not necessarily require the relocation of the "visiting scientist" to the PICES Secretariat.

Agenda Item 11. Improvement of participation and productivity of PICES committees and groups

In 1996, when PICES was approaching its Fifth Annual Meeting and the election of a new Chairman, Dr. Warren S. Wooster, the principal founder and the first Chairman of PICES, prepared a paper on "PICES perspective" (see pp. 21-23 in the 1996 PICES Annual Report) that, among other issues, outlined problems in the participation in PICES activities. Many of these problems still exist. The discussion of this item focused on two issues:

Agency participation

Within the member countries, different agencies have the principal responsibility for interaction with PICES. Often the lead agencies do not seem to represent the interests of others, or are not inclined to coordinate PICES-related activities with them. At PICES V, Council recommended that all Contracting Parties be encouraged to establish an inter-agency coordinating committee to facilitate the coordination of broad participation in PICES activities within each member country (Decision 96/S/6). Last year, the PICES Review Committee discussed this issue again and re-iterated that Contracting Parties should consider the formation of national committees to enhance and coordinate involvement of their scientists in PICES activities, and to promote activities within PICES that have high national interest and relevance. National delegates were requested to follow up on this recommendation (Decision 03/S/7(i)).

Appointed scientists

At the recommendation of Science Board, Council approved that all national membership lists be confirmed prior to each Annual Meeting and be included as Appendices in the Annual Report. This will help maintain a historical record of PICES membership, and may help to improve participation in activities of the Organization (Decision 03/S/7(ii)). It was noted that appointed members often tend to represent their agencies' interests, and not national interests. Council suggested that national delegates clarify the responsibilities of members at the time of their appointment. Council also instructed the Executive Secretary to regularly prepare terms of reference and other relevant information for new members, and circulate these documents to national delegates (Decision 03/S/7(iii)).

Although some of the work of PICES Committees and other groups is conducted by correspondence, their main activities take place at meetings, and especially during the Annual Meetings. While it is obviously important for appointed scientists to attend, and it is even stated in Rule of Procedure 1(iii), that each Contracting Party shall pay the expenses of its own Delegation to all meetings held pursuant to the PICES Convention, there appears to be an increased frequency of PICES member countries failing to support attendance of their appointed experts at the Annual Meetings and in the work of various groups. The work of these groups is thereby seriously impaired. This is particularly a problem when the lead agency is reluctant to support other than its own people. A potential solution is that in budgeting for PICES, member countries should include the costs of participation of appointed scientists in PICES activities.

Agenda Item 12. Schedule and financing of future Annual Meetings of the Organization

At PICES XI (Qingdao, People's Republic of China), Council approved the proposal of the United States of America to hold the Thirteenth Annual Meeting in Honolulu, Hawaii, U.S.A., from October 15-23, 2004 (Decision 02/A/4(i)). In consideration of the Annual Meeting being held in Hawaii, the overall theme for PICES XIII is "*Beyond the continental slope – complexity and variability in the open North Pacific Ocean*". The US delegation and the Executive Secretary provided brief information on the current status of arrangements for PICES XIII. It was pointed out that the United States has no intention to ask PICES to transfer any funds from the Organization to partially cover costs. Dr. Marasco noted that at this year's meeting, F&A again discussed Canada's proposal to discontinue the practice of transferring funds from PICES to member countries to partially cover Annual Meeting costs, but no recommendation was made.

Council approved the proposal of the Russian Federation to host the Fourteenth Annual Meeting in Vladivostok, Russia, from September 30-October 5, 2005 (Decision 03/A/5(i)), and requested that sufficient budgetary information be provided as soon as possible, to facilitate *FY* 2005 budget planning.

In keeping with the six-year rotation cycle, Council invited Japan to explore the feasibility of hosting PICES XV in October 2006, and inform the Secretariat on this matter by May 31, 2004 (Decision 03/A/5(ii)).

Canada indicated an interest to hold the Annual Meeting in 2008, to link it to the celebration of the centennial anniversary of the Pacific Biological Station. This would mean an alteration to the existing rotation cycle. No action was taken, and it was agreed that this issue would be discussed at the 2004 interim Council meeting or at PICES XIII.

Council confirmed that the practice of charging a registration fee for future PICES Annual Meetings should continue, and adopted the registration fee structure recommended by F&A (Decision 03/A/5(iii)).

Council approved holding a second interim Science Board meeting, again with possible participation of the Governing Council, in spring 2004 (Decision 03/A/5(iv)). The PICES Chairman, Vice-Chairman and F&A Chairman are required to attend the meeting. Even though discussions at Science Board and Council meetings clearly indicated the importance of rotating the venue for interim meetings, the Executive Secretary was instructed to select the meeting venue based on the recommendation of F&A to keep the costs for the Organization at the minimal possible level. The necessity of having a separate interim Council meeting, in conjunction with the Science Board meeting, will be decided at a later date by correspondence.

Agenda Item 13. North Pacific Ecosystem Status Report

Developing a North Pacific Ecosystem Status Report (NPESR) as a high-priority scientific project was first suggested by Science Board at PICES X in 2001. A conceptual model of the report was introduced a year later, at PICES XI. Following a discussion of this pilot report, Council established a Working Group under the direction of Science Board to oversee the development and completion of the NPESR (Decision 02/S/5 and *2002 GC Appendix B*).

The major responsibilities of the Working Group included: (1) to prepare the final NPESR; (2) to prepare a report for the PICES - CoML project on "*Marine life in the North Pacific Ocean: The known, unknown and unknowable*"; (3) to recommend mechanisms to facilitate the data management requirements of the NPESR; and (4) to recommend on how to implement the production of the NPESR as a regular activity of PICES.

The Executive Secretary informed Council that the Alaska Fisheries Science Center (National Marine Fisheries Service/NOAA, U.S.A.) and Gulf of Alaska Ecosystem Monitoring and

Research Program (Exxon Valdez Oil Spill Trustee Council, U.S.A.) strongly supported this project, and allocated US $36,700 (from US *FY* 2001-2003) and US $42,600 (from US *FY* 2002-2004), respectively, for the development of the NPESR. PICES was also awarded a grant of US $45,000 from the Alfred P. Sloan Foundation to produce a report for the Census of Marine Life. The work necessary to prepare the report is complementary to the material presented in the NPESR.

The Science Board Chairman provided an update on the current status of the report. Major activities to prepare the draft NPESR during 2003 included:

- Identifying and appointing Lead Authors for regional chapters;
- Convening a 3-day PICES/TINRO/CoML Workshop on "Okhotsk Sea and adjacent areas" (June 4-6, 2003, in Vladivostok, Russia). The workshop included 41 oral presentations and 54 posters on various aspects of the ecology of the Okhotsk Sea. A half-day was used to discuss the most important and relevant contributions to the NPESR;
- Producing (at the Secretariat) the near-complete first draft NPESR for distribution to the Working Group and Lead Authors in mid-August;
- Organizing a 3-day Workshop (Working Group meeting with Lead Authors) from August 25-27, 2003, in Victoria, Canada, to review and discuss the contents of the draft NPESR, to develop a synthesis/integration of the regional results, and to plan for the development of the final NPESR;
- Assigning of editing and writing tasks for developing the final NPESR – September 2003;
- Holding a 2-day workshop on "Status of Yellow Sea and East China Sea ecosystems" at PICES XII (October 9-10, 2003, Seoul, Korea) to develop the Yellow Sea/East China Sea chapter, and discuss the relationship between issues there and the rest of the North Pacific;
- Convening a 2-day workshop at PICES XII, organized by the MONITOR Task Team and co-sponsored by EVOS/GEM, to "Examine and critique a North Pacific Ecosystem Status Report" (October 10-11, 2003). The report of this workshop is expected to recommend a process for future production of this report;
- Distribution of the draft NPESR to the Scientific Committees and the CCCC Program before PICES XII for information and comments.

The NPESR Workshop in August 2003 laid the foundation for completing the NPESR in a timely fashion. Upcoming activities related to this objective include:

- Implementing comments on the draft NPESR from the Scientific Committees and the CCCC Program (requested by the end of November 2003);
- Editing, designing and structuring of the final report for publication;
- Editing, designing and structuring of the final report for publication on the PICES Home Page;
- Developing a plan to produce timely updates of the NPESR;
- Convening a 3-day workshop to produce the PICES/CoML Report on "Marine life in the North Pacific: The known, unknown and unknowable".

It is anticipated that the final NPESR will be presented at the interim Science Board meeting in spring 2004.

During the discussion Japan brought up the issue of the name for the body of water surrounded by the Japanese Archipelago and the Korean Peninsula, which is currently in dispute between the countries concerned. Japan's position is that the only name "Sea of Japan" should be used in the international arena, as this name is historically and geographically established (*GC Endnote 5*). Korea responded that their position is that the names "East Sea" and "Japan Sea (Sea of Japan)" should be used simultaneously, until a final resolution is agreed upon between the relevant countries (*GC Endnote 5*).

The Chairman reminded Council about the discussion on this issue at last year's Annual Meeting (see 2002 Annual Report, p. 20), and

advised that PICES, as a scientific organization, should not focus on diplomatic problems. No actions were taken.

Agenda Item 14. Report of Science Board

The Science Board met under the chairmanship of Dr. R. Ian Perry, who presented the report to the Governing Council (see Science Board Report for text). Council approved the Science Board Report. Details are given in *Appendix A* (Decisions 03/S/1 – 03/S/7).

Agenda Item 15. Proposed changes to PICES' Rules of Procedure and Financial Regulations

Vice-Chairman of Science Board

At the 2003 interim meeting, by the recommendation of the Science Board, Council established a position of the Vice-Chairman of Science Board, and approved the following rules for this position:

(i) The Vice-Chairman of the Science Board shall be elected from the members of the Board;

(ii) The Vice-Chairman will normally reside on the opposite side of the Pacific to the Science Board Chairman;

(iii) Duration of the appointment shall be for 1 year (18 months for the first Vice-Chairman). Re-election for an additional term is permitted;

(iv) When the position of Science Board Chairman becomes (or will become) vacant, the incumbent Vice-Chairman does not automatically succeed the Chairman, and elections will proceed according to regulations;

(v) The Vice-Chairman will prepare meeting materials and chair the meetings of the Science Board in the absence of the Chairman, as required;

(vi) The Vice-Chairman will assist the Science Board Chairman with the coordination of the scientific activities of PICES by: preparing material for meetings (Science Board, PICES Annual Meetings, etc.); representing PICES at meetings and conferences of other organizations; consulting on Science Board Chairman's decisions that must be taken between normal meetings of PICES Standing Committees; and representing the interests of scientists in the countries on his continent.

To identify the new position, Council approved the following changes in the Rules of Procedure (Decision 03/A/6):

- add new Rule 14 (ii)
  "*The Vice-Chairman of the Science Board shall be elected from amongst the members of the Board for a term of one year and shall be eligible for re-election for a successive term. The Vice-Chairman will normally reside on the opposite side of the Pacific to the Science Board Chairman. The Vice-Chairman shall act as Chairman whenever the Chairman is unable to act, but in the event of the office of Chairman becoming vacant, the Vice-Chairman shall not automatically succeed the Chairman, and the Science Board shall elect a new Chairman at its next meeting*".
- re-numerate the current Rules 14 (ii) and 14 (iii) to 14 (iii) and 14 (iv) respectively.

In addition, the detailed responsibilities of the Vice-Chairman of Science Board will be identified in the PICES Chairmen's Handbook.

Proposed changes to PICES' Rules of Procedure (Rule 15) and Financial Regulations (Reg. 3(v))

At PICES XI, to ensure timely payment of annual contributions, F&A recommended, and Council approved, that "*starting from the next Annual Meeting, Council will consider and adopt the budget for the ensuing and subsequent financial years*" (Decision 02/A/2(iii)). This action requires changes to the Rules of Procedure (Rule 15(c)) and the Financial Regulations (Regulation 3(v)), and the Executive Secretary was requested to develop the appropriate wording changes for consideration at PICES XII.

Dr. Marasco reported that in the process of preparing budgets for consideration at PICES

XII, a serious problem was discovered as a result of the previous year's decision to have budgets for ensuing and subsequent financial years approved, and explained the infeasibility of the implementation of Decision 02/A/2(iii). F&A recommended, and Council agreed to re-consider this decision (Decision 03/A/2(ii)); see also F&A Report for details).

Agenda Item 16. Report of Finance and Administration Committee

The Finance and Administration Committee (F&A) met under the chairmanship of Dr. Richard J. Marasco, who presented the report to the Governing Council (see F&A Report for text). Council approved the report.

16.1 Audited accounts for fiscal year 2002

At the recommendation of F&A, Council accepted the audited accounts of *FY* 2002 (Decision 03/A/1(i)). At the 2003 interim Council meeting, *Flader & Hale* was selected as the auditor for *FY* 2003-2005 (*GC Endnote 4* and Decision 03/A/1(ii)).

16.2 Annual contributions

Council discussed the payment schedule of annual fees to the Organization (*F&A Endnote 4*), and following F&A, expressed serious concern over the increased frequency of partial payments of annual fees, especially if they are remitted without explanation or an indication of when the outstanding balance will be paid. Council instructed the Executive Secretary to send a letter commending some Contracting Parties for improved performance in submitting annual contributions in 2003, and describing the difficulties partial payment causes the Organization (Decision 03/A/2(i)).

Council also approved the recommendation that last year's Decision 02/A/2(iii) be re-considered, returning to the previous budget preparation practice, currently reflected in the Rules of Procedure (Rule 15) and Financial Regulations (Reg. 3(v)), when at each Annual Meeting, Council adopts its budget for the ensuing fiscal year, and considers, but not adopt, the forecast budget for the subsequent fiscal year (Decision 03/A/2(ii)). Council confirmed that for planning purposes, Contracting Parties should continue to use the guideline generally accepted at the Eighth Annual Meeting (Decision 99/A/2(ii)), which states that the annual contributions will increase at the rate of inflation (about 3%) in Canada.

16.3 Fund-raising activities

Grants and voluntary contributions received this year for various activities initiated by PICES are reflected in F&A *Endnote 5*. Council noted the significant increase in the level of external funding, and thanked the Science Board Chairman and the Secretariat for their efforts. At the same time, Council is seriously concerned about the increased workload of the Secretariat related to the growing number of projects, as all external funding offers have specific product/service requirements. It was re-iterated that funding constraints resulting from the current practice of an increase in annual contributions only at the rate of inflation, can impede improvement and development of the Organization, and therefore, fund-raising continues to be an important component of PICES activities. Delegates were requested to determine the possibility of obtaining additional funding to support PICES (Decision 03/A/4(i)).

Council also directed Science Board to develop a prioritized list of PICES activities that are strong candidates for external funding (Decision 03/A/4(ii)). This list could be used by delegates and F&A members to raise funds.

16.4 Budget

16.4a Estimated accounts for fiscal year 2003

The estimated accounts for *FY* 2003 were reviewed by F&A and approved by Council (Decision 03/A/3(i)).

16.4b Proposed budget for fiscal year 2004

Council approved the proposed *FY* 2004 budget of $679,000 (*F&A Endnote 7*). The amount of $79,000 will be transferred from the Working

Capital Fund to the General Fund to reduce the total annual contribution to $600,000, setting the 2003 fee at $100,000 per Contracting Party (Decision 02/A/3(ii)).

16.4c Forecast budget for fiscal year 2005

The *FY* 2005 forecast budget of $725,000 was examined by F&A and presented to Council for information only. It will be further discussed at PICES XIII. Per the guideline adopted in 1999 (Decision 99/A/2(ii)), the 2005 annual fee would be set at $103,000 per Contracting Party. Then, a transfer of about $107,000 from the Working Capital Fund would be required to balance funds. A transfer of this magnitude will only be possible if additional funds can be raised.

16.4d Working Capital Fund

The balance in the Working Capital Fund is forecast to be about $218,600 at the end of 2003. Council approved a transfer of $79,000 from the Working Capital Fund to the General Fund for 2004. This amount includes external funds, $67,500, allocated for PICES projects that will be completed in 2004. Council also approved a transfer of $11,600 from the Working Capital Fund to the Trust Fund to restore the Trust Fund to the level of $110,000. After all inter-fund transfers (Decision 02/A/3(iii)), the Working Capital Fund will total approximately $128,000.

16.4e Home Leave and Relocation Fund

The status of the Home Leave and Relocation Fund was reviewed. In *FY 2003*, expenditures were offset by interest earned by the Fund and, in part, by the foreign staff tax levies. The Fund will be at its required level of $110,000 by the end of the fiscal year.

16.4f Trust Fund

In *FY 2003*, the Trust Fund was used to finance the Intern Program, and to bring young scientists from PICES member countries and scientists from countries with "economies in transition" to scientific meetings. These expenditures were compensated only partly by voluntary contributions from Canada and U.S.A. for the Intern Program, and by travel grants from the Scientific Committee of Oceanic Research. As a result, the Trust Fund would be approximately $98,400 at the end of 2003. Council approved a transfer of $11,600 from the Working Capital Fund to the Trust Fund to recover all 2003 expenditures and restore the Trust Fund to the level of $110,000.

Agenda Item 17. Appointment of F&A Committee Chairman

According to the Rules of Procedure (Rule 15), "*The Chairman of the Finance and Administration Committee shall be appointed by the Council from amongst the Committee's members for a term of two years and shall be eligible for re-appointment only once for a successive term.*" Dr. Richard J. Marasco of U.S.A. was appointed as the F&A Chairman at PICES VII in 1998 (Fairbanks, U.S.A.), and re-appointed at PICES IX in 2000 (Hakodate, Japan). At PICES XI, at the recommendation of the Finance and Administration Committee, Council extended his term for one year (Decision 02/A/7). This issue was discussed again by F&A, and it was highly recommended that the term of Dr. Richard J. Marasco (U.S.A.) be extended for one more year. The motion was supported by all Contracting Parties and approved by Council (Decision 03/A/7).

Agenda Item 18. Other business

Publication of PICES Review Committee Report

At PICES XI, Council endorsed the Review Committee Report and its recommendations (Decision 02/A/9). Pending full consideration of the Review Committee Report by the Science Board, action on its disposition was postponed until the 2003 interim Science Board/Governing Council meeting. At the recommendation of F&A, Council approved that the Review Committee Report be included in this year's PICES Annual Report (Decision 03/A/9).

Request for scientific advice

A letter was received from the United States requesting scientific advice on recent (1998-1999) climate-ocean changes in the North Pacific and their implications for fisheries (*SB*

Endnote 15). This is the first request ever for PICES to provide scientific advice to a member nation. In discussion, it was noted that the request is a clear recognition of PICES' expertise and scientific leadership on the topic of ecosystem regime shifts. It is also evidence that governments are open to strong (and independent) scientific input regarding ecosystem variability, and the development of robust management strategies. Council found this request as both timely and important, and agreed to accept.

At the recommendation of Science Board, Council approved the establishment of a Study Group under Science Board titled (tentatively) "Potential implications of recent regime shifts in the North Pacific for fisheries", with a 1-year duration (Decision 03/S/5). The Study Group would assess the request, assemble the information and data relevant to responding to this request, and develop a draft document for discussion. It would also develop plans for a workshop to be held in late June 2004, to discuss this document and to gather broader input. Following the workshop, the Study Group would finalize the report, which would then be circulated within PICES for review. It would be completed and delivered to the United States by PICES XIII in October 2004.

The Terms of Reference for this Study Group are described in *GC Appendix B*.

GC Appendix A. Decisions

03/A/1: Auditor

i. Council accepted the audited accounts for 2002
ii. Council selected *Flader & Hale* as the auditor for *FY* 2003-2005.

03/A/2: Annual contributions

i. Council instructed the Executive Secretary to send a letter commending some Contracting Parties for improved performance in submitting annual contributions in 2003, and describing the difficulties partial payment causes the Organization.
ii. Council re-considered last year's Decision 02/A/2(iii), and agreed to return to the previous budget preparation practice, currently reflected in the Rules of Procedure (Rule 15) and Financial Regulations (Reg. 3(v)), when at each Annual Meeting, Council adopts its budget for the ensuing fiscal year, and considers, but not adopt, the forecast budget for the subsequent fiscal year. For planning of their funding requests for annual contributions, Contracting Parties should continue to use the guideline generally accepted at the Eighth Annual Meeting (Decision 99/A/2(ii)).

03/A/3: Budget

i. Council accepted the estimated accounts for 2003.
ii. Council approved the 2004 budget at the level of $679,000. The amount of $79,000 will be transferred from the Working Capital Fund to reduce the total annual contribution to $600,000, setting the 2003 fee at $100,000 per Contracting Party.
iii. Council approved the following inter-fund transfers:
    - A transfer of $79,000 from the Working Capital Fund to the General Fund for 2004. This amount includes external funds, $67,500, allocated for PICES projects that will be completed in 2004;
    - A transfer of $11,600 from the Working Capital Fund to the Trust Fund to recover all 2003 expenditures and to restore the Trust Fund to the level of $110,000.

03/A/4: Fund-raising

i. National delegates were requested to determine the possibility of obtaining additional funding to support PICES activities.

ii. Council directed Science Board to develop a prioritised list of PICES activities that are strong candidates for external funding.

03/A/5: Schedule and financing future Annual Meetings

i. Council approved the proposal of the Russian Federation to hold the Fourteenth Annual Meeting from September 30 - October 8, 2005, in Vladivostok, Russia.
ii. Council requested Japan to explore the possibility of hosting the Fifteenth Annual Meeting in 2006, and inform the Secretariat on this matter by May 31, 2004.
iii. Council accepted the following registration fee structure for 2004:

Type	CDN $
Registration fee	225
Early registration fee	150
Students	50

iv. Council approved the holding of an interim Science Board meeting, with participation of the Governing Council, in spring 2004.

03/A/6: Changes to Rules of Procedure

Council approved the following changes in the Rules of Procedure:

- add new Rule 14 (ii)
  "*The Vice-Chairman of the Science Board shall be elected from amongst the members of the Board for a term of one year and shall be eligible for re-election for a successive term. The Vice-Chairman will normally reside on the opposite side of the Pacific to the Science Board Chairman. The Vice-Chairman shall act as Chairman whenever the Chairman is unable to act, but in the event of the office of Chairman becoming vacant, the Vice-Chairman shall not automatically succeed the Chairman, and the Science Board shall elect a new Chairman at its next meeting*".
- re-numerate the current Rules 14 (ii) and 14 (iii) to 14 (iii) and 14 (iv) respectively.

The detailed responsibilities of the Vice-Chairman of Science Board should be identified in the PICES Chairmen's Handbook

03/A/7: Appointment of Finance and Administration Committee Chairman

Council extended the term of Dr. Richard J. Marasco (U.S.A.), the current Finance and Administration Committee Chairman, for one year.

03/A/8: Intern Program

i. Council approved that the deadline for applications for the 2004 Intern Program be extended to December 31, 2003.
ii. Council instructed the Executive Secretary to invite member countries to provide voluntary contributions to support the Program in 2004 and beyond.
iii. Council confirmed that the stipend should be kept at the current level of $2,000 per month, and given the modest stipend, advised Contracting Parties to consider whether personal circumstances of intern warrant supplementation.
iv. Council recommended that Contracting Parties give equal consideration to both administrative and scientific interns when making nominations.

03/A/9: Review Committee Report

Council approved that the Review Committee Report be published in this year's PICES Annual Report.

03/S/1: Inter-sessional meetings, Working Group and CCCC Program Workshops

The following inter-sessional meetings, Working Group and CCCC Program Workshops are to be convened/co-sponsored in 2003-2004 and beyond (see Acronym List at the end of the Annual Report):

- A PICES/CoML *Regional marine life expert* workshop, November 17-19, 2003, Victoria, Canada (approved in 2002);
- A PICES/PaCOS/AOOS/GEM workshop on "Development of pilot coastal monitoring

program(s) in the NE Pacific", November 20-22, 2003, Victoria, Canada;

- A MODEL workshop to further manuscript development for a special issue of *Ecological Modeling* devoted to NEMURO and NEMURO.FISH, December 2003, Yokohama, Japan (funded by the Fisheries Research Agency of Japan);
- A IOCCP/PICES workshop on "Ocean surface $p(CO_2)$, data integration and database development", January 14-17, 2004, Tsukuba, Japan (approved in 2002, postponed from 2003);
- A meeting of the PICES Study Group on *Potential implications of recent regime shifts in the North Pacific for fisheries*, January 2004, on the west coast of Canada or the United States;
- A PICES-IFEP workshop on "*In situ* iron enrichment experiments in the eastern and western subarctic Pacific", February 11-13, 2004, Victoria, Canada (approved in 2002, postponed from 2003);
- A Canada-SOLAS/PICES-IFEP Session on "Response of the upper ocean to mesoscale iron enrichment" at the TOS/ASLO 2004 Ocean Research Conference, February 15-20, Honolulu, U.S.A.;
- A SCOR/IOC/PICES/GLOBEC Symposium on "Quantitative ecosystem indicators for fisheries management", March 31-April 3, 2004, Paris, France (approved in 2002);
- A 3-day interim Science Board meeting, spring 2004, location TBD;
- A NOAA/GCP/PICES workshop on "Understanding North Pacific carbon-cycle change: Data synthesis and modeling", June 2004, Seattle, U.S.A.;
- A MODEL workshop on "The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific" (partial funding from Japan Fisheries Research Agency), August 2004, Seattle, U.S.A. Purpose is to document and distribute the NEMURO model code, and to edit *Ecological Modeling* manuscripts;
- A PICES/NOAA workshop to discuss issues relating to the request for advice to PICES from the United States, June 2004, likely on the west coast of the United States;
- A 1-day MEQ Workshop on "Developing a North Pacific HAB data resource - II", October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 2-day PICES-CLIVAR Workshop on "Scale interactions of climate and marine ecosystems", October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 1-day MBM-AP Workshop on "Combining data sets on diets of marine birds and mammals - Phase II", October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 1-day MIE-AP Workshop to review preliminary results from the first inter-calibration cruise, and discuss the goals, objectives, and status of the experiment and the future field program, October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 2-day CCCC Workshop on "Linking open ocean and coastal ecosystems II", October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 1-day CCCC/REX Workshop on "Seasonal cycles of plankton and nutrients around the North Pacific Rim", October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 4-day CCCC/MODEL Workshop on "Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food webs and implications for marine fish production in the North Pacific Ocean and marginal seas" (funded by APN, if approved), October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A 1-day CCCC/MODEL Workshop to prepare a strategy and products for future NEMURO and NEMURO.FISH training sessions (if the APN proposal is successful, this workshop will not be necessary), October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A symposium, co-sponsored with GLOBEC, on "Climate variability and sub-Arctic marine ecosystem", spring 2005, Victoria, Canada;
- A CREAMS/PICES workshop (with training component) on "Japan/East Sea

circulation: What we know and how well can we forecast?", summer 2005, near Vladivostok, Russia;
- A symposium, co-sponsored with NPAFC, on "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems", fall 2005, Seoul, Korea;
- A joint theme session on "Fisheries, ecology and life history of small pelagic fish" at the ICES Annual Science Conference, September 2005, Aberdeen, Scotland;
- A symposium, co-sponsored with ICES, on "Marine bioinvasions", spring 2006, likely on the east coast of the United States;
- A 3-day symposium on CCCC Synthesis, April 2006, Honolulu, U.S.A.;
- A 4th International Zooplankton Production Symposium (co-sponsors TBD), spring 2007, Hiroshima, Japan.

03/S/2: Travel support

PICES will provide travel support for:

<u>PICES XIII</u>
- Invited speakers for Topic Sessions at the PICES Thirteenth Annual Meeting (the normal allocation is $5,000 per Scientific Committee, and additional requests are subject to fund availability);
- Two invited speakers to the CCCC Topic Session on "The impacts of large-scale climate change on North Pacific marine ecosystem";
- Two invited speakers to the PICES/CLIVAR Workshop on "Scale interactions of climate and marine ecosystems";
- Two invited speakers to the CCCC Workshop on "Linking open ocean and coastal ecosystems II";
- Two Canadian scientists to attend the CCCC/MODEL APN Workshop (if APN grant approved).

<u>Inter-sessional meetings</u>
- PICES representative to attend the NPAFC Annual Meeting (October 2003, Honolulu, U.S.A.);
- MONITOR Co-Chairman to represent PICES at POGO-5 (November 2003, Tokyo, Japan);
- One scientist to participate in the joint IOCCP/PICES workshop on "Ocean surface $p(CO_2)$ data integration and database development" (January 2004, Tsukuba, Japan);
- PICES representative to attend the annual meetings of the ICES Working Group on *Introductions and transfers of marine organisms* and the ICES/IOC/IMO Working Group on *Ballast waters and other ship vectors* (March 2004, Italy);
- PICES invited speaker to the symposium on "Quantitative ecosystem indicators for fisheries management" (April 2004, Paris, France);
- MONITOR member to represent PICES at the meeting of ICES/IOC Steering Group for GOOS (April 2004, Tenerife, Spain);
- PICES representative to participate in NEAR-GOOS activities in conjunction with the 6th WESTPAC Symposium (April 2004, Hangzhou, People's Republic of China);
- Co-Chairmen of CCCC-IP to attend the 2nd interim Science Board meeting (spring 2004);
- TCODE member from Russia to attend the meeting of the ICES Study Group on *Development of Marine Data Exchange Systems using XML* (May 2004, Oostende, Belgium);
- One scientist to participate in the joint NOAA/GCP/PICES workshop on "Understanding North Pacific carbon cycle change: Data synthesis and modeling" (June 2004, Seattle, U.S.A.);
- One scientist to attend the MODEL Workshop on "The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific", August 2004, Seattle, U.S.A.;
- PICES representative to participate in the SCOR General Meeting (September 2004, Venice, Italy);
- Two scientists to participate in the CREAMS/PICES workshop on "Japan/East Sea circulation: What we know and how well can we forecast?", summer 2005, near Vladivostok, Russia.

Trust Fund

- One Russian scientist to participate in the MBM-AP Workshop on "Combining data sets on diets of marine birds and mammals II" at PICES XIII;
- One Russian and one Chinese scientist to attend the workshop on "Developing a North Pacific HAB data resource II" at PICES XIII;

Science Board Chairman

- Science Board Chairman to attend the Symposium on "Quantitative ecosystem indicators for fisheries management" (April 2004, Paris, France), 2nd interim Science Board Meeting (spring 2004), the ICES Annual Science Conference (September 2004, Vigo, Spain), and PICES Thirteenth Annual Meeting (October 2004, Honolulu, U.S.A.).

The Science Board Chairman and Executive Secretary are instructed to use the following criteria suggested by the Science Board in prioritising additional requests:

- Consider whether the proposed activity will contribute to the strategic plans of PICES;
- Balance travel support requests among PICES Committees and Programs; and
- Use PICES funds to bring people to PICES rather than for sending them to other meetings.

03/S/3: Publications

The following publications were approved:

PICES Scientific Report Series in 2004

- Report for the Census of Marine Life on "Marine life in the North Pacific Ocean: The known, unknown and unknowable";
- Report from the MONITOR workshop on "Examine and critique a North Pacific Ecosystem Report";
- Final report of WG 14 on *Effective sampling of micronekton*;
- Proceedings of the 3rd PICES workshop on "Okhotsk Sea and adjacent areas";
- Guide of best practices for oceanic CO_2 measurements and data reporting (WG 17);
- Proceedings of the 2004 IFEP workshop.

PICES Scientific Report Series in 2005

- Final report of WG 16 on *Climate change and fisheries management.*

Special issues of primary journals in 2003

- *Marine Environmental Research* - papers resulting from the 1999 MEQ Practical Workshop (Guest editors: Richard F. Addison and John E. Stein);
- *Journal of Oceanography* - selected papers from the 2002 PICES Symposium on *North Pacific transitional areas* (Guest editors: Michio J. Kishi, Daniel Lluch-Belda, Stewart M. McKinnell, Arthur Miller and Yoshiro Watanabe);
- *Progress in Oceanography* - selected papers from the 2001 BIO Topic Session on *Plankton size classes, functional groups and ecosystem dynamics* (Guest editors: Alexander S. Bychkov and Angelica Peña);
- *Fisheries Oceanography* - selected contributions to the joint PICES/GLOBEC sessions at the GLOBEC Open Science Meeting.

Special issues of primary journals in 2004 and beyond

- *Journal of Oceanography* (2004)- invited papers on *Synthesis of JGOFS North Pacific Process Study* (jointly with JGOFS) (Guest editors: Toshiro Saino, Alexander Bychkov, Chen-Tung A. Chen and Paul J. Harrison);
- *Journal of Marine Systems* (2004) - selected papers from the 2002 BIO/POC/FIS Topic Session on "The importance of biophysical coupling in concentrating marine organisms around shallow topographies" (Guest editors: Richard D. Brodeur and John Dower);
- *Progress in Oceanography* (2004) - selected papers from the PICES/CREAMS workshop on *Recent progress in studies of physical processes and impact to the Japan/East Sea ecosystem* (Guest editors: Stewart M. McKinnell, Alexander Bychkov, Kyung-Ryul Kim and Makoto Terazaki);
- *ICES Journal of Marine Research* (2004) - selected papers from the 3rd Zooplankton Production Symposium on "Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans"

(Guest editors: Roger Harris, Tsutomu Ikeda, William Peterson and Luis Valdez);
- *Ecological Modelling* (2005) – selected papers on NEMURO and NEMURO.FISH models (Guest editors: Shin-ichi Ito, Michio Kishi, Bernard Megrey and Francisco Werner).

Other
- North Pacific Ecosystem Status Report;
- Book on History of PICES.

03/S/4: Future of current Working Groups

- WG 14 on *Effective sampling of micronekton* will continue its activities and produce a final report in 2004;
- WG 15 on *Ecology of harmful algal blooms in the North Pacific* has completed its terms of reference and will be disbanded (see also Decision 03/A/5 below);
- WG 16 on *Climate change, shifts in fish production and fisheries management* will continue its activities and produce a final report in 2005;
- Study Group on *PICES Capacity Building* has completed its report (*SB Endnote 14*) and will be disbanded.

03/S/5: New PICES Groups

- A Section on *Harmful algal blooms and their impacts* will be formed under MEQ, with the Terms of Reference described in *SB Endnote 7*. This also implies that WG 15 on *Ecology of harmful algal blooms in the North Pacific* will be disbanded.
- A Working Group on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production*, will be established under the direction of MEQ and FIS, with the Terms of Reference described in *SB Endnote 6*.
- A Study Group on *Ecosystem-based management science and its application to the North Pacific* will be formed under the direction of FIS and MEQ, with the Terms of Reference described in *SB Endnote 5*.
- A Study Group on *PICES Strategic Issues* was established (at the 2003 interim Science Board/Governing Council meeting) under the direction of the Governing Council to develop a Strategic Plan for the Organization.
- A Study Group on *Potential implications of recent regime shifts in the North Pacific for fisheries* will be established under the direction of Science Board to deal with the request for scientific advice received from the United States. The Terms of Reference are provided in *GC Appendix B*.

03/S/6: Relations with other organizations and programs

Council approved the revised Standing List of International Organizations and Programs, and agreed with the identified priorities for interaction in 2003 (*SB Endnote 10*).

03/S/7: Improvement of participation in PICES activities

i. Council requested national delegates to follow up on Decision 96/S/6 and the recommendation of the PICES Review Committee, and consider the formation of national committees to enhance and coordinate involvement of their scientists in PICES activities, and to promote activities within PICES that have high national interest and relevance.
ii. Council approved that national membership lists be confirmed prior to each Annual Meeting and be included as Appendices in the Annual Report. This will help maintain a historical record of PICES membership, and may help to improve participation in activities of the Organization.
iii. Council instructed the Executive Secretary to regularly prepare terms of reference and other relevant information for new members, and circulate these documents to national delegates. National delegates are encouraged to clarify the responsibilities of members at the time of their appointment.

GC Appendix B

Terms of Reference for Study Group on
Potential implications of recent regime shifts in the North Pacific for fisheries

1. Examine the request from the United States on the potential effects of recent climate-ocean changes in the North Pacific on fisheries, and clarify what can be delivered by PICES;
2. Gather appropriate information to respond to the request, develop a draft document for discussion, and develop plans for a workshop to be held in late June 2004 to discuss this document and to gather broader input;
3. Conduct the workshop and provide a final written report by summer 2004, for review by PICES.

GC Endnote 1

Participation List

Canada
Robin Brown (alternate delegate)
Laura Richards

Japan
Junzo Fujita (advisor, October 18 only)
Tatsu Kishida (advisor)
Tokimasa Kobayashi
Motobumi Manabe (advisor)
Tokio Wada (advisor)

People's Republic of China
Not presented

Republic of Korea
Keun-Oh Kim (advisor)
Yong-Ju Lee
Hyun-Churl Lim

Russia
Lev N. Bocharov
Igor I. Shevchenko (advisor)
Pavel Vorobyov (advisor)

U.S.A.
George Boehlert
Richard J. Marasco
Elizabeth J. Tirpak (advisor)

Other
Vera Alexander (Chairman, PICES)
Alexander S. Bychkov (Executive Secretary)
Hyung-Tack Huh (Past-Chairman, PICES)
R. Ian Perry (Science Board Chairman, October 18 only)

GC Endnote 2

Governing Council Meeting Agenda

1. Opening remarks
2. Adoption of agenda and meeting procedures
3. Preliminary report on administration
4. Report of Science Board/Governing Council 2003 interim meeting
5. Membership and observers from other countries
6. Relations with relevant international and regional organizations/programs
7. Report of Study Group on *PICES Strategic Issues*
8. Report of Study Group on *PICES Capacity Building*
9. PICES Intern Program
10. PICES Visiting Scientist Program
11. Improvement of participation and productivity of PICES committees and groups
12. Schedule and financing of future Annual Meetings of the Organization
13. North Pacific Ecosystem Status Report
14. Report of Science Board
15. Proposed changes to PICES' Rules of Procedure and Financial Regulations

16. Report of Finance and Administration (F&A) Committee
17. Appointment of F&A Chairman
18. Other business

GC Endnote 3

Report on Administration for 2003

I. Annual contributions

According to Financial Regulations 5(ii), all national contributions to PICES are payable by the first day of the financial year (January 1) to which they relate. The initial request was sent on November 8, 2002, and a reminder on March 4, 2003. Dues for 2003 were paid as follows:

U.S.A.	December 6, 2002
Japan	December 11, 2002
Canada	January 13, 2003
Russian Federation	April 2, 2003 (96.5%) and July 18, 2003 (3.5%)
Republic of Korea	May 5, 2003
People's Republic of China	October 3, 2003 (78%)

II. External and additional funding

Serious efforts were made this year to get external and additional funding for various activities initiated by PICES. The following reflects special contributions and grants received:

- The remainder of the Nakajima Foundation grant, approved in 2001, was used this year to finance a MODEL workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model" (March 3-6, 2003, Yokohama, Japan).
- A grant of $69,480 (US $45,000) from the Alfred P. Sloan Foundation, approved in 2002, will be used this year to produce a report entitled "Marine life in the North Pacific Ocean: The known, unknown and unknowable".
- The North Pacific Research Board (NPRB, U.S.A.) agreed to fund the sample collection and analysis for the east-west transect the PICES Continuous Plankton Recorder (CPR) survey of the North Pacific and southern Bering Sea, at the level US $185,000 for two years, from July 2003 to June 2005.
- The Gulf of Alaska Ecosystem Monitoring and Research Program (GEM) of EVOS (Exxon Valdez Oil Spill Trustee Council, U.S.A.) agreed to fund the sample collection and analysis for the north-south transect of the PICES CPR survey from 2004 to 2006, at the level of US $120,000 per year.
- Alaska Fisheries Science Center (National Marine Fisheries Service, NOAA, U.S.A.) contributed US $12,450 to finance the development of the North Pacific Ecosystem Status Report.
- The EVOS/GEM Program contributed US $16,000 to support the development of the North Pacific Ecosystem Status Report in US *FY 2003* (October 1, 2002 - September 30, 2003) and US $16,600 for the continuation of this work in US *FY 2004* (October 1, 2003-September 30, 2004).
- Southwest Fisheries Science Center (National Marine Fisheries Service, NOAA, U.S.A.) offered US $18,200 to facilitate the gathering and coordination of potential international PaCOS (Pacific Coastal Observing System) contributions and to design basic governance structure options for coordinating biological observations between the United States, Canada and Mexico.
- The Japan Fisheries Research Agency provided a grant of JPY 6,000,000 (from April 2003 to March 2006) to support international collaboration on the development of a model on coupled response of lower and higher trophic level ecosystems for climate variability in the

North Pacific. This grant will be used to convene 3 workshops – 2 in Japan (2003 and 2005) and 1 in the United States (2004).

- The Scientific Committee on Oceanic Research (SCOR) approved two grants to support travel of scientists from countries with "economies in transition" to scientific meetings organized by PICES: US $7,000 for the joint PICES/GLOBEC/ICES Zooplankton Production Symposium (May 19-23, 2003, in Gijón, Spain) and US $5,000 for PICES XII (October 10-18, 2003, in Seoul, Korea).
- IOC (Intergovernmental Oceanographic Commission) provided US $6,000 to PICES for the publication of the "Guide of best practices for oceanic CO_2 measurements and data reporting" being prepared by the PICES WG 17 on *Biogeochemical data integration and synthesis*, to ensure a large print run. This publication is expected in 2004.
- GLOBEC contributed about $4,630 to finance the production of a special joint PICES/GLOBEC issue of PICES Press that focused on results of the PICES Eleventh Annual Meeting and the Second GLOBEC Open Science Meeting, held sequentially in Qingdao, People's Republic of China, in October 2002.
- In addition to their annual fees, Canada and U.S.A. contributed $10,000 and $17,200, respectively, to finance the 2003 PICES Intern Program.

III. Inter-sessional meetings

The following inter-sessional meetings were convened/co-sponsored, for which financial, travel and logistical arrangements were made:

- A 2-day Fifth Annual Workshop on *Coastal ocean ecosystem*, February 11-12, 2003, in Newport, U.S.A.;
- A 4-day MODEL Workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model" (co-sponsored by the Nakajima Foundation), March 3-6, 2003, in Yokohama, Japan;
- A 5-day international inter-comparison of underway and drifting/mooring-based pCO_2 measurement systems (co-sponsored by several Japanese agencies/institutes), March 10-14, 2003, in Hazaki, Japan;
- A 3-day interim meeting of Science Board/Governing Council, April 7-9, 2003, in Victoria, Canada;
- A 4-day PICES/GLOBEC/ICES Zooplankton Production Symposium on "The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Oceans" (co-sponsored by SCOR), May 20-23, 2003, in Gijón, Spain (the largest and most exciting zooplankton meeting that has ever been convened, with 333 participants from 38 countries from 6 continents);
- A 1-day Workshop on "Climate variability, zooplankton abundance and distribution – comparative opportunities from the world's oceans" was held immediately prior to the Zooplankton Production Symposium to develop suggestions for follow-up collaborative projects with ICES and GLOBEC, May 19, 2003, in Gijón, Spain;
- A 3-day Third PICES Workshop on "Okhotsk Sea and adjacent areas" (co-sponsored by TINRO-Center and CoML), June 4-6, 2003, in Vladivostok, Russia;
- A 3-day "North Pacific Ecosystem Status Report" Workshop, August 25-27, 2003, in Victoria, Canada.

The following workshops are to be convened in conjunction with PICES XII in Seoul, Republic of Korea:

- A 2-day Workshop on "Status of Yellow Sea and East China Sea ecosystems" (co-sponsored by CoML), October 9-10, 2003;
- A 2-day MONITOR Workshop to "Examine and critique a North Pacific Ecosystem Status Report" (co-sponsored by EVOS/GEM), October 10-11, 2003;
- A 1½-day WG 15/TCODE Workshop on "Harmful algal blooms - harmonization data" (co-sponsored by IOC), October 10-11, 2003;
- A 1-day MBM-AP Workshop on "Combining data sets on distribution and diets of marine birds and mammals", October 10, 2003;
- A 1-day BASS Workshop to "Examine linkages between open and coastal systems", October 15, 2003;

Preparation and arrangements are in progress for:

- A 3-day PICES/CoML "Regional marine life expert" Workshop, November 17-19, 2003, in Victoria, Canada;
- A 3-day Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" (co-sponsored by EVOS/GEM, SWFSC/NMFS), November 20-22, 2003, in Victoria, Canada;
- A 4-day MODEL Workshop on "Summary and synthesis of contributions from NEMURO and NEMURO.FISH" (funded by a grant from Japan Fisheries Research Agency), December 14-18, 2003, in Yokohama, Japan;
- A 5-day IOCCP/PICES Workshop on "Ocean surface pCO_2, data integration and database development" (co-sponsored by several Japanese agencies), January 13-17, 2004, in Tsukuba, Japan;
- A 3-day IFEP Workshop on "*In situ* iron enrichment experiments in the eastern and western subarctic Pacific", February 10-12, 2004, Victoria, Canada;
- A 1-day joint Canadian-SOLAS/PICES-IFEP session on "Response of the upper ocean to mesoscale iron enrichment" at the TOS/ASLO Ocean Research Conference, February 15-20, 2004, in Honolulu, U.S.A.;
- A 4-day International Symposium on "Quantitative ecosystem indicators in fisheries management", March 31-April 3, 2004, in Paris, France.

IV. Publications

Publications produced after PICES XI or still in progress include:

PICES Reports:

- PICES 2002 Annual Report;
- PICES Scientific Report No. 24 (July 2003): *CO_2 in the North Pacific*; this report is the final effort of PICES WG 13 and summarizes the research and technical activities that have been conducted by member nations of PICES to synthesize CO_2 data in the North Pacific, and provides a comprehensive picture of the distribution of anthropogenic CO_2 in this region;
- PICES Scientific Report No. 25 (July 2003): *Climate Change and Carrying Capacity Program / Report of BASS/MODEL on Trophic models of the subarctic Pacific basin ecosystems*;
- PICES Scientific Report No. 26 (in progress): *Climate Change and Carrying Capacity Program / Report of the 2003 MODEL workshop to "Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes"*;
- PICES Scientific Report No. 27 (in progress): *Climate Change and Carrying Capacity Program / Report of the 2002 MONITOR Workshops on "Requirements and methods for early detection of ocean change* and *Monitoring from moored and drifting buoys"*;
- PICES Scientific Report No. 28 (in progress): *Marine life in the North Pacific Ocean: The known, unknown and unknowable* (report for the Census of Marine Life).

Special issues of primary journals:

- *Canadian Journal of Fisheries and Aquatic Sciences* (December 2002, section in Vol. 59, No. 12) - selected papers from the 2001 FIS Topic Session on "Migration of key ecological species in the North Pacific Ocean" (Guest editor: J. Irvine); the section includes 4 papers by authors from Canada, Japan and Mexico;
- *Deep-Sea Research Part II* (December 2002, Vol. 49, Nos. 24-25) on "North Pacific Biogeochemical Processes" - a collection of contributed papers from JGOFS-related field programs in the North Pacific (Guest editors: T. Saino, A. Bychkov, C.T.A. Chen and P. Harrison); the issue includes an overview and 27 papers by authors from Canada, Japan, Russia and China-Taipei, but majority of papers (21) are from Japan;
- *Journal of Oceanography* (August 2003, Vol. 59, No. 4) - selected papers from the 2002 PICES Symposium on "North Pacific transitional areas" (Guest editors: S. McKinnell, M. Kishi, D. Lluch-Belda, A. Miller and Y. Watanabe); the issue includes 10 papers by authors from Japan, Mexico, U.S.A.) and PICES;

- *Progress in Oceanography* (September 2003, Vol. 57, Nos. 3-4) - selected papers from the 2001 BIO Topic Session on "Plankton size classes, functional groups and ecosystem dynamics" dedicated to the memory of the late Prof. Michael M. Mullin (Guest editors: A. Peña and A. Bychkov); the issue includes 11 papers by authors from Canada, Chile, Japan, Korea and U.S.A.;
- *Marine Environmental Research* (September 2004, Vol. 57, Nos. 1-2) - papers resulting from the 1999 MEQ Practical Workshop (Guest editor: R. Addison); the issue includes 9 papers from all PICES member countries.

Peer-review process was initiated for four special issues to be published in 2004:

- *Progress in Oceanography* - selected papers from the 2002 PICES/CREAMS workshop on "Recent progress in studies of the Japan/East Sea ecosystem" (Guest editors: S. McKinnell, K.-R. Kim, M. Terazaki and A. Bychkov); 13 papers have been submitted by authors from Japan, Korea, Russia and U.S.A.;
- *Journal of Oceanography* – a collection of invited papers on *JGOFS North Pacific Synthesis* (Guest editors: T. Saino, A. Bychkov, C.T.A. Chen and P. Harrison);
- *Journal of Marine Systems* - selected papers from the 2002 BIO/POC/FIS Topic Session on "The importance of biophysical coupling in concentrating marine organisms around shallow topographies" (Guest editors: R. Brodeur and J. Dower); 5 papers have been submitted by authors from Israel, Japan, Mexico and U.S.A.;
- *ICES Journal of Marine Research* - selected papers from the PICES/GLOBEC/ICES Zooplankton Production Symposium on "Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans" (Guest Editors: R. Harris, T. Ikeda, S. McKinnell, L. Valdes and W. Peterson); 42 papers have been submitted.

PICES Press - Newsletters

- Vol. 11 No. 1 - joint PICES/GLOBEC issue that focused on the results of PICES XI and the 2nd GLOBEC Open Science Meeting held sequentially in Qingdao, People's Republic of China, in October 2002;
- Vol. 11, No. 2 – regular issue.

Other publications

- CD-ROM with PICES Scientific. Report No. 23 on *Harmful algal blooms in the PICES region of the North Pacific* was published by IOC for UNESCO training courses for harmful algal bloom scientists and managers in developing countries.
- Final announcement for PICES XII was printed and distributed in April;
- A Book of Abstracts for the 3rd PICES/GLOBEC/ICES Zooplankton Production Symposium on *The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Oceans* was compiled and distributed at the meeting in May;
- A Book of Abstracts for PICES XII was compiled and distributed at the meeting in October.

Review of current publication practices of PICES

Publication activities of the Organization have expanded significantly in the last several years. The Review Committee recommended an external review of current publication practices of PICES. The review was conducted from September 16-19, 2003, by two experts from the National Marine Fisheries Service (U.S.A.). The results were presented at PICES XII and included elsewhere in the Annual Report.

V. Travel and representation at other organization meetings

- Drs. Ian Perry (Science Board Chairman), Makoto Kashiwai (CCCC Co-Chairman) and Alexander Bychkov (Executive Secretary) participated in the Open Science Meeting on "Ocean biogeochemistry and ecosystems", in Paris, France, in January;
- Dr. Skip McKinnell (Deputy Executive Secretary), attended the Fifth Annual Workshop on "Coastal ocean ecosystem", in Newport, U.S.A., in February;
- Dr. Alexander Bychkov participated in a conference on "Multilateralism and

international ocean-resources law", in Berkeley, U.S.A., in February;

- Dr. Skip McKinnell attended a planning meeting for the U.S. CLIVAR-Pacific Decadal Variability project (paid by US CLIVAR) in Washington, DC, U.S.A., in February;
- Dr. F.J.R. "Max" Taylor (WG 15 Co-Chairman) represented PICES at the annual meeting of the ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors*, in Vancouver, Canada, in March;
- Dr. John Stein (MEQ Chairman) represented PICES at the annual meeting of the ICES WG on *Introductions and transfers of marine organisms* in Vancouver, Canada, in March (paid by NMFS);
- Dr. Phillip Mundy (MONITOR member) represented PICES at three sequential ICES meetings (Regional Ecosystem Study Group for the North Sea, the ICES-EuroGOOS Planning Group on the North Sea Pilot Project, and the ICES/IOC Steering Group for GOOS) related to monitoring activities in Nantes, France, in April;
- Full travel support was provided to Dr. Vera Alexander (PICES Chairman), Dr. Ian Perry (Science Board Chairman) and two members of Science Board to attend the PICES interim Science Board / Governing Council Meeting, in Victoria, Canada, in April;
- Ms. Christina Chiu attended the International Fisheries Commission Pension Society Meeting in Halifax, Canada, in May;
- Dr. Alexander Bychkov participated in the Third JGOFS Open Science Conference and the JGOFS SSC meeting, in Washington, DC, U.S.A., in May (paid by JGOFS);
- Dr. Elizabeth Logerwell (FIS member) represented PICES at the NPAFC Research Planning and Coordinating Meeting, in Seattle, U.S.A., in May;
- Drs. Ian Perry, David Mackas and members of the Secretariat travelled to Gijón, Spain, in May, for the PICES/GLOBEC/ICES Zooplankton Production Symposium; Drs. Tsutomu Ikeda (Japan, PICES co-convenor for the Symposium), William Peterson (U.S.A., PICES co-coordinator for associated workshops and Poster Session), Harold Batchelder (U.S.A., PICES co-convenor for a special workshop) attended the Symposium with their own funding;
- Partial travel support was provided to 27 scientists from countries with "economies in transition" (11 paid by the Trust Fund and 16 by a SCOR travel grant) to attend the Zooplankton Production Symposium;
- Drs. Skip McKinnell (PICES representative and discussion leader on the development of the Okhotsk Sea ecosystem status report) and Tokihiro Kono (Japan, invited speaker) attended the 3rd PICES Workshop on the "Okhotsk sea and adjacent areas", in Vladivostok, Russia, in June;
- Drs. Michio Kishi (Japan), Bernard Megrey (U.S.A., PICES funding) and Francisco Werner participated in the first Workshop of the Study Group on *Extending ecosystem models to the basin scale*, in Cambridge, UK, in May. The second workshop was planned at the same venue in October 2003.
- Drs. Vera Alexander and Alexander Bychkov represented PICES at the 22nd session of the IOC (Intergovernmental Oceanographic Commission) Assembly, in Paris, France, in June;
- Dr. Alexander Bychkov traveled to Seoul, Republic of Korea, to participate in the CREAMS-III planning workshop and to discuss preparations for PICES XII with the Local Organizing Committee (partly paid by the Seoul National University);
- Full or partial travel support was provided to 11 participants (1 from Canada, 1 from China, 3 from Japan, 3 from Korea, 2 from U.S.A. and 1 from Mexico) to attend the "North Pacific Ecosystem Status Report" Workshop, in Victoria, Canada, in August;
- Dr. Skip McKinnell (invited participant) attended the U.S./NMFS PaCOS (Pacific Coastal Observing System) planning meeting, in Seattle, U.S.A., in September;
- Dr. Vladimir Radchenko (Science Board Vice-Chairman) represented PICES at the 36th SCOR Executive Committee, in Moscow, Russia, in September (paid by Russian government);
- Dr. Ian Perry represented PICES at the ICES Annual Conference, in Tallinn, Estonia, in September;

- Drs. Vera Alexander and Ian Perry and members of the Secretariat travelled to Seoul, Republic of Korea, in October, for PICES XII;
- Full or partial travel support (paid by PICES and co-sponsoring programs and organizations) was provided to 3 invited speakers for the Science Board Symposium, and 15 invited speakers for scientific sessions and workshops at PICES XII, in Seoul, Republic of Korea, in October;
- Partial travel support (paid by the Trust Fund and a SCOR travel grant) was provided to 33 scientists (1 Canadian, 11 Chinese, 1 Japanese, 4 Korean, 15 Russian and 1 U.S.A.) to attend PICES XII. The majority of these scientists are younger than 35 year of age;
- Dr. Skip McKinnell will represent PICES at the CoML Ocean Life Symposium and associated events, in Washington, DC, U.S.A., in October;
- Dr. Elizabeth Logerwell will represent PICES at the NPAFC Eleventh Annual Meeting, in Honolulu, U.S.A., in October;
- Dr. Sei-ichi Saitoh (MONITOR Co-Chairman) will represent PICES at the POGO Fifth Annual Meeting, in Tokyo, Japan, in November;
- Dr. Alexander Bychkov will travel to Japan in November, to participate in the final meeting of the JGOFS North Pacific Synthesis Group in Nagoya (paid by JGOFS), and represent PICES at the First Argo Science Symposium in Tokyo;
- Full or partial travel support will be provided to 2 scientists to attend the workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific", in Victoria, Canada, in November;
- Full or partial travel support will be provided to 2-3 scientists to participate in the PICES/CoML "Regional marine life expert" Workshop, in Victoria, Canada, in November.

VI. Relations with international scientific organizations and programs

The following reflects expanding relationships with international scientific organizations and programs that are considered to have the highest priority for PICES with respect to cooperation and facilitation of ecosystem research in the North Pacific during this year:

International Geosphere-Biosphere Program (IGBP)

- Discussion on the role PICES, as a regional organization, can play in implementing marine aspects of the IGBP Phase II continued at the IGBP Congress in June 2003 (Banff, Canada), where PICES was represented by the Science Board Chairman, Dr. Ian Perry.

IGBP Global Ocean Ecosystem Dynamics project (GLOBEC)

- The PICES Climate Change and Carrying Capacity (CCCC) Program provides a mechanism for integrating national GLOBEC research programs in the North Pacific and is a regional component of the international GLOBEC effort.
- A joint PICES/GLOBEC issue of PICES Press (Vol. 11, No. 1) was published in February 2003. The issue is focused on the results from PICES XI and the 2nd GLOBEC Open Science Meeting held sequentially in Qingdao, People's Republic of China, in October 2002.
- PICES and GLOBEC worked together to organize the 3rd Zooplankton Production Symposium on "The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Ocean" (May 20-23, 2003, Gijón, Spain).
- The GLOBEC Focus 3 Working Group on *Linking biophysical and upper trophic level models* and PICES MODEL Task Team are the key players in the Study Group on *Extending ecosystem models to the basin scale*. The first workshop of this Study Group was held May 28-June 2, 2003, in Cambridge, UK. The second workshop is planned at the same venue in October 2003. It is expected that this activity will result in publication of a background/review paper in *Science* in 2004.
- The objectives of the Science Board Symposium on "Human dimensions of ecosystem variability" at PICES XII

(October 10-18, 2003, Seoul, Republic of Korea) are highly relevant to activities of the GLOBEC Focus 4 Working Group on *Feedbacks from the changes in marine ecosystem structure*, and by the invitation from PICES, GLOBEC agreed to co-sponsor the Symposium by supporting a keynote speaker, Dr. Lawrence Hamilton (U.S.A.).

- PICES will co-sponsor a GLOBEC/SPACC Workshop to compare long-term data on small pelagic fishes from the Kuroshio/Oyashio system with those of other ecosystems in the Pacific and Atlantic Oceans to better understand mechanisms which govern regime shifts (December 8-10, 2003, Tokyo, Japan).
- PICES scientists were, and will continue to be, active participants of planning meetings for a new program on *Ecosystem Studies of Subarctic Seas* (ESSAS). The first meeting was held May 25-28, 2003, in Bergen, Norway; and the second meeting is planned for the coming November. ESSAS is being developed as an international comparative field program that may eventually become a regional GLOBEC program. Planning for ESSAS would benefit from efforts to synthesize current knowledge, and as a first step in this direction, PICES proposed that GLOBEC, PICES and ICES hold a joint workshop in 2004-05 on the comparison of factors controlling the biomass, species composition, and fate of zooplankton (including micro-zooplankton, gelatinous zooplankton, and micronekton such as euphausiids) in the Bering and Barents Seas.

IGBP Joint Global Ocean Flux Study (JGOFS)

- A collection of contributed papers from JGOFS-related field programs in the North Pacific was published as a special JGOFS/PICES issue of *Deep-Sea Research II* on *North Pacific Biogeochemical Processes* (Guest editors: T. Saino, A. Bychkov, C.-T. Chen and P. Harrison). The issue includes an overview and 27 papers by authors from Canada, Japan, China-Taipei and Russia.
- Selected papers from the PICES/JGOFS Topic Session on "Plankton size classes, functional groups and ecosystem dynamics: Causes and consequences" at PICES X comprise a special issue of *Progress in Oceanography* (Guest editors: A. Peña and A. Bychkov) published in September 2003. The issue includes 11 papers by authors from Canada, Chile, Japan, Korea and U.S.A.
- A collection of invited papers on *JGOFS North Pacific Synthesis* will be published in a special issue of *Journal of Oceanography* (Guest Editors: T. Saino, A. Bychkov, C.T.A. Chen and P. Harrison) in spring 2004. A CD-ROM with data sets obtained during the *North Pacific Process Studies* will be prepared by the Japan Oceanographic Data Center (JODC) and circulated at the same time.
- Posters summarizing activities of the PICES WG 13 on *CO_2 in the North Pacific* and WG 17 on *Biogeochemical data integration and synthesis* were presented at the 3rd JGOFS Open Science Conference, held May 5-8, 2003, in Washington, DC, U.S.A.

IGBP Surface Ocean-Lower Atmosphere Study (SOLAS)

- Iron enhancement experiments are an important part in the agenda of both SOLAS and PICES. All initial planning for iron enhancement experiments in the subarctic Pacific was made under the PICES umbrella. Recommendations from the PICES Workshop on "Iron Fertilization Experiment in the Subarctic Pacific Ocean" (October 2000, Tsukuba, Japan) were used to design the Japanese Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study (SEEDS) in the western North Pacific (summer 2001) and the Canadian Subarctic Ecosystem Response to Iron Enrichment Study (SERIES) in the eastern North Pacific (summer 2002). The results of these experiments will be published as special issues of primary journals in 2004.
- A PICES IFEP Workshop on "*In situ* iron enrichment experiments in the eastern and western subarctic Pacific" will be held February 10-12, 2004, in Victoria, Canada.
- A 1½-day joint Canadian-SOLAS/PICES session on "Response of the upper ocean to mesoscale iron enrichment" will be held at

the ASLO (American Society of Limnologists and Oceanographers) meeting, February 15-20, 2004, in Honolulu, U.S.A.

IGBP Ocean Biogeochemistry and Ecosystem Analysis Program (IMBER or OCEANS)

- PICES is interested in the development of a new project on ocean biogeochemistry and ecology, and sent representatives to the International Open Science Meeting on "Ocean Biogeochemistry and Ecosystems", held in January 2003, in Paris, France.

WCRP Climate Variability and Predictability (CLIVAR) Programme

- A 1-day PICES/CLIVAR Workshop on "Climate variability in the Pacific and its impact on the marine ecosystem" was held October 20, 2002, in Qingdao, People's Republic of China (in conjunction with PICES XI). A follow-up PICES/CLIVAR Workshop on "Scale interactions of climate and marine ecosystems" will be convened in October 2004, in conjunction with PICES XIII (Honolulu, U.S.A.). A planning meeting for the workshop was held in October 2003, at PICES XII.

Scientific Committee on Oceanic Research (SCOR)

- PICES and SCOR have many coinciding interests, and PICES scientists have been important contributors to certain SCOR activities. In 2002, presentations by Dr. Alexander Bychkov (PICES Executive Secretary) at the 26th SCOR General Meeting, and by Dr. Edward Urban (SCOR Executive Director) at PICES XI clearly demonstrated the positive benefits of interactions between SCOR and PICES. This year, Dr. Vladimir Radchenko (PICES Science Board Vice-Chairman) attended the 36th SCOR Executive Committee meeting, and Dr. Akira Taniguchi (SCOR Vice-President) participated in PICES XII, to review and discuss existing and future cooperation between the two organizations. Relationships with GLOBEC, JGOFS and SOLAS are reflected above. Other on-going collaborations between PICES and scientific projects and programs, working groups and activities established/co-sponsored by SCOR are listed below.
- The overlapping scientific interests of PICES and SCOR-IOC WG 119 resulted in PICES' involvement in planning and organizing the International Symposium on "Quantitative ecosystem indicators for fisheries management", to be held March 31-April 3, 2003, in Paris, France. PICES is represented on the Scientific Steering and Organizing Committees for this symposium and provides the use of its web site for on-line registration and abstract submission.
- The SCOR-IOC Advisory Panel on Ocean CO_2 recognized activities of the PICES WG 17 on *Biogeochemical data integration and synthesis* (as well as its predecessor, PICES WG 13 on *CO_2 in the North Pacific*) as essential for improving the overall quality of oceanic CO_2 measurements and resolving data synthesis issues, and adopted PICES as a regional coordination group for Pacific carbon work.
  - To foster international cooperation towards the integration and synthesis of the global CO_2 survey data, IOCCP (International Ocean Carbon Coordinated Project) and PICES collaborate on developing the global database for CO_2 and CO_2-related data, and work on involving other regional groups such as CARINA and the CLIVAR Pacific Panel in this project.
  - A report on *CO_2 in the North Pacific* published in the *PICES Scientific Report Series* (No. 24) in June 2003, summarizes the research and technical activities that have been conducted by member nations of PICES, to synthesize CO_2 data in the North Pacific, and to provide a comprehensive picture of the anthropogenic CO_2 distribution in this region. The report was circulated using both PICES and the SCOR-IOC Advisory Panel mailing lists.
  - A joint IOCCP/PICES Workshop on "Ocean surface pCO_2 data integration and database development" will be held January 13-17, 2004, in Tsukuba, Japan.
  - IOCCP provided US $6,000 to PICES for the publication of the "Guide of best

practices for oceanic CO_2 measurements and data reporting" being prepared by the PICES WG 17 on *Biogeochemical data integration and synthesis*, to ensure a large print run. Publication is expected in 2004 in the *PICES Scientific Report Series*.

- SCOR-IOC Advisory Panel Ocean CO_2 and IOCCP are invited to participate in the planning and co-sponsor a session on "The impacts of climate change on the carbon cycle in the North Pacific", to be convened in conjunction with PICES XIII (October 2004, Honolulu, U.S.A.).

- Activities and products of the PICES WG 15 on *Ecology of Harmful Algal Blooms in the North Pacific* are complementary to the efforts of the SCOR-IOC GEOHAB Program. PICES is prepared to discuss involvement in the development/realization of the GEOHAB Implementation Plan by assisting with the coordination of national efforts in the North Pacific.
- SCOR provided two grants to support the travel of scientists from countries with "economies in transition" to scientific meetings organized by PICES: US $7,000 for the 3rd Zooplankton Production Symposium (May 19-23, 2003, Gijón, Spain); and US $5,000 for PICES XII (October 10-18, 2003, Seoul, Republic of Korea).

Intergovernmental Oceanographic Commission (IOC)

- IOC and PICES agreed to cooperate on four fronts: (i) ecosystem monitoring (see description under GOOS); (ii) ecosystem indicators (see description under SCOR); (iii) CO_2 data integration and synthesis (see description under SCOR); and (iv) harmful algal blooms (see below).
- A CD-ROM with the PICES Scientific Report No. 23 on *Harmful algal blooms in the PICES region of the North Pacific* was prepared for IOC/UNESCO training courses for harmful algal bloom scientists and managers in developing countries.
- The IOC HAB Programme has already invited PICES to become an equal partner in HAE-DAT, a IOC/ICES Harmful Algal Event meta-Database which has already compiled 15 years of data from the Western Atlantic, with an idea to build one single global database on HAB occurrences and impacts. A PICES-IOC Workshop on "Harmful algal blooms - harmonization of data" at PICES XII was convened to explore and discuss the interest of PICES member countries in establishing a common database and integrating this database with HAE-DAT.

Global Ocean Observing System (GOOS)

- PICES and GOOS started a dialogue in order to explore the possibility of developing a joint GOOS and PICES approach to ocean observations in the North Pacific, and to define the direction that PICES should take in integrating its regional interests with GOOS.
- PICES has initiated several projects of direct relevance to GOOS: development of the North Pacific Ecosystem Status Report, North Pacific Continuous Plankton Recorder Program, inter-laboratory method comparisons of measurement technique for carbonate parameters in seawater, etc.
- A MONITOR Workshop to "Examine and critique a North Pacific Ecosystem Status Report" at PICES XII (October 10-11, 2003, in Seoul, Republic of Korea) and a joint PICES/PaCOS Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" (November 20-22, 2003, in Victoria, Canada) are of direct relevance to GOOS.

International Council for the Exploration of the Sea (ICES)

- PICES and ICES worked together to organize the 3rd Zooplankton Production Symposium on "The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Ocean" (May 20-23, 2003, Gijón, Spain).
- At the 2002 ICES Annual Conference, Dr. Ian Perry presented a PICES proposal that included four "themes" which might be of interest for enhanced interactions between ICES and PICES: (i) *teleconnections* -

investigations of whether there is a similarity of forcing and then comparisons of responses in the Atlantic and Pacific Oceans; (ii) *ecosystem reporting* - evaluating, summarizing and conveying the state of marine ecosystems; (iii) *ecosystem-based approaches to the management of marine resources*; and (iv) *harmful algal blooms*. These "themes" were recognized by ICES as affording opportunities for fruitful cooperation.

- To initiate co-operation in specific areas, PICES representatives attended annual meetings of the ICES *Cod and Climate Change* (CCC) Program (April 2002, Copenhagen, Denmark), the ICES/GOOS Steering Group (April 2003, Nantes, France), the ICES WG on *Introductions and transfers of marine organisms* and the ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors* (March 2003, Vancouver, Canada).
- Teleconnections:
  - PICES proposed that PICES, ICES and GLOBEC co-convene a workshop (or series of workshops) in 2004/05, to develop comparisons of zooplankton population variability among the world's oceans, in particular between the North Pacific and North Atlantic;
  - PICES proposed that PICES, ICES and GLOBEC co-convene a joint workshop that focuses on the comparison of the factors controlling the biomass, species composition, and fate of zooplankton (including microzooplankton, gelatinous zooplankton, and micro-nekton such as euphausiids) in the Bering and Barents Seas. The workshop could be the precursor of a larger, more comprehensive examination of the full ecosystems of all of the sub-arctic seas.
- Ecosystem reporting:
  - The ICES-GOOS Steering Group and PICES' MONITOR Task Team should work together to identify opportunities for common sampling approaches and techniques (to facilitate North Pacific – North Atlantic comparisons), and in that context, collaborate on implementation of ferry box systems for continuous underway observations, and the development of biophysical models of these marine systems;
  - A 2-day MONITOR Workshop at PICES XII was intended to identify what should be addressed in the North Pacific Ecosystem Status Report, using relevance to management decisions and relation to other pieces in other areas of the North Pacific as selection criteria. Dr. Keith Brander (ICES) was invited to participate in this workshop at PICES' expense.
- Ecosystem-based management science:
  - ICES accepted PICES' invitation to co-sponsor a Topic Session on "Ecosystem-based management science and its application to the North Pacific" at PICES XII, by identifying and supporting the travel expenses of a keynote speaker, Dr. Chris Frid (Chairman of the ICES Working Group on *Ecosystem effects of fishing activities*);
  - A new Working Group on ecosystem-based management issues is expected to be established by PICES. Cooperation between this PICES Working Group and the ICES Working Group on *Ecosystem effects of fishing activities* should be advanced by exchanging representatives and organizing joint meetings and workshops;
  - The overlapping scientific interests of ICES and PICES in this area resulted in their involvement (jointly with SCOR, IOC, FAO, GLOBEC, etc.) in planning and organizing the International Symposium on "Quantitative ecosystem indicators for fisheries management", to be held March 31-April 3, 2004, in Paris, France.
- Species introductions:

  The following steps are suggested to further collaboration between the two organizations:
  - Participation of PICES representatives in the annual meetings of the ICES WG on *Introductions and transfers of marine organisms* (WGITMO) and ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors*

(SGBOSV) in March 2004, in Italy;
  - Participation of representatives of WGITMO (and/or SGBOSV) in the meeting of PICES WG 15 (or HAB Section, if formed) and a Topic Session on "Natural and anthropogenic introductions of marine species" to be held during PICES XIII (October 15-23, 2004, Honolulu, U.S.A.);
  - A joint ICES/PICES workshop on scientific issues related to i*ntroductions and transfers of marine organisms* in 2005 (possibly in conjunction with the annual meetings of WGITMO and SGBOSV).

North Pacific Anadromous Fish Commission (NPAFC)

- In March 2002, NPAFC and PICES, along with NASCO (North Atlantic Salmon Conservation Organization), IBSFC (International Baltic Sea Fishery Organization) and ICES, co-sponsored an international symposium on "Causes of marine mortality of salmon in the North Pacific and North Atlantic Ocean and in the Baltic Sea". A proposal was received to consider holding an international scientific symposium on "Factors affecting mortality of salmon at sea" in 2005 or 2006, in Europe, with the same group of sponsors.
- Dr. Douglas M. Eggers attended the PICES North Pacific Ecosystem Status Report Workshop in August 2003, and presented a report on the status of North Pacific salmon on behalf of NPAFC, as a contribution to the *North Pacific Ecosystem Status Report*.
- At a meeting between the Chairman of PICES Science Board and the Chairman of NPAFC CSRS Committee, it was recommended that (i) PICES issue a "formal invitation" to NPAFC to present a report on the status of North Pacific salmon at each PICES Annual Meeting (the most appropriate venue within PICES for presentation of this report was left for discussion in PICES); and (ii) NPAFC consider an invitation to PICES to present the North Pacific Ecosystem Status Report to NPAFC Annual Meetings.
- It is proposed that a 3-day joint NPAFC-PICES Symposium with the working title "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems" be held in 2005, in conjunction with the NPAFC Annual Meeting in Korea, in part to celebrate Korea becoming a member of NPAFC.

Other regional International Fisheries Organizations

- The Inter-American Tropical Tuna Commission (IATTC) and the International Pacific Halibut Commission (IPHC) provided information on species of their concern for the first PICES *North Pacific Ecosystem Status Report*.

Census of Marine Life program (CoML)/Sloan Foundation

- In 2002, PICES was awarded a grant of US $45,000 from the Alfred P. Sloan Foundation to produce (by December 31, 2003) a report for the Census of Marine Life entitled *Marine life in the North Pacific Ocean: The known, unknown and unknowable*.
- As a part of the process of developing this report, as well as for a PICES North Pacific Ecosystem Status Report, PICES and CoML held in 2003, two regional workshops: "Okhotsk Sea and adjacent areas" (June 4-6, Vladivostok, Russia) and "Status of the East China Sea and Yellow Sea ecosystems" (October 9-10, Seoul, Korea), to summarize and review available information in each region of interest.
- A PICES/CoML *Regional marine life expert* Workshop will be held in November 2003 (Sidney, Canada) to discuss the final draft of the report for CoML.

EVOS Gulf of Alaska Ecosystem Monitoring and Research Program (GEM)

- EVOS/GEM agreed to fund the sample collection and analysis for the north-south transect of the PICES Continuous Plankton Recorder (CPR) survey from 2004 to 2006, at the level of US $120,000 per year.
- EVOS/GEM contributed US $16,000 for the development of the *North Pacific Ecosystem Status Report* in *US FY 2003* (October 1,

2002-September 30, 2003) and US $16,600 for the continuation of this work in *US FY 2004* (October 1, 2003-September 30, 2004). These grants include support for the MONITOR Workshop to "Examine and critique a North Pacific Ecosystem Status Report" (October 10-11, 2003, Seoul, Korea), and the PICES/PaCOS Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" (November 20-22, 2003, Victoria, Canada).

North Pacific Research Board (NPRB)

- The North Pacific Research Board (U.S.A.) agreed to fund the sample collection and analysis for the east-west transect of the PICES Continuous Plankton Recorder survey of the North Pacific and southern Bering Sea at the level of US $185,000 for two years, from July 2003 to June 2005.

Pacific Coastal Observing System (PaCOS)

- Southwest Fisheries Science Center (National Marine Fisheries Service/NOAA, U.S.A.) offered US $18,200 to facilitate the gathering and coordination of potential international PaCOS (Pacific Coastal Observing System) contributions, and to design basic governance structure options for coordinating biological observations between the United States, Canada and Mexico.
- A joint PICES/PaCOS Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" will be held in November 20-22, 2003, in Victoria, Canada. The workshop will be co-sponsored by EVOS/GEM.

VII. PICES Intern Program

See GC Agenda item 9 for details.

VIII. PICES database

The general functions of the PICES database are to hold and update information of all the people who attended meetings, members of PICES groups, libraries and organizations, meetings, abstract submissions, meeting finances (the tracking of registration fee payments, financial support grants, etc.), as well as to generate various printouts such as participation lists, lists of papers sorted by session/country/speakers, confirmation letters to meeting participants regarding their presentations, meeting schedules, registration fee payment summaries, mailing list labels, poster session labels, nametags etc.

The database was constructed after PICES X, and tested for the first time at PICES XI in October 2002 (Qingdao, People's Republic of China). The database was subsequently updated, improved and cleaned from duplication and programming errors in 2003. Some tables and functions in the database were modified to improve on-line registration and abstract submission for various meetings. The improved database was tested at the PICES/GLOBEC/ICES Zooplankton Production Symposium in May 2003 (Gijón, Spain).

A new utility was written to create the "Index of Authors" table. This table is a part of every "Book of Abstracts" prepared for meetings organized or co-sponsored by PICES. Before this new function, the "Index of Authors" was created manually, which was tedious. Now it is generated automatically, and that assures accuracy and allows easy update due to last minute changes. This utility has been successfully tested during the preparation for PICES XII.

IX. PICES web site

This form of communication is extremely important, and should be a priority within PICES. Unfortunately, due to the lack of expertise at the Secretariat and the limited financial resources, the current PICES web site is badly out-dated and in need of a major overhaul. At the 2003 interim Science Board/Governing Council meeting, the Secretariat was requested to develop a plan to improve the web site for discussion at PICES XII. This plan includes three important aspects: (1) immediate updating of material and ongoing maintenance of the web site; (2) longer-term re-design of the web site; and (3) determining and providing information for the web site.

Immediate updating and ongoing maintenance of the web site

- Ms. Julia Yazvenko, PICES' Administrative Assistant, was tasked with the responsibility of maintaining the web site on a regular basis;
- Additional funds need to be allocated every year under "Contractual Services" to assist in maintaining the web site;
- All Annual Reports, Scientific Reports and Newsletters will be added to the web site immediately after its re-design.

Re-design of the web site

In July 2003, PICES signed a 6,000-dollar contract with *Sage Internet Solutions Ltd.* to re-design the PICES web site. The re-design will:

- Improve the web site esthetically
  - Templates, Style Sheets and/or server-side includes will be used to maintain a consistent look and feel throughout the entire site;
- Make the web site user-friendly
  - Local search engine will provide easy access to all of the key areas of the site, while not hiding or burying any important information;
  - When searching the site by designated fields, matching results will be listed on a smaller page, eliminating lengthy scrolling and making the pages more printer-friendly;
  - On-line meeting registration and abstract submission will be advanced by using a common registration area;
- Enhance communication within various groups
  - Each Committee, Working Group, Project and the CCCC Program will have their Pages on the web site;
  - The *"Discussion Club"* feature will allow members of the Committees, Working Groups and CCCC Program to edit their products on-line;
  - The *"ListServ"* system will improve distribution of information within the group.

Determining and providing information for the web site

- The Secretariat cannot be responsible for determining what information goes onto the web site;
- Members of Science Board and Governing Council were requested to provide the Secretariat with suggestions of the information that is necessary on the uppermost levels of the website by June 10 (This Action item #16.4 of the 2003 interim Science Board/Governing Council meeting was not implemented);
- All Committees and the CCCC Program, including Working Groups, Task Teams and Advisory Panels, were requested to discuss and identify what information should be included in the PICES web site, in particular for their group page, and how this information should be provided to the website (i.e. the "flow" of information from Committee. Responses to the Secretariat and Science Board were expected by August 1, for circulation prior to PICES XII (This Action item #16.3 of the 2003 interim Science Board/Governing Council meeting was not implemented).

GC Endnote 4

Report of 2003 interim Governing Council meeting

The Governing Council met from 13:30-17:30 on April 9, 2003, immediately after the first joint interim Science Board/Governing Council meeting. All Contracting Parties were represented at the meeting. The Chairman, Dr. Vera Alexander, also invited Science Board members to attend. She welcomed the participants *(GC-IM Endnote 1*) and reviewed the provisional agenda. One addition – approval of the report of interim Science Board/Governing Council meeting - was made as Agenda Item 1. Canada proposed the adoption of the agenda *(GC-IM Endnote 2*), seconded by the Republic of Korea.

Agenda Item 1. Report of 2003 interim Science Board/Governing Council meeting

The Chairman noted that the first interim Science Board/Governing Council meeting (April 7-9, 2003) was very worthwhile, and that all member countries and Standing Committees and Scientific Programs profited from the experience of having Science Board meet with Governing Council. Council approved the report and complimented the Science Board Chairman, Dr. Ian Perry, on his excellent work in preparing for and convening the meeting.

Agenda Item 2. Preliminary Report on Administration for 2003

The Executive Secretary summarized the activities of the Organization and the Secretariat since PICES XI. The Chairman noted further improvements in the timeliness of payments of annual fees to the Organization from most member countries, and thanked the United States, Japan, Canada and Russia for their performance. The Republic of Korea reported that they will pay the 2003 annual fee within their second fiscal quarter. The People's Republic of China stated that they will attempt to pay the 2003 annual dues and the outstanding balance from 2002 by September 2003.

Council reviewed the external funding and voluntary contributions received since PICES XI, and thanked Science Board and the Secretariat for their efforts. Dr. Richard Marasco noted that funding constraints can impede the improvement of the Organization, and therefore fund-raising is an essential function of the Finance and Administration Committee (F&A). However, various foundations in the United States are more inclined to fund specific projects, and for F&A to proceed effectively, proposals developed by the Science Board and/or Scientific Committees are needed.

The discussion that followed focused on potential funding sources for specific activities initiated by PICES. Dr. George Boehlert suggested that the expertise in micronekton in PICES could form the focus of a workshop followed by a pilot project for the Census of Marine Life. There are no pilot projects that target the mid-water regions of the world ocean, and PICES could organize this effort. He also recommended contacting NOAA Global Programs about helping to fund the publication of the "Guide of best practices for oceanic CO_2 measurements and data reporting". Dr. Alexander suggested the communication and cooperation with regional scientific research efforts in the North Pacific such as the North Pacific Research Board. She also indicated that PICES should consider pairing with some other entities to apply for funding for educational/training/outreach projects.

Agenda Item 3. Membership and observers from other countries

<u>Mexico</u>

At PICES VIII (October 1999, Vladivostok, Russia), Council adopted a resolution reflecting a strong interest in having Mexico accede to the PICES Convention (Decision 99/A/5). This interest was confirmed at PICES IX (October 2000, Hakodate, Japan), and during a visit of a PICES delegation to Mexico (La Paz) in May 2001 (Decision 00/A/6). Progress in developing PICES-Mexico relations since PICES X is reflected in the 2002 Annual Report.

At last year's Annual Meeting, Council discussed future actions to accelerate the process in having Mexico accede to the PICES Convention. It was noted that even though the Mexican scientific community has a strong interest for Mexico to join PICES, implementing recommendations from the 2001 joint PICES/Mexico meeting in La Paz is going slower than expected.

One of the recommendations at PICES XI was to send a formal invitation letter to the Mexican Ministry of Foreign Affairs, but another suggestion was that PICES should continue its effort through contacts with the Directors of Mexican marine research institutes and the Mexican National Oceanographic Committee. Council instructed the Chairman and Executive Secretary to explore both approaches.

The Executive Secretary reported on the correspondence with Dr. Patricio A. Bernal (IOC Executive Secretary and Assistant Director-General of UNESCO) and Dr. Daniel-Lluch-Belda (organizer of the 2001 joint meeting in La Paz). They both suggested that the National Oceanographic Committee is the right Mexican body to approach to coordinate Mexico's intention to join PICES. Dr. Bernal indicated that it is the only body that represents the Mexican Government above all institutions, agencies and universities in ocean research and related matters, and the coordination offered by the National Oceanographic Committee would be extended to other areas, including, especially, the environment and fisheries.

After a lengthy discussion, Council approved the following actions:

- To send a formal letter inviting Mexico to joint PICES through the Embassy of Mexico in Canada;
- To continue contacts with the Mexican National Oceanographic Committee, including a meeting of PICES representatives with Ing. Marco Polo Bernal (Undersecretary of State on Education and Investigation Technologies and Mexican representative on IOC) at the 36th Session of the IOC Executive Council and/or the 22nd Session of the IOC Assembly, in June 2003;
- To encourage the Directors of Mexican marine research institutes represented at the joint meeting in La Paz to send letters to the National Oceanographic Committee expressing their interest for Mexico to join PICES;
- To explore the practical value of another visit of a PICES delegation to Mexico.

Democratic People's Republic of Korea

At PICES XI, the Republic of Korea advocated that the Twelfth Annual Meeting in Seoul is a good opportunity to involve scientists from the D.P.R. Korea in PICES activities. The Executive Secretary was requested to find an appropriate way of sending invitation letters and information about PICES XII.

A preliminary list of contacts was prepared with assistance from the Center for East Asian Studies (Monterey Institute of International Studies, U.S.A.). More information on potential contacts and appropriate contact procedures with the D.P.R. Korea is needed and will be requested from the Ministry of Maritime Affairs and Fisheries (Republic of Korea) and the State Oceanic Administration (People's Republic of China). Considering the current political situation in the region, Council agreed to defer sending invitation letters to the D.P.R. Korea until a more appropriate occasion arose.

Agenda Item 4. PICES Intern Program

The PICES Intern Program was approved in 1999 (Decision 99/A/7) and commenced in 2000. At PICES XI, Council examined the results from the first three years of the Intern Program, and concluded that the Organization and member countries are benefiting from the Program, and that it should be continued.

Ms. Natalya Bessmertnaya (TINRO-Center, Russian Federation) completed her term on March 21, 2003, and Mr. Chuanlin Huo (National Marine Environmental Monitoring Center, State Oceanic Administration, People's Republic of China) is expected to start his term in April 2003.

The Intern Program was not budgeted for in the years 2000-2002, and has been financed solely by voluntary contributions. At PICES X, Council approved the use of registration fees collected from the Annual Meetings to finance the Program (Decision 01/A/4(iv)), but noted that this will limit the ability of the Organization to support high priority projects identified by Science Board. The Executive Secretary reported that according to the instructions from Council, letters were sent (March 3, 2003) to invite voluntary contributions from member countries to support the Intern Program in 2003 and beyond. At the meeting, Mr. Douglas Bancroft confirmed that in addition to the annual fee, Canada agreed to provide $10,000 in support of the 2003 Intern Program. Council commended Canada for its contribution and requested other member countries to examine the possibility of making voluntary contributions to the Intern Program, and inform the Secretariat on this matter by May 31, 2003.

At PICES XI, Council decided to re-visit the guidelines for recruiting and selecting interns, methods of advertising, as well as the level of stipend provided to the intern. Dr. Laura Richards worked with the Executive Secretary on these issues. The following recommended changes were accepted by Council:

- To advertise the Intern Program on the PICES web site;
- To encourage national delegates to take additional measures to advertise the Intern Program within their countries;
- To require that applicants send a copy of their application to the PICES Secretariat.

These changes are to be included in the *Guidelines for application and selection procedure* section for the Intern Program, and the revised document posted on the PICES web site by April 30, 2003.

The Executive Secretary presented (see table below) a comparison between the stipend (maximum 1-year term) for PICES interns and fellowships (2-3 year term) provided by the National Science and Engineering Research Council of Canada (NSERC). It was agreed that F&A will review this information and discuss the level of stipend for the interns at PICES XII.

Stipend/Fellowship	Per year before tax	Per year after tax
PICES Internship	$24,000	$24,000
Postdoctoral Fellowship	$35,000	$27,838
NATO Science Fellowship	$33,000	$26,061
Visiting Fellowship for Canadian Government Labs	$39,000	$30,878

It was also suggested that an expanded Intern Program that includes scientific interns, in addition to administrative interns, might be valuable. Funding opportunities for such extension have to be explored by national delegates and the Secretariat.

Agenda Item 5. PICES Visiting Scientist Program

In the last 2-3 years, Science Board has recommended, subsequently approved by Governing Council, an increasing variety and number of activities for scientists working toward achieving PICES scientific goals. Evidence of rapid growth is apparent in the number of events in which the Organization is involved, and in the scope and variety of its publications. Increasing activity in PICES reflects a growing interest among scientists of member countries to look beyond their own national jurisdictions for solutions and answers to many of society's pressing questions about the health and functioning of marine ecosystems. Despite these growing societal pressures on marine ecosystems, there has been no consensus among member countries on the level of financial or human resources required to sustain the cooperative activities of their scientists. Council has endorsed increasing staffing levels at the PICES Secretariat, but only if it can be implemented within the inflation adjusted annual contribution.

At PICES X, Council approved the PICES Visiting Scientist Program (Decision 01/A/6) with two main objectives: (i) to provide professional development of marine scientists and managers from PICES member countries; and (ii) to strengthen the capacity of the Organization to develop and implement projects that have high priority for PICES and member countries. The Program is seen as an opportunity to improve the functioning of the Organization without increasing annual contributions. It provides an opportunity for member countries and/or national agencies to contribute human resources to support key projects of the Organization, which are also of specific interest for country/agency, *e.g.* such as the development of the North Pacific Ecosystem Status Report. The expectation was to commence the Visiting Scientist Program in 2002, but despite this opportunity, no member country or national agency has taken advantage of the Program.

At PICES XI, Council reviewed the Program and discussed ways for implementing it in 2003 and beyond. It was noted that the Program should be more widely advertised, the description re-formulated and alternative mechanisms to fund the Program be considered. Dr. Laura Richards worked with the Executive Secretary on these issues. A draft report was presented to Council for review:

<u>Advertising</u>
It was generally accepted that the Visiting Scientist Program should be advertised on the PICES web site, and that national Delegates should be encouraged to take additional measures to advertise the Program within their countries.

<u>Funding</u>
Council also agreed that the Visiting Scientist Program should be open for funding from various sources, such as:

- *Secondment of experts by national agencies or other international organizations*:
  An example of an existing arrangement is the secondment of experts by the National Marine Fisheries Service (NMFS) of NOAA to the Intergovernmental Oceanographic Commission (IOC). The secondment is governed by an MOU developed between IOC and NMFS/NOAA. The MOU spells out the terms of reference for the tasks, responsibilities, duration, as well as the legal terms. Dr. Hyung-Tack Huh also informed Council that KORDI is using the same approach to send their experts to IOC. The PICES Visiting Scientist Program was designed using the IOC Visiting Scientist Program as example, and currently includes the secondment from national agencies as the only mechanism to deploy a member of their staff to the Secretariat. Dr. George Boehlert noted that a variant of this is the NMFS/NOAA rotational assignment program (4-6 months) to advance agency and career, when home institute pays the salary and the NMFS Central Office pays living and travel expenses. Dr. Tokimasa Kobayashi reported that the Japanese Research Agency is establishing a program that will allow Japanese scientists to take such opportunities for overseas appointments, and he will provide Council with details.

- *Voluntary financial contributions from member countries and/or organizations (governmental or non-governmental) with interests in North Pacific marine ecosystem science*:
  An example of an existing arrangement is the external funding provided to support the ICES/GLOBEC Coordinator position at the ICES Secretariat. According to the ICES Annual Report for 2001, this position was funded by voluntary contributions by 3 of 19 ICES member countries (Canada, Norway and the United States). The budget for FY 2003, based on current exchange rates, was at a level of CDN$181,000, of which 94% was salary and benefits. The responsibilities of the office include maintaining information flow among scientists, pace and coordination of the Cod and Climate Change project within the ICES/GLOBEC context, enhancing collaboration between ICES and other organizations that contribute to the

ICES Vision, and attracting a broad range of scientists who might not otherwise participate in ICES workshops, working groups, and theme sessions. In the original prospectus for the ICES/GLOBEC Project Coordinator, regional project coordination, data management, and newsletter preparation were anticipated tasks as well.

- *Research grants from agencies for a specific task that require international cooperation to complete, and could not be done without the expertise and guidance of the scientist residing at PICES*:
  For example, a visiting scientist from the western Pacific with knowledge of data sources would be invaluable for comparative studies with eastern data sources that might be more readily accessible, and conversely. The potential partners are: North Pacific Research Board, Exxon Valdez Trustee Council, etc.

Council requested Dr. Laura Richards and the Secretariat to work together to re-write the Visiting Scientist Program by the end of August. Council also asked member countries to keep track of opportunities for the Program that might be available.

Agenda Item 6. Improvement of participation and productivity of PICES committees and groups

The Executive Secretary noted that national delegates are responsible for appointing scientists with relevant expertise to various PICES subsidiary bodies, supporting attendance of these experts at the Annual Meetings and in the work of their groups, and monitoring their performance. He provided examples when member countries failed to nominate or replace their appointed experts, or support their participation at the Annual Meetings. He also reminded Council that the Review Committee discussed this issue and recommended that Contracting Parties should consider the formation of national committees to enhance and coordinate involvement of their scientists in PICES activities, and to promote activities within PICES that have high national interest and relevance. The Chairman requested national delegates to follow up on this recommendation.

Responding to Dr. Igor Shevchenko's comment that Committee members often tend to represent their agencies' interests and not national interests, the Chairman suggested that the responsibilities of members have to be clarified at the time of their appointment. Council approved Dr. George Boehlert's recommendatio that terms of reference and other relevant information for new members should be prepared by the Secretariat and circulated to national delegates.

Agenda Item 7. Audited accounts for fiscal year 2002

The Auditor's Report for *FY* 2002 was circulated by e-mail to all Contracting Parties on March 31, 2003. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2002. At the meeting, it was agreed that audited accounts for *FY* 2002 should be reviewed by F&A and presented to Council for approval at PICES XII.

According to the recommendation of F&A at PICES XI, bids were solicited from three auditing firms for PICES' annual external audit. One company did not respond and two bids for the annual audit fee were received: $3,500 from *Flader & Hale*, and in the range of $3,800-4,300 from *Moores, Roberts & Co*. Council selected *Flader & Hale* as the auditor for *FY* 2003-2005.

Agenda Item 8. Other business

<u>Review of current publication practices</u>
Publication activities of the Organization have expanded significantly in the last several years. The Review Committee recommended an external review of the current publication practices of PICES. At PICES XI, F&A supported this action and requested that the Executive Secretary explore the costs of having an external review of these activities, and report on the potential costs at the interim meeting of

Science Board/Governing Council. With assistance from Fisheries & Oceans Canada and the Alaska Fisheries Science Center (U.S.A.), two bids were received: at the level $4,000-4,500 from the Canadian expert, and about $3,500 from the US expert. Council decided to proceed with the review as soon as possible and instructed the F&A Chairman and the Executive Secretary to review the submitted proposals and select an expert for this activity.

Public outreach

Dr. Vladimir Radchenko noted that PICES has grown into a major international scientific forum in the North Pacific and now it must become more ambitious. PICES is doing a good job exploring new ideas, building cooperative approaches to key scientific questions, and communicating scientific information around the North Pacific basin and globally. However, there is a perception that communication with the general public and decision makers is not adequate. He suggested that there is a need to do more advertising using various approaches: popular articles for newspapers and journals (University Presses, Fisheries Oceanography, EOS, Sea Grant publications were mentioned in the discussion), interview on radio and TV, news releases, distribution of PICES Press to Embassies of member countries, or even postage stamp series. Some funds are needed for this public outreach and perhaps a special budget should be set aside. Council supported his view but no decision was made. Dr. Laura Richards suggested that a set of recommendations may flow naturally from the work of the Study Group on *PICES Strategic Issues*.

GC-IM Endnote 1

Participation List

Canada
Laura Richards
Douglas Bancroft (advisor)

Japan
Tokimasa Kobayashi

People's Republic of China
Qian-Fei Liu (alternate Delegate)
Jin Ping Zhao (advisor)

Republic of Korea
Hyung-Tack Huh (alternate Delegate)

Russia
Igor Shevchenko (alternate Delegate)

U.S.A.
George Boehlert
Richard Marasco

Other
Vera Alexander (Chairman, PICES)
Harold P. Batchelder (Co-Chairman, CCCC-IP)
Alexander Bychkov (Executive Secretary)
Yukimasa Ishida (Chairman, FIS)
Stewart (Skip) M. McKinnell (Deputy Executive Secretary)
R. Ian Perry (Chairman, Science Board)
Vladimir I. Radchenko (Vice-Chairman, Science Board)

GC-IM Endnote 2

Governing Council Interim Meeting Agenda

1. Report of 2003 interim Science Board/Governing Council meeting
2. Preliminary Report on Administration for 2003
3. Membership and observers from other countries
4. PICES Intern Program
5. PICES Visiting Scientist Program
6. Improvement of participation and productivity of PICES committees and groups
7. Audited accounts for fiscal year 2002
8. Other business

GC Endnote 5

Statement on the naming of "the Sea in dispute" by Mr. Junzo Fujita (Japanese advisor)

We understand that this meeting is not a place to discuss about individual issues such as the naming of certain areas like the "Sea of Japan". However, we have to claim our position every time we find the name "Sea of Japan" used in a document of PICES together with another name, such as "Japan/East Sea". Our position on this issue is very simple. We are just asking the PICES Secretariat to change the incorrect name "Japan/East Sea" to the correct name "Sea of Japan".

It is needless to say that the name "Sea of Japan" is geographically and historically, as well as internationally well established. Some countries argue that the name "Sea of Japan" became widely used from the beginning of the 20th century, as a result of Japan's expansionism and colonialism. But it is not true. Historically, the name "Sea of Japan" was first established in Europe from the late 18th century to the early 19th century, and has been used for more than 200 years. The results of our research undertaken last year at the British Library and at the University of Cambridge on this issue showed that 86% of the maps made in Europe since the 18th century use the name "Sea of Japan".

If a firmly established sea name were to be changed for the political intentions of only a few countries without a valid reason, such an action would not only bring confusion in the world's geographical orders, but also would leave a bad precedent for generations to come.

Statement on the naming of the Sea in dispute by Mr. Hyun-Churl Lim (Korean delegate)

Let me first express my gratitude to Dr. Vera Alexander and other Governing Council members for providing me with the opportunity to speak before such an esteemed group of scientists.

I would like to address the issue of naming the sea area between the Korean peninsula and the Japanese archipelago. In principle, my government holds the view that this meeting is not an appropriate forum to discuss geographical designations, even an issue of great importance to Korea such as this. However, since our Japanese colleague has presented the Japanese point of view on this, we feel it is necessary to provide you with the Korean position.

Korea is of the view that, considering the historical background to the naming of the sea area in question, as well as international practices for the designation of geographical names, it is the most reasonable solution at this stage to use both names, the East Sea and the Sea of Japan, while the countries concerned make efforts to reach an agreement on a common name. Indeed, this is in accordance with international standardization rules.

We, therefore, believe that the description of the sea area in question in the draft of the North Pacific Ecosystem Status Report appropriately reflects the current stage of development with respect to this issue, and is fully in line with the international norms and practices of cartography. The description is also in conformity with the long-standing practice of PICES when naming the sea area in question. As all of you are fully aware, PICES has been consistent in the use of both names since 1995 when describing the sea area between Korea and Japan.

PICES is an eminent scientific body, which has contributed greatly to the promotion of marine science research in the North Pacific region. We are afraid that a discussion on geographical names within PICES could adversely affect its original functions and activities. We sincerely hope that PICES will focus on its deliberations in marine scientific issues. Korea, therefore, calls upon PICES to maintain its position of using both names in its future publications, including the North Pacific Ecosystem Status Report, until such time as Korea and Japan agree on a common name. This, in turn, will help to

avoid unnecessary and time-consuming discussions on geographical names within PICES.

In closing, I wish all the participants a very productive and successful meeting, thus advancing the work of PICES as a whole.

GC Endnote 6

Tenth Anniversary PICES Organization Review

Preamble

After completing its task, the Review Committee concluded that PICES has grown into an internationally renowned Organization. It has become the major forum for advancing and coordinating marine sciences in the North Pacific, for communication among its scientists of the member countries, for exploration of new ideas and building cooperative approaches to key scientific questions. Scientists from all over the world attend its Annual Meetings, Symposia and Workshops. Publications produced by the Organization are considered to be of the highest quality. Therefore, recommendations contained in this document should be considered "course adjustments" that will hopefully lead to even greater recognition in the scientific community and the global community at large.

Introduction

In October 2001, the North Pacific Marine Scientific Organization (PICES) held its Tenth Anniversary Meeting. At the meeting, the Governing Council decided that it was time to perform an internal audit of the Organization. The view was that such an examination would determine if the original purpose of the Organization is being realized and if the structure is appropriate to achieve the defined objectives. The Governing Council approved the establishment of a Review Committee (Decision 01/A/7) that was charged with tasks specified in *Appendix A*. Review Committee membership is shown in *Appendix B*.

This report of the Review Committee contains a brief description of global scientific issues and how they have changed since the creation of PICES. This discussion is followed by a review of objectives, functions and roles of the Organization, a discussion of the integration of multiple disciplines, a review of rules of procedure, and an identification of possible changes.

Background

Global scientific issues have changed and expanded during the first ten years of PICES. Principal issues of significance include:

- Broader recognition of the potential for multiple factors affecting ecosystem change:
  - Climate change has been a major focus of PICES, but there are other agents of ecosystem change, *e.g.* fishing, eutrophication, habitat destruction, exotic species introductions, and contaminants;
  - Better recognition of differences of "scale" - i) climate change and fishing are perceived to have basin/global scales, and ii) habitat destruction, eutrophication, species introductions, and contaminants are perceived to impact local or regional scales;
  - MacDonald *et al.* (PICES Scientific Report No. 22, 2002) suggest an integrated and systematic approach to studying these multiple factors of change, including box models, case studies, time series, and development of a "warning system" based on indicators.

- Ecosystems
  - Understanding of the present state of marine ecosystems, the factors causing changes in marine ecosystems, and attempts to manage or mitigate human-caused changes within the context of natural variation;
  - Understudied organisms - non-commercial species; hard-to-sample species; etc.

- Ocean observation networks / ocean operational modeling
  - Emphases are now placed on ocean observing systems, data distribution and integration, syntheses and forecasts – all in a timely manner.

- Ocean–atmosphere coupling
  - Understanding the interactions between atmosphere and ocean in climate variability and change – *e.g.* improved representations of oceans and ocean-atmosphere interactions in global climate models.

- Fisheries issues
  - Fluctuations of (commercial) fish stocks and their causes;
  - New trends, *e.g.*, aquaculture (coastal and offshore within exclusive economic zones);
  - Collection and exchange of fisheries data in a timely manner are problematic.

- Human dimensions
  - The human dimensions of global changes, both as causes and consequences, are becoming recognized and are being incorporated into large international programs.

Review of objectives, functions and roles of PICES

Objectives

The purpose of the Organization (Article III) is:

(a) to promote and coordinate marine scientific research in order to advance scientific knowledge of the area concerned and of its living resources, including but not necessarily limited to research with respect to the ocean environment and its interactions with land and atmosphere, its role in and response to global weather and climate change, its flora, fauna and ecosystems, its uses and resources, and impacts upon it from human activities; and

(b) to promote the collection and exchange of information and data related to marine scientific research in the area concerned.

After examining these objectives, the Review Committee concluded that, while broad, they are still relevant.

The Review Committee also considered suggestions to expand the Area Concerned (Article II) to include possibly the entire Pacific Ocean. Scientific arguments in support of this suggestion include the importance of processes occurring in the tropics to conditions in the North Pacific, and comparisons between systems such as the California and Humboldt (Peru-Chile) Currents. The Review Committee does not support formal expansion at this time, as this would require opening the PICES Convention for negotiations and changes. The Review Committee noted that the scientific points in favor of expansion are valid, and that scientific initiatives, discussions, and studies between regions of the North, Tropical, and South Pacific can occur without formal changes to the PICES Convention.

Functions

Functions of the Organization are:

(1) Identify and prioritize relevant scientific research;
(2) Promote and coordinate scientific research that facilitates an integrated evaluation of the status of the North Pacific and its ecosystems;
(3) Promote the collection and synthesis of data;
(4) Promote the exchange of scientific information and data; and
(5) Capacity building

The results of the review of how effectively these functions have been carried out by the Organization are reported below:

Function (1)

Each Scientific Committee is charged with the responsibility of developing and reviewing Strategic Plans. Existing documents have emphasized what has been done and have given little attention to the identification of future activities. Further, an explicit prioritization of

issues is currently lacking. The Science Board also has its own Strategic Plan that contains an identification of issues that require attention. However, little attention has been given to the prioritization of issues, identification of associated research activities, and coordination among scientific committees.

Function (2)

An integrated evaluation of the status of the North Pacific and its ecosystems requires the conduct of research activities in a variety of disciplines. The Standing Committees have been created to advance the understanding of critical issues in their associated disciplines and, therefore, their activities have been largely disciplinary in focus by design. While the Committees have promoted scientific research in their associated disciplines, minimal effort has been devoted to the formal identification of issues that would benefit from an integrated approach. In recent years, however, there has been an increase in the number of multi-disciplinary sessions at annual meetings co-sponsored by the Scientific Committees. In keeping with the point identified above under Function (1), co-sponsorship of these sessions has been rather *ad-hoc*, with little attempt to prioritize or follow a strategic direction. The CCCC Program is currently the main mechanism for the coordination of scientific activities that are holistic in character. The focus of this Program has been largely on climate change as a driver in marine ecosystem change. The Review Committee noted that in general there has been little effort devoted to discerning the impacts of human activities. This will change in the future as the overall theme for PICES XII (2003) is *"Human Dimensions of Ecosystem Variability"*, and a 1-day Science Board Symposium will be convened on this theme to discuss the many ways that humans interact with marine ecosystems and the scientific efforts required to quantify and predict human impacts on such dynamic systems.

Function (3)

As the Organization progresses in the development of its North Pacific Ecosystem Status Report, data collection and synthesis will become increasingly important. The collection and synthesis of data are considered broad charges and, therefore, the responsibility of all Committees and Working Groups. Little effort has been made to develop or maintain time series of critical data sets. This could possibly be due to the lack of effort on the part of Scientific Committees to identify relevant data sets and different data exchange policies. Further, limited effort has been made to follow up on findings and recommendations of most Working Groups.

Function (4)

The Technical Committee on Data Exchange (TCODE) is charged with identifying the data management requirements of PICES and developing a strategic plan to meet them. Responsibility for data exchange also rests with the Scientific Committees and programs. To date, there have been exchanges of physical and chemical data. While some biological data have been exchanged, there is a need to expand these activities, especially for fisheries data. Progress on this issue has been slow perhaps because of its complexity, standardization problems and different inter- and intra-data exchanges policies in member countries. PICES has supported Working Groups to foster these activities (*e.g.* WG 17 on *Biogeochemical data integration and synthesis*) and the creation of a Meta-database of marine data sources.

Function (5)

Capacity building is defined as the enhancement of the intellectual capital available to the Organization. To support its goals of promoting and coordinating marine scientific research, PICES must recognize the importance of capacity building. Scientific sessions convened by PICES and the work of its Scientific Committees and other groups, are important contributions to capacity building. PICES has also engaged in activities to support the transfer of knowledge to scientists new to PICES, *e.g.* the Intern Program and travel support for scientists new to PICES to attend Annual Meetings. There is a need to development an

Organizational strategy for capacity building and an Implementation Plan to facilitate this activity.

Integration of multiple disciplines

The discussion began by addressing the question, "Should there be disciplinary Committees?" Experience indicates that Committees work best when they have a disciplinary focus. Effective operation of these Committees is critical to viewing issues in a holistic manner. By providing information needed for analyses, disciplinary Committees facilitate the operations of groups that are charged with working on multi-disciplinary issues. Feedback from multi-disciplinary Working Groups and Scientific Programs to the Committees is considered to be critical to the successful operation of the Organization. The development of the North Pacific Ecosystem Status Report will necessitate input from each of the Committees.

Several Working Groups have been formed to address multi-disciplinary issues, in particular during the early years of PICES. The Bering Sea Working Group (WG 5) and Sub-Arctic Gyre Working Group (WG 6) are two examples. More recently, the Science Board has assigned multi-disciplinary issues to the CCCC Program. The success of the CCCC Program (*e.g.* Perry *et al.* PICES Scientific Report No. 22, 2002) indicates that progress is being made in addressing issues in a multi-disciplinary manner. The accomplishments of this program are considered to be due to the Program's thematic focus (climate change as a driver in marine ecosystem change) and the development of Science and Implementation Plans. Currently, however, there is little feedback from the CCCC Program to the Committees. Several Annual Meetings have had symposia and sessions that were multi-disciplinary in character, but the follow-up or integration of the findings of these sessions into the further work of PICES has generally been lacking.

Review of existing structure

The current Organizational structure is depicted schematically in *Appendix C*. The Organization consists of: (a) the Governing Council, (b) permanent or *ad hoc* scientific groups and committees as deemed necessary, and (c) a Secretariat.

Perceived problems

The following are some possible problems that have been identified:

Proliferation of "subsidiary bodies"

The number of "subsidiary" bodies recognized by the Organization has increased in recent years. BIO has an Advisory Panel on Marine Birds and Mammals (MBM); POC has an Advisory Panel on Data Buoys; BASS has an Advisory Panel on the Iron Fertilization Experiment (IFEP) and MONITOR has an Advisory Panel on the Continuous Plankton Recorder Survey (CPR). The duration of these Advisory Panels is frequently unclear. Further, there is no agreement on the number of such panels that should be in existence during any given period of time. "Study Groups" have also been formed to examine specific issues relating to the establishment of new activities or substructures, *e.g.*, the North Pacific Ecosystem Status Report.

Possible reasons for the proliferation of "subsidiary" bodies include:

- A need to facilitate PICES initiation, coordination, and support for specific field data collection and exchange programs (*e.g.* IFEP and CPR Advisory Panels), and
- A necessity to oversee specific activities that are perhaps too detailed for direct supervision by parent Committee, as the membership of the parent Committee is not the most appropriate for the specific task (*e.g.*, BIO and MBM Advisory Panel).

Working Groups

Scientific Committees would like to have more than one Working Group operating at the same time and/or extend the duration of Working Groups beyond three years. Three years is often considered too short if a Working Group gets a slow start or if not all members are able to attend

each meeting. Most Working Groups have indicated that they were just getting productive when their three-year term ended.

Scientific mandates

Some Committees are considered to have very broad mandates, while others believe that their mandate is too narrow. BIO's mandate, for example, spans from microbes to mammals and birds. It has dealt with this problem by establishing an Advisory Panel on Marine Birds and Mammals. FIS believes that, because of the scope of fishery issues and the stated goals of PICES, the profile of the Committee should be elevated. They would like to establish other bodies to deal with aquaculture and small pelagics issues, for example. MEQ has struggled with implementing its mandate because of the "scale" issue. Many human activities have direct effects at the local scale, whereas basin-wide effects may be non-existent or difficult to quantify.

Participation

There appears to be an increased frequency of PICES member countries failing to support attendance of their appointed experts at meetings and in the work of the Scientific Committees. Proliferation of subsidiary bodies and long duration of Working Groups implies greater costs, and perhaps even less willingness by member counties to support participation of appointed members. Lack of support by member countries may indicate marginal interest in particular activities. The Review Committee believes that Contracting Parties should consider the formation of national committees to enhance and coordinate involvement of their scientists in PICES activities, and to promote activities within PICES that have high national interest and relevance.

Some disciplines are under-represented at present, for example, meteorologists within POC, aquaculture scientists within FIS, and social scientists within the CCCC Program.

Although the intent was to nominate national GLOBEC representatives on the CCCC Implementation Panel, recently this Panel has moved to being composed of predominantly Task Team Co-Chairmen who are not necessarily representatives of national GLOBEC Programs. This may have reduced the links of CCCC back to the national GLOBEC Programs and to the interests of member countries.

Communication

There is a general sense that PICES is doing a good job with communication, particularly with communicating science information among scientists around the North Pacific basin and globally (PICES publications have increased exponentially). A plan is in place to capture information presented at scientific sessions that is not published in the literature. However, there is a perception that PICES has not done as good a job in communicating with the general public and decision makers.

Discussion

Science Board and associated bodies

The Science Board is responsible for providing the Governing Council with recommendations on various issues of scientific interest and carrying out scientific work, including giving guidance to the Scientific Committees and Programs. It is critical that the members of the Science Board understand the goals of PICES to fulfill this charge. The Science Board should take an active role in ensuring that Scientific Committees and *ad hoc* groups are addressing issues of continued relevance to PICES. They should also take an active role in identifying opportunities to promote multi-disciplinary activities. The Science Board's Strategic Plan should provide a section on activities that facilitate addressing issues in a holistic fashion where appropriate.

Scientific Committees are responsible for keeping under review and coordinating scientific investigations in the subject or area defined by their assigned responsibilities. These groups are important because they provide PICES with an information base that is critical to the realization of its goals. Scientific Committees provide a

vehicle for national designees to bring to the attention of the Organization important issues and to mobilize expertise needed to address these issues. They also facilitate the dissemination of information to scientific counterparts in their respective member countries. This latter task and the bi-directional nature of these Scientific Committee responsibilities have perhaps not been adequately recognized.

The issue of the creation of additional disciplinary committees was also discussed, for example, Geosciences, and Social science. There is recognition that these disciplines are under-represented at present. PICES should be open to the formation of new Scientific Committees. However, the formation of additional committees should wait until the need is clearly demonstrated.

Scientific Committees should have the ability to form subsidiary bodies other than Working Groups, with the approval of the Science Board. These bodies should be formed only if the needed expertise is lacking on the parent committee. Work of these bodies should be periodically reviewed by the parent committee and recommendations made to the Science Board concerning their continued existence. Historically, two types of Advisory Panels have been formed. The first type is made up of experts that are not well-represented on the Scientific Committee (*e.g*. Marine Birds and Mammals Advisory Panel). The second type is a group of experts brought together to advise on a field study of limited duration (*e.g*. Advisory Panel on Iron Fertilization Experiment and Advisory Panel on Continuous Plankton Recorder Survey). It is suggested that the first type be renamed a "Section" of the parent committee. The duration of sections should be ongoing, with periodic review. The number of designated participants from member countries for the "Section" should not normally exceed three. The duration of Advisory Panels should be determined by the length of time required to complete the field study, and they may include as many members as is necessary to coordinate the field program and as nations are willing to support.

Working Groups are groups of experts that are established by the Governing Council with specific terms of reference based on the recommendations of the Science Board. They are expected normally to complete their work in three years. While it is believed that the existence time should be limited, it is important that the durations of these groups be flexible to facilitate their work. Further, past practice has limited the number of Working Groups in existence to one at anytime for each Scientific Committee. The Review Committee believes that there should be some flexibility in the number of Working Groups that a Scientific Committee is allowed at any one time. If there is a desire to have multiple Working Groups, the concerned Committee should make its request to the Science Board. Furthermore, there is a need for Scientific Committees to follow-up on the findings and recommendations of their Working Groups. Some of the concerns about additional costs of having more than one Working Group concurrently may be mitigated by using novel methods of operating, for example by electronic correspondence.

The Science Board has also facilitated the creation of Scientific Programs. Experience with the CCCC Program has indicated that this mechanism provides flexibility of addressing issues that are multi-disciplinary in character. Given the desire to address issues in a holistic manner, continued use of this mechanism appears appropriate. It is critical, when these programs are used, that feedback is given to the relevant Scientific Committees and that follow-up occurs on recommendations. In-addition, formation of such programs may be made clearer with the development of Science and Implementation Plans.

The Technical Committee on Data Exchange (TCODE) requires special treatment since it is a service committee. It is charged with: 1) identifying the data management requirements of PICES; 2) developing strategic plans to meet these requirements; 3) recommending establishment of *ad hoc* task groups to deal with specific functions of TCODE; 4) reviewing the progress of task groups and providing Annual Reports to the

Science Board on the work of TCODE; and 5) advising the PICES Secretariat on its data exchange activities. A review of these charges indicated that only item 5 has been adequately addressed. It was determined that the charges given to TCODE are still relevant and important to PICES especially given the desire to develop a North Pacific Ecosystems Status Report.

The Publication Committee was created in 1998. It was charged with reviewing: 1) questions of publication policy; 2) the question of translation policy; 3) the desirability of establishing a fully peer reviewed publication; 4) the desirability of establishing a PICES editorial board; and 5) other matters concerning PICES publications. At its Tenth Annual Meeting, the Committee was disbanded because it had not conducted substantive business in its last two years and because its terms of reference were viewed as outdated. The Science Board agreed to review the need for such a committee in two years. The Secretariat is tasked presently with implementing Council decisions on publication policy: *e.g.* utilizing peer-reviewed journals on an ongoing basis and maintaining publication of PICES Press and the Scientific Report Series. The creation and distribution of publications is critical to the success of the Organization. The view of PICES by the community at-large is heavily dependent upon the way products are made available. The PICES Scientific Report Series creates serious problems for the Secretariat, as in general: documents for publication in this series are received in poor shape, requiring staff to spend significant time editing and making revisions.

Finance and Administration Committee

At each ordinary meeting of the Governing Council, the Finance and Administration Committee (F&A) is charged with examining: 1) the audited accounts of the Council for the preceding financial year; 2) the preliminary accounts for the current financial year; 3) a budget for the ensuing financial year and a forecast budget for the following year; and 4) the administrative effectiveness of the Secretariat in particular, and the Organization in general. While the Review Committee did not engage an in-depth examination of this Committee, it was concluded that F&A was operating satisfactorily. It was suggested that members of the Committee be requested to intensify their external fund raising activities to enhance the operations of the Organization. Lastly, it was pointed out that scheduling of meetings of the Governing Council and of the Finance and Administration Committee at the same time as scientific sessions makes it impossible for their members to attend these activities.

Secretariat

It is stated in Article VIII of the PICES Convention that, "The Council shall appoint an Executive Secretary on such terms and with such duties as it may determine." Further, it states that "the staff of the Secretariat shall be appointed by the Executive Secretary in accordance with such rules, procedures, and requirements as may be determine by the Council." At present, the staff includes the Executive Secretary, Assistant Executive Secretary, Administrative Assistant and Office Secretary.

Scientific activities sponsored and/or conducted by PICES have increased significantly since its inception in 1992 (for details see *Appendixes D* and *E*). PICES has grown into an internationally renowned organization and has to anticipate and plan for even further growth. The ability of the Organization to expand its activities and products is an indication of staff dedication. The size of the Secretariat has not expanded with the increased level of activity, and the structure of the Secretariat has remained unchanged since its inception. While annual contributions have increased, they have not increased at the same rate as the growth in workload (*Appendix F*). Further, the inflation-adjusted contributions have decreased for Canada, China, Japan, and the United States; remained about constant for Russia since making its initial contribution in 1995; and increased slightly for Korea since making its initial contribution in 1996 (see *Appendix G*).

The Review Committee believes that the increase in staff responsibilities warrants serious consideration of the addition of a new staff member, if it can be accommodated within the inflation adjusted annual contributions. The person occupying this position would serve as the Organization's Scientific Officer (or Science Coordinator) and be responsible for the coordination of scientific projects/programs identified by the Science Board (*e.g.*, North Pacific Ecosystem Status Report) and capacity building. His/her specific tasks would include: (i) soliciting, compiling and editing scientific project/program reports; (ii) participation in workshop development of scientific projects/programs; and (iii) assisting in fund-raising and coordination for training and capacity building efforts. A scientist from one of the contracting parties would occupy the position. This action would allow the Assistant Executive Secretary to focus more on Secretariat operations, information management, data exchange, and web development.

The need for these actions is made apparent by the increased workload being experienced by Secretariat staff. During the past year alone, in additional to the Annual Meeting, eight inter-sessional symposia/workshops were held. Publications included three special issues of peer-reviewed journals, five PICES Scientific Reports and "A Historical Atlas of the North Pacific".

It is also recommended that some of the existing positions at the Secretariat be re-named as follows provided the act is budget-neutral:

- Assistant Executive Secretary - Deputy Executive Secretary
- Administrative Assistant - Deputy Executive Secretary on Administration
- Office Secretary - Administrative Assistant

Review of rules of procedure

The Review Committee identified three items that require change:

- Rule 1 (i) - A definition of "formal meeting" is required;
- Rule 1 (iii) - This rule should be clarified to indicate that it is the responsibility of the contracting party to pay the expenses of its own Delegation. Delegation includes Delegates on the Council and Alternate Delegates, and experts, advisers and observers appointed to attend each formal meeting;
- Rule 18 (iii) - Meetings of the Science Board may be attended by persons other than the members only on the invitation of the Chairman of the Science Board.

The Review Committee recommends that the following wording changes be made:

- Rule 1 (i) - replace "formal meeting" with "meeting authorized by Council";
- Rule 1 (iii) - replace "its own Delegation" with "its Delegates and other nationally designated participants" or more simply "its nationally designated participants";
- Rule 18 (iii) - replace "Chairman of the Council" with "Chairman of the Science Board".

Identification of possible changes

Objectives and area of concern

No changes in the purpose of the Organization and no formal extension of the PICES area of concern are recommended at this time.

Functions

Strategic Plans

Strategic Plans of Scientific Committees and the Science Board need to be more forward-looking. The Science Board's Strategic Plan should incorporate a vision statement and objectives that include looking at issues in a holistic fashion. The document also should include the identification of issues that will become important in the next five to ten years. Prioritization of important issues should be done in these plans. More Science Board feedback to Scientific Committees is needed and this should be highlighted in the Strategic Plan. A mid-session Science Board meeting, with participation of members of the Governing Council, is needed to provide time for the Science Board to discuss direction and

prioritization of issues to stimulate the work of the Scientific Committees and Working Groups and, in general, to maintain momentum between Annual Meetings.

Collection and synthesis of data

Working Groups are the primary collectors and synthesizers of data. Each Working Group should include in its Terms of Reference a data collection/archival element and coordinate with TCODE as necessary. The Scientific Committees also have an important role to play in synthesizing and summarizing data relevant to their expertise and reporting to the Science Board or to activities such as the North Pacific Ecosystem Status Report.

Data exchange

It appears TCODE has not met its objectives as outlined in its Terms of Reference. The Science Board needs to review TCODE Terms of Reference and activities. Development of a Strategic Plan for TCODE during this year needs to be ensured. Differences in data exchange policies should be addressed in the development of the plan. Membership in TCODE should be examined to guarantee that there are strong links to national/regional data centers. A position in the Secretariat that would oversee data exchange efforts is recommended to keep this activity on track. The Ecosystem Status Report development and CCCC Program data archival will require the assistance of TCODE.

Data exchange is also the responsibility of Scientific Committees and more of this activity needs to occur on an annual basis. Strategic Plans of the Scientific Committees should address data exchange, management, and archival.

Capacity building

PICES needs a more pro-active approach for capacity building. The development of an Organizational strategy for capacity building and an Implementation Plan to facilitate this activity should be undertaken.

Integration of multiple disciplines

Integration of multiple disciplines would be facilitated by: (i) the Science Board taking an active role in the guidance of Committees and Program activities, (ii) increased feedback among multi-disciplinary groups and disciplinary Committees and vice-versa, and (iii) annually scheduled mid-session meetings of the Science Board.

Structure

Science Board

As mentioned earlier, the Science Board needs to revise its Strategic Plan. It should play a more active role in getting committees to specify and prioritize important issues, and in identifying how PICES should deal with multi-disciplinary issues. A mid-session Science Board meeting is recommended to facilitate progress in this area.

Scientific Committees

As with the Science Board, Scientific Committees also need to revise their Strategic Plans to be more forward-looking and to provide a prioritization of issues to be addressed. It is recognized that the formation of disciplinary Sections within a committee (*e.g.*, Marine Birds and Mammals within BIO) may be needed to ensure adequate representation of these disciplinary areas in PICES. After formation, the committee to guarantee an ongoing need for its existence should subject activities of the Section to periodic review.

Committees should also improve communication with their scientific counterparts elsewhere/outside of PICES through periodic reports in the PICES Press. Committees could better facilitate communication by having their own web page on the PICES web site.

There is recognition that some disciplines, such as geosciences, are not represented in PICES at present. It is suggested that PICES should be open to the formation of new Scientific Committees. However, such action should wait

until a clear interest on the part of these disciplines to be represented is expressed.

Working Groups

The Review Committee re-emphasized the need for an initial workshop or session to clearly define the issues before a Working Group is formed. Scientific Committees should have flexibility in the number of active Working Groups maintained at a particular time. Scientific Committees need to follow-up more on the findings and final recommendations of Working Groups and should consider novel ways for working groups to operate (*e.g.*, through correspondence).

Advisory Panels

It is recommended that the present definition of Advisory Panel be revised to emphasize their role in providing the scientific advice and coordination needed for specific field programs. Duration of advisory panels should be determined by the parent committee based on the duration of the field study that is under consideration.

Secretariat

The Review Committee believes that the increase in staff responsibilities warrants serious consideration of the addition of a new staff member, if it can be accommodated within the inflation adjusted annual contributions. The person occupying this position would serve as the Organization's Scientific Officer (or Science Coordinator) and be responsible for the coordination of scientific projects/programs identified by the Science Board and capacity building. A scientist from one of the contracting parties would be occupy the position. This action would allow the Assistant Executive Secretary to focus more on Secretariat operations, information management, data exchange, and web development.

It is also recommended that some of the existing Secretariat positions be re-named as follows:

- Assistant Executive Secretary - Deputy Executive Secretary,
- Administrative Assistant - Deputy Executive Secretary on Administration, and
- Office Secretary - Administrative Assistant.

Publications

Scientific Committees and the CCCC Program should assume more responsibility for editing and finalizing Working Group and CCCC Program annual reports, and their publications that appear in the PICES Scientific Report Series. Publication guidelines need to be communicated to these groups to ensure the documents meet specified standards. It is suggested strongly that an outside expert examine how the Organization currently handles the publication and distribution of scientific information, and make recommendations on how to improve the process.

Rules/Procedures

The following changes to the PICES Rules of Procedure are recommended:

- Rule 1 (i) - replace "formal meeting" with "meeting authorized by Council";
- Rule 1 (iii) - replace "its own Delegation" with "its Delegates and other nationally designated participants" or more simply "its nationally designated participants";
- Rule 18 (iii) - replace "Chairman of the Council" with "Chairman of the Science Board".

Awards

PICES has been a success because of tremendous efforts on the part of participants. Currently, there is no mechanism to recognize individuals who have contributed significantly to PICES. The Review Committee, therefore, suggests the creation of the following awards:

PICES Builder's Award

- to be awarded to those individuals who have made substantial contributions to the organization and/or the science of PICES, *e.g.*, who changed the direction of PICES, that contributed substantially to increasing its scientific reputation and/or public awareness of PICES;

- would be distinct from the Wooster Award, which is targeted more generally to individuals making significant contributions to North Pacific marine science (not necessarily to PICES);
- the award would be expected to be normally, but not exclusively, given to someone who is or has been active within PICES;
- the award is not expected to be awarded every year;
- the award would consist of a small plaque to be kept by the recipient and a large plaque with names added to be kept by the Secretariat;
- nominations would be forwarded to the Secretariat by May 15 outlining clearly the nominee's substantive contributions made to PICES;
- the Governing Council would be responsible for selecting the recipient upon recommendation of the Science Board

PICES Service Awards

- Outgoing Chairmen of Scientific and Technical Committees, Scientific Programs, and of Working Groups be recognized with a "Certificate of Service to PICES" upon completion of their term.

APPENDICES

Appendix A

Terms of Reference for Review Committee

a. Review the objectives, functions and role of PICES in the context of changing requirements for scientific information;
b. Consider how to integrate the multiple disciplines that make up PICES;
c. Analyze and review the existing structure of PICES and the nature of change required to meet the needs identified in a) and b);
d. Develop specific proposals for change, as necessary, and a plan for implementation;
e. Review the Rules of Procedure.

Appendix B

Membership of the Review Committee

The membership of the Review Committee includes: the Chairman of the Finance and Administration Committee (Dr. Richard J. Marasco), the Chairman of the Science Board (Dr. R. Ian Perry), most recent outgoing Chairman of the Science Board (Ms. Patricia Livingston), Dr. Warren Wooster (founder and first Chairman of PICES) and one member each from the People's Republic of China, Japan, Republic of Korea, and Russian Federation. Countries not specifically mentioned are represented by the Science Board Chairman (Canada) and the F&A Chairman (U.S.A.). Contact information for all members (alphabetical order) is listed below:

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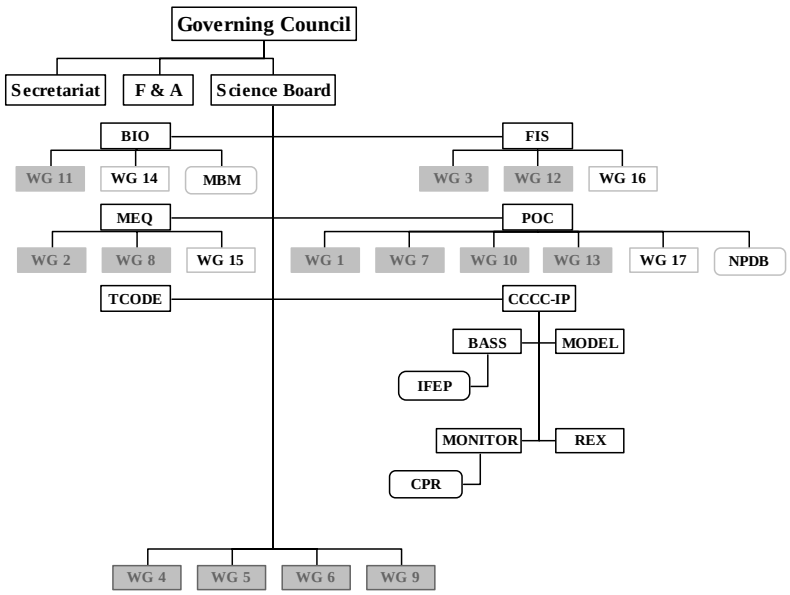
Appendix C

North Pacific Marine Science Organization (PICES) - Organization Chart



Appendix D

PICES-sponsored inter-sessional symposia/workshops and workshops held in conjunction with Annual Meetings (excludes Working Group meetings), 1992-2002

Inter-sessional symposia/workshops

Year	Dates	Meeting	Co-Sponsors	Location
1993	September 19-23	Workshop on *Western subarctic circulation*	STA, JFA, Nemuro-city	Nemuro, Japan
1995	June 19-24	1st Workshop on *The Okhotsk Sea and adjacent areas*	RAS, TINRO, FESU,	Vladivostok, Russia
1996	June 23-28	Workshop on *Conceptual/theoretical studies and model development*	Nemuro-city	Nemuro, Japan
1998	November 9-12	2nd Workshop on *The Okhotsk Sea and adjacent areas*	Nemuro-city	Nemuro, Japan
1999	April 20-22	1st Technical Workshop on *CO_2 method inter-comparison*	NIES, KEEC, JAMSTEC	Tsukuba, Japan
	May 24 – June 7	MEQ Practical Workshop on *Environmental assessment of Vancouver Harbour*		Vancouver, Canada
	August 10-14	WG 12 (Crabs and shrimps) Workshop	NMFS	Qingdao, China
2000	Jan. 31 – Feb. 3	CCCC/MODEL Workshop on *Lower trophic level modeling*	Nemuro-city	Nemuro, Japan
	March 23-26	*Beyond El Niño: A conference on Pacific climate variability and marine ecosystem impacts, from the Tropics to the Arctic*	IATTC, IPHC, ISC, NPAFC and SCOR	La Jolla, U.S.A.
	April 17-19	ICES/PICES Workshop on *Zooplankton ecology of the North Atlantic and North Pacific*	ICES	Honolulu, U.S.A.
	May 15-16	CREAMS 2000 International symposium on *Oceanography of the Japan/East Sea*	CREAMS, ONR	Vladivostok, Russia
	October 18-21	Symposium/Workshop on *North Pacific CO_2 data synthesis* (incl. 2nd Technical Workshop on *CO_2 method inter-comparison*)	CREST/JST, MIRC and JGOFS	Tsukuba, Japan
	October 29	Workshop on *Factors affecting production of juvenile salmon: Comparative studies on juvenile salmon ecology between east and west North Pacific Ocean*	NPAFC	Tokyo, Japan
2001	January 22-24	Test Workshop on *CO_2 data integration*		Sidney, Canada
	Jan. 31 – Feb. 1	Third Annual Workshop on *Salmon ecology in coastal ecosystem*		Nanaimo, Canada
	March 5-6	BASS/MODEL Workshop on *Quantification of a food web model for the subarctic gyre systems*		Honolulu, U.S.A.
	March 7-9	Workshop on *Impact of climate variability on observation and prediction of ecosystem and biodiversity changes in the N. Pacific*	Census of Marine Life and IPRC	Honolulu, U.S.A.
	March 20-22	International Argo Science Team Meeting	Argo	Sidney, Canada
	July 30 – Aug. 1	Implementation Workshop on *CO_2 data integration*	NIRE and MIRC	Tokyo, Japan
	August 27-30	*NEAR-GOOS Forecasting* Workshop	IOC, WESTPAC	Seoul, Korea

Year	Dates	Meeting	Co-Sponsors	Location
2001	November 14-17	*Pacific climate – fisheries* Workshop	IRI, IOC, GLOBEC, and IPRC	Honolulu, U.S.A.
2002	January 24-27	MODEL/REX Workshop to *build a "nutrient-phytoplankton-zooplankton-fish" version of the PICES NEMURO model*	Nakajima Foundation and Nemuro-city	Nemuro/Yokohama, Japan
	March 13-14	Symposium on *Causes of marine mortality of salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea*	NPAFC, NASCO, IRSFC, ICES	Vancouver, Canada
	April 5-6	MONITOR Workshop on *Voluntary observing systems*	EVOS	Seattle, U.S.A.
	April 21-22	BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system*		La Paz, México
	April 23-25	Symposium on *North Pacific transitional areas*	CIBNOR, CICIMAR	La Paz, México
	June 5-7	Advisory Panel on North Pacific Data Buoys	WMO/IOC/PICES	Victoria, Canada
	August 22-24	Symposium/Workshop on *Recent progress in studies of physical processes and their impact to the Japan/East Sea ecosystem*	CREAMS	Seoul, Korea
	October 1-2	JGOFS/PICES Session on *Carbon cycle in the North Pacific (in conjunction with the 2002 SCOR General)*	JOS	Sapporo, Japan

Workshops held in conjunction with PICES Annual Meetings

Year	Dates	Meeting	Co-Sponsors	Location
1993				
1994	October 15-17	PICES-GLOBEC Workshop on *Climate Change and Carrying Capacity*	Fisheries Agency of Japan (JFA)	Nemuro, Japan
	October 22-23	PICES-STA Workshop on *Monitoring Pacific subarctic variability*	STA	Nemuro, Japan
1995				
1996				
1997	October 17-18	CCCC Workshop on *Development of cooperative research in coastal regions of the North Pacific*		Pusan, Korea
1998	October 14-15	MODEL Workshop on *Lower trophic level modeling and nutrient data bases*		Fairbanks, U.S.A.
	October 16-17	REX Workshop on *Small pelagic species and climate change in the North Pacific Ocean*		Fairbanks, U.S.A.
1998	October 16-17	MONITOR Workshop on *Monitoring activities in the North Pacific*		Fairbanks, U.S.A.
	October 18	PICES-CREAMS Workshop on *Recent progress in studies of the Japan/East Sea*		Fairbanks, U.S.A.
1999	October 8-10	REX Workshop on *Herring and euphausiids population dynamics*		Vladivostok, Russia
	October 8-9	MONITOR-GOOS Workshop on *Monitoring efforts in the North Pacific*		Vladivostok, Russia
	October 12 & 14	TCODE Workshop on *Application of scientific visualization to marine ecosystem analysis*		Vladivostok, Russia

Year	Dates	Meeting	Co-Sponsors	Location
2000	October 19-20	Planning Workshop on *Designing the iron fertilization experiment in the subarctic Pacific*	CRIEPI and MIRC	Tsukuba, Japan
	October 20	Workshop on *Basis for estimating the abundance of marine birds and mammals, and the impact of their predation on other organisms*	Fisheries Agency of Japan (JFA)	Hakodate, Japan
	October 20-21	BASS Workshop on *Development of a conceptual model of the subarctic Pacific basin ecosystem(s)*	Ministry of Education of Japan	Hakodate, Japan
	October 20-21	MODEL Workshop on *Strategies for coupling higher and lower trophic level models*	Ministry of Education of Japan	Hakodate, Japan
	October 20-21	MONITOR Workshop on *Progress in monitoring the North Pacific*	Ministry of Education of Japan	Hakodate, Japan
	October 20-21	REX Workshop on *Trends in herring population dynamics and trophodynamics*	Ministry of Education of Japan	Hakodate, Japan
2001	October 5-6	WG 15 Workshop on Taxonomy and identification of HAB species		Vancouver, Canada
	October 5	BASS/MODEL Workshop on *Ecosystem models for the Subarctic Pacific Gyres*		Victoria, Canada
	October 5	REX Workshop on *Temporal variations in size-at-age for fish species in coastal areas around the Pacific Rim*		Victoria, Canada
	October 6	MONITOR Workshop on *Progress in monitoring the North Pacific*		Victoria, Canada
	October 6	REX/MODEL Workshop on *Higher trophic levels in the PICES NEMURO Model*		Victoria, Canada
2002	October 19	MONITOR Workshop on *Requirements and methods for early detection of ocean change*		Qingdao, China
	October 19	PICES/GLOBEC Data Management Workshop on *Exchange, inventory and archival of GLOBEC data*	GLOBEC	Qingdao, China
	October 20	CCCC Integration Workshop		Qingdao, China
	October 20	PICES/CLIVAR Workshop on *Implementation of CLIVAR in the North Pacific*	WCRP, NASA, NOAA and NSF	Qingdao, China
	October 23	MONITOR Workshop on *Monitoring from moored and drifting buoys*		Qingdao, China
	October 25	PICES/CKJORC Workshop on *Regional cooperation and management of the marine environment and resources in the Yellow Sea*		Qingdao, China

Appendix E

PICES publications in 1992-2003

Year	Publication
1992	1992 Annual Report
	Proceedings of PICES Scientific Workshop
1993	1993 Annual Report
	PICES Press Vol. 1 No. 1
	PICES Scientific Report No.1 Part 1: Coastal Pelagic Fishes Part 2: Subarctic Gyre
1994	1994 Annual Report
	PICES Press Vol. 2 No. 1
	PICES Press Vol. 2 No. 2
	The PICES Papers: Reports of Meetings Leading to the Establishment of the North Pacific Marine Science Organization (PICES), 1978-1992
	Proceedings of Nemuro Workshop on "Western subarctic circulation"
1995	1995 Annual Report
	PICES Press Vol. 3 No. 1
	PICES Press Vol. 3 No. 2
	PICES Scientific Report No. 2 The Okhotsk Sea and the Oyashio Region
	PICES Scientific Report No. 3 Monitoring Subarctic North Pacific Variability
1996	1996 Annual Report
	PICES Press Vol. 4 No. 1
	PICES Press Vol. 4 No. 2
	PICES Scientific Report No. 4 Science Plan, Implementation Plan, Report of the PICES-GLOBEC International Program on Climate Change and Carrying Capacity
	PICES Scientific Report No. 5 Modelling of the Subarctic North Pacific Circulation
	PICES Scientific Report No. 6 Proceedings of the Workshop on the Okhotsk Sea and Adjacent Areas
1997	1997 Annual Report
	PICES Press Vol. 5 No. 1
	PICES Press Vol. 5 No. 2
	PICES Scientific Report No. 7 Summary of the Workshop Conceptual/Theoretical Studies and Model Development and the 1996 MODEL, BASS and REX Task Team Reports. PICES-GLOBEC International Program on Climate Change and Carrying Capacity
1998	1998 Annual Report
	PICES Press Vol. 6 No. 1
	PICES Press Vol. 6 No. 2
	PICES Scientific Report No. 8 Multilingual Nomenclature of Place and Oceanographic Names in the Region of the Okhotsk Sea
	PICES Scientific Report No. 9 PICES Climate Change and Carrying Capacity Workshop on the Development of Cooperative Research in Coastal Regions of the North Pacific
1999	1999 Annual Report
	PICES Press Vol. 7 No. 1
	PICES Press Vol. 7 No. 2

Year	Publication
1999	PICES Scientific Report No. 10 Proceedings of the 1998 Science Board Symposium on the Impacts of the 1997/98 El Niño Event on the North Pacific Ocean and its Marginal Seas
	PICES Scientific Report No. 11 PICES-GLOBEC International Program on Climate Change and Carrying Capacity. Summary of the 1998 MODEL, MONITOR and REX Task Team Workshops and Task Team Reports
	PICES Scientific Report No. 12 Proceedings of the Second PICES Workshop on the Okhotsk Sea and Adjacent Areas
	Progress In Oceanography Vol. 43 Nos. 2-4 1999 (special issue) Ecosystem Dynamics in the Eastern and Western Gyres of the Subarctic Pacific
	Dynamics of the Bering Sea
2000	2000 Annual Report
	PICES Press Vol. 8 No. 1
	PICES Press Vol. 8 No. 2
	PICES Scientific Report No. 13 Bibliography of the Oceanography of the Japan/East Sea
	PICES Scientific Report No. 14 Predation by Marine Birds and Mammals in the Subarctic North Pacific Ocean
	PICES Scientific Report No. 15 PICES-GLOBEC International Program on Climate Change and Carrying Capacity. Report on the 1999 MONITOR and REX Workshops, and the 2000 MODEL Workshop on Lower Trophic Level Modelling
	Progress in Oceanography Vol. 47 Nos. 2-4 2000 (special issue) North Pacific Climate Regime Shifts
2001	2001 Annual Report
	PICES Press Vol. 9 No. 1
	PICES Press Vol. 9 No. 2
	PICES Scientific Report No. 16 Environmental Assessment of Vancouver Harbour. Data Report for the PICES Practical Workshop
	PICES Scientific Report No. 17 PICES-GLOBEC International Program on Climate Change and Carrying Capacity Report of the 2000 BASS, MODEL, MONITOR, and REX Workshops, and the 2001 BASS/MODEL Workshop
	PICES Scientific Report No. 18 Proceedings of the PICES/CoML/IPRC Workshop on "Impact of Climate Variability on Observation and Prediction of Ecosystem and Biodiversity Changes in the North Pacific"
	PICES Scientific Report No. 19 Commercially Imported Crabs, Shrimps and Lobsters of the North Pacific Ocean
	Progress in Oceanography Vol. 49 Nos. 1-4 2001 (special issue) Pacific Climate Variability and Marine Ecosystem Impacts
	Historical Atlas of the North Pacific Ocean (Anniversary Book)
2002	2002 Annual Report
	PICES Press Vol. 10 No. 1
	PICES Press Vol. 10 No. 2
	PICES Scientific Report No. 20 PICES-GLOBEC International Program on Climate Change and Carrying Capacity Report of the 2001 BASS/MODEL, MONITOR and REX Workshops, and the 2002 MODEL Workshop
	PICES Scientific Report No. 21 PICES-GLOBEC International Program on Climate Change and Carrying Capacity Report of the PICES 2002 *Volunteer Observing Ship* Workshop
	PICES Scientific Report No. 22 PICES Science: The first ten years and a look to the future

Year	Publication
2002	PICES Scientific Report No. 23 Harmful algal blooms in the PICES region of the North Pacific (national reports)
	Journal of Oceanography, Vol. 58, No. 5 (special issue) Physics and biology of eddies, meanders and rings in the PICES region
	Progress in Oceanography, Vol. 55, Nos. 1-2 (special issue) Variability in the Bering Sea ecosystem
	Canadian Journal of Fisheries and Aquatic Sciences, Vol. 59, No. 12 (special issue) Migration of key ecological species in the North Pacific Ocean
	Oceanographic Atlas of the Okhotsk Sea, Bering Sea and Japan/East Sea (CD ROM version)
2003	2003 Annual Report
	PICES Press Vol. 11 No. 1 (jointly with GLOBEC)
	PICES Press Vol. 11 No. 2
	PICES Scientific Report No. 24 CO_2 in the North Pacific Ocean (Working Group 13 Final Report)
	PICES Scientific Report No. 25 PICES-GLOBEC International Program on Climate Change and Carrying Capacity The BASS/MODEL Report on Trophic Models of the Subarctic Pacific Basin Ecosystems.
	Journal of Oceanography, Vol. 59, No. 4 (special issue) Transitional areas in the North Pacific
	Progress in Oceanography, Vol. 57, Nos. 3-4 (special issue) Plankton size classes, functional groups, and ecosystem dynamic
	North Pacific Ecosystem Status Report

Appendix F

History of national contributions[1]

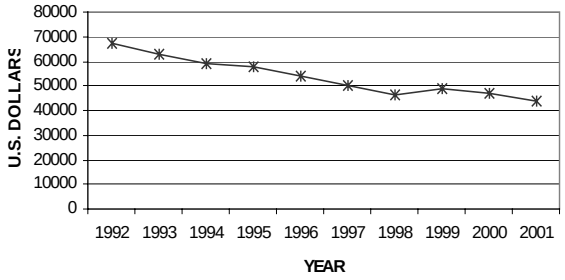
Year	Annual fee per country	WCF transfer	Total budget	Notes
1992[2]	88,000		352,000	
1993	88,000[3]	24,000	376,000	4 member countries
1994	90,000[3]	80,000	440,000	
1995	88,000		440,000	5 member countries
1996	84,800		509,000[4]	
1997	84,800		509,000	
1998	84,800[3]	12,000	521,000	
1999	86,000[3]	58,000	574,000	6 member countries
2000	88,600[3]	58,400	590,000	
2001	91,300[3]	58,200	606,000	
2002	94,000[3]	59,000	623,000	

[1] all amounts are in Canadian dollars
[2] partial year from March 23- December 31, 1992
[3] after transfer from the Working Capital Fund

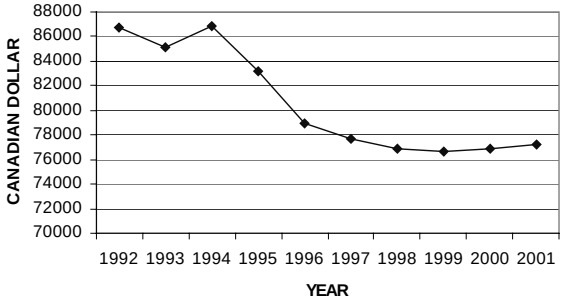
Appendix G

Inflation-adjusted annual contributions were calculated by converting the annual contributions listed in Appendix F to each contracting parties contribution. The inflation-adjusted contributions that appear in the figures were calculated by dividing annual contributions by the Consumers Price Index. Data were obtained from the IMF International Financial Data Base (http://ifs.apdi.net/imf).

UNITED STATES CONTRIBUTIONS IN REAL U.S. DOLLARS



CANADA CONTRIBUTIONS IN REAL CANADIAN DOLLARS



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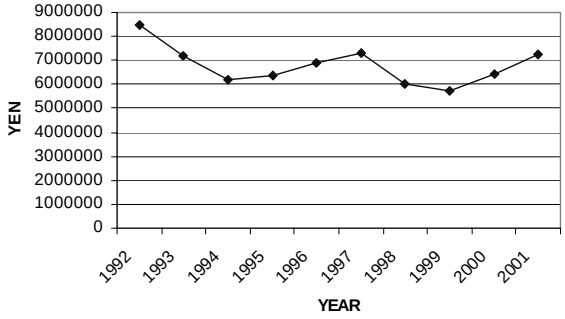
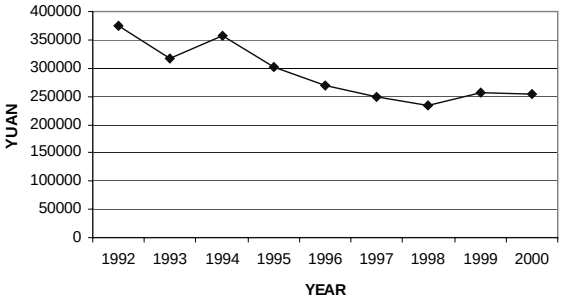
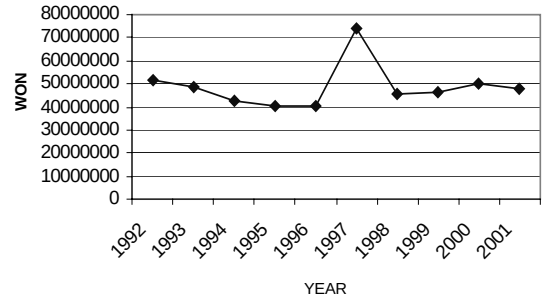


CHINA CONTRIBUTIONS IN REAL YUAN

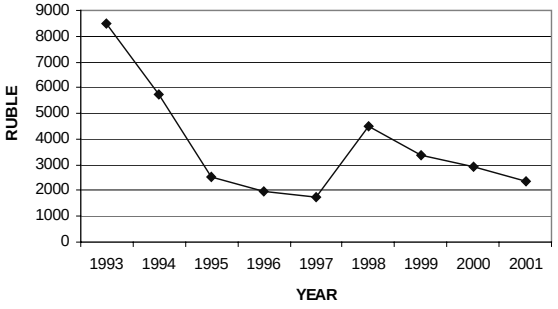


KOREA CONTRIBUTIONS IN REAL WON



*Korea's first contribution was made in 1996

RUSSIA CONTRIBUTIONS IN REAL RUBLES



*Russia's first contribution was made in 1995

REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE

The Finance and Administration Committee (F&A) met from 09:30-13:00 hours on October 12, from 09:00-13:00 on October 14, and from 13:30-14:30 on October 16, under the chairmanship of Dr. Richard J. Marasco. Dr. Alexander S. Bychkov acted as rapporteur.

Agenda Item 1. Welcome and opening remarks

The Chairman called the meeting to order, welcomed participants and requested an introduction of members for each delegation. All Contracting Parties except the People's Republic of China were represented at all sessions (*F&A Endnote 1*).

Agenda Item 2. Adoption of agenda

The Committee reviewed and adopted the agenda (*F&A Endnote 2*).

Agenda Item 3. Audited accounts for fiscal year 2002

The Auditor's Report for *FY* 2002 (*F&A Endnote 3*) was circulated to all Contracting Parties on March 31, 2003, and distributed again at the 2003 interim Governing Council meeting on April 9. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the Organization as of December 31, 2002. The Report was reviewed and adopted by the Committee. The Committee recommends that Council approve the Report. The Committee was informed that Council selected *Flader & Hale* as the auditor for *FY* 2003-2005.

Agenda Item 4. Annual contributions

National contributions for 2003 and beyond

The Executive Secretary provided historical statistics on the payment schedule of annual fees to the Organization and reported on the 2003 annual fee payment dates. As stated in Financial Regulation 5(ii), all national contributions to PICES "*shall be considered due as of the first day of the financial year (January 1) to which they relate*". Unfortunately, every year in the last 11 years, some national contributions were not received until the second, third, or even the fourth, quarter of our fiscal year (*F&A Endnote 4*). Following the instruction of Council (Decisions 02/A/2(i)), the Executive Secretary sent a letter to member countries advising on the benefits of timely payments and requesting the payment of contributions by January 1. Nevertheless, for *FY 2003* only two contributions (U.S.A. and Japan) arrived prior to this date, one payment (Canada) was received in the first part of January, one partial (~96.5%) payment in early April (Russia; the remainder was paid in July), one payment (Korea) in early May, and a partial contribution (~78%, plus the remaining $4,000 of 2002 fee) from China was received in early October.

The Chairman noted that there has been an overall improvement in the timeliness of payment. He also asked members to advise on problems they are facing in remitting the annual contribution on time. The Committee is concerned over the increased frequency of partial payments of annual fees. In some cases, these partial payments are remitted without explanation or an indication of when the outstanding balance will be paid. The operation of the Secretariat is structured around the receipt of full annual due payments at the beginning of the PICES fiscal year. Late payments cause the Secretariat to function conservatively to avoid cash flow problems. This approach could adversely affect its operations.

The Committee recommends that Council instruct the Executive Secretary to send a letter to each Contracting Party commending them for their improved performance in submitting

annual contributions in 2003. In addition, the letter should describe the difficulties that partial payments cause for the Secretariat.

Proposed changes to PICES' Rules of Procedure and Financial Regulations

At PICES XI, to ensure timely payment of annual contributions, F&A recommended, and Council approved, that *starting from the next Annual Meeting, Council will consider and adopt the budget for the ensuing and subsequent financial years* (Decision 02/A/2(iii)). This action requires changes in the Rules of Procedure (Rule 15) and the Financial Regulations (Regulation 3(v)), and the Executive Secretary was requested to develop the appropriate wording changes for consideration at PICES XII.

In the process of preparing budgets for consideration at PICES XII, a serious problem was discovered as a result of the previous year's decision to have budgets for ensuing and subsequent financial years approved. The preparation of realistic budgets requires knowledge of programmatic activities. This is difficult enough for a coming year and would be highly speculative for the succeeding year, with the end result being inaccurate funding requests made to the Contracting Parties.

The Committee recommends returning to the previous practice, currently reflected in the Rules of Procedure and Financial Regulations, where Council will adopt its budget for the ensuing fiscal year, and only consider the forecast budget for the subsequent fiscal year. For planning purposes, Contracting Parties should continue to use the guideline generally accepted at the Eighth Annual Meeting (Decision 99/A/2(ii)), which states that the annual contributions will increase at the rate of inflation (about 3%) in Canada.

Inflation-adjusted annual contributions from 1992-2002

At PICES XI, the F&A Chairman introduced an analysis of inflation-adjusted contributions since 1992. The adjusted contributions were calculated by dividing annual contributions by the Consumers Price Index (CPI) for each member country (data were obtained from the IMF International Financial Data Base at http://ifs.apdi.net/imf). This analysis indicated that the inflation-adjusted contributions in national currency have actually decreased for Canada, China, Japan and the United States, remained about constant for Russia, and increased slightly for Korea. The Committee requested that the inflation-adjusted annual contribution tables be updated regularly.

Agenda Item 5. Fund-raising

PICES has grown into an internationally renowned organization and has to anticipate and plan for even further growth. The current practice of a 3% increase in annual contributions covers inflation only. Funding constraints can impede improvement and development of the Organization. Therefore, fund-raising is becoming an important component of PICES activities. Additional resources could include extra-budgetary contributions from member states, and grants from international organizations and private foundations. The Committee noted the significant increase in the level of external funding for various activities initiated by PICES since 2000, but all these funding offers have specific product/service requirements. Serious concern was expressed about how the Secretariat, the size and structure of which have remained unchanged for the last 10 years, can handle the extra workload related to the growing number of projects. The Committee recommends that Council request delegates to determine the possibility of obtaining additional funding to support PICES activities.

The Executive Secretary reported on fund-raising efforts in 2003. External and additional funding received for various activities initiated by PICES is reflected in F&A *Endnote 5*. The Committee commended the Science Board Chairman and the Secretariat for their efforts. The Committee suggests that future reports on external funding activity contain information on costs (both staffing and non-staffing) incurred by PICES for undertaking these projects.

Further, serious attempts should be made to recover PICES' expenses that are associated with involvement in the activity.

At PICES X, Council assigned fund-raising functions to the Finance and Administration Committee. The Committee recommends that Science Board should identify and prioritize activities that are strong candidates for external funding. The list could be used by members of the PICES family to raise funds. Such an attempt, if successful, would make it possible for PICES to expand its programmatic content.

Agenda Item 6. Completion of items from the report of PICES Review Committee

Upon analyzing the draft Review Committee Report at PICES XI, F&A indicated that a few items might have budgetary implications:

Interim Science Board/Governing Council Meeting

Council strongly supported a proposal by Science Board to hold an interim Science Board meeting, with participation of Governing Council, in spring 2003 (Decision 02/A/4(iv)). F&A concluded that the interim meeting would have minimal budgetary implications for the Organization, since member countries will cover travel expenses for Council and Science Board members. This joint meeting was convened April 7-9 (noon), 2003, in Victoria, Canada, followed immediately by a ½-day Governing Council meeting in the afternoon of April 9.

The Executive Secretary reported that the overall expenses for the 2003 interim meeting were at a level of $10,000. The interim meeting was a success and met its objectives of engaging Science Board and Council in discussions of broad and long-term importance to PICES. The reports of both meetings and summaries of recommended actions were circulated to participants and Council members in early May 2003. An article entitled "PICES Science Board and Governing Council hold their first joint meeting" was prepared by the Science Board Chairman, Dr. Ian Perry, and published in PICES Press (Vol. 11, No. 2) in July 2003. The Committee supports a second inter-sessional meeting to be held in spring 2004, provided that Science Board and Council concur. Costs should be carefully considered in selecting a venue for the interim meeting.

Review of current publication practices of the Organization

Publication activities of the Organization have expanded significantly in the last several years. The Review Committee recommended an external review of current publication practices of PICES. At PICES XI, F&A supported this action and requested the Secretariat to explore the potential costs of having such a review. At the 2003 interim Governing Council meeting, the Executive Secretary reported that with the assistance from Fisheries & Oceans Canada and the National Marine Fisheries Service (U.S.A.), two bids were received: at the level of $4,000-4,500 from the Canadian expert, and about $3,500 from the US team. Council agreed to proceed with the review, and it was conducted by two NMFS experts from September 16-19, 2003. PICES' expenses for the review were about $2,000, as some of the costs were covered by the Alaska Fisheries Science Center.

The Report (see *F&A Endnote 6*), which contains a number of recommendations, was circulated to all Contracting Parties on October 1. The addition of a full time professional editor was the report's main recommendation. While supporting this recommendation in principle, the Organization's funding situation cannot support this action at the present time. In the interim, F&A recommends the use of contract services.

Re-naming of positions at the PICES Secretariat

At PICES XI, F&A supported the re-naming of staff positions at the PICES Secretariat if the action is budget-neutral, and requested the Secretariat and Canada to explore this issue. Discussions between the Executive Secretary and Canadian Delegate, Dr. Laura Richards, indicated that the re-naming of positions would cause no changes in the salary levels.

Publication of Review Committee Report

Pending full consideration of the Review Committee Report by the Science Board, action on its disposition was postponed until the 2003 interim Science Board meeting. F&A recommends that the Review Committee Report be included in this year's PICES Annual Report.

Agenda Item 7. Budget

a. Estimated accounts for fiscal year 2003

The Committee reviewed the estimated accounts for *FY* 2003 and recommends their acceptance by Council.

b. Interest and other income

During a fiscal year, the amount of funds in PICES accounts may be increased by miscellaneous income, voluntary contributions and grants. Miscellaneous income (tax rebates, income tax levies from foreign staff, bank interest and registration fees for PICES XII) in 2003 is estimated to be about $77,500. The Committee noted significant external funding ($99,000) and additional contributions ($27,200) for various activities initiated by PICES.

c. Home Leave and Relocation Fund

The status of the Home Leave and Relocation Fund was reviewed. It was noted that expenditures ($7,540) will be offset by interest earned by the Fund and, in part, by the foreign staff tax levies. The Fund will be at its required level of $110,000 by the end of the fiscal year. No relocation expenses are expected in *FY 2004*.

d. Trust Fund

In *FY 2003*, approximately $71,700 from the Trust Fund will be used to finance the Intern Program, to bring young scientists from PICES member countries and scientists from countries with "economies in transition" to scientific meetings. These expenditures are compensated for partly by the voluntary contributions from Canada and the United States for the Intern Program (totaled $27,200), and by travel grants from SCOR ($14,900). A transfer of $11,600 from the Working Capital Fund to the Trust Fund is recommended. With this transfer, the Trust Fund balance will be $110,000 at the end of the fiscal year.

e. Working Capital Fund

The balance in the Working Capital Fund is expected to be about $218,600 at the end of 2003. The Committee recommends a transfer of $79,000 from the Working Capital Fund to the General Fund for 2004. This amount includes external funds, $67,500, allocated for PICES projects that will be completed in 2004. The Committee also recommends that $11,600 be transferred to the Trust Fund. After these transfers, the Working Capital Fund will total approximately $128,000.

f. Budget for fiscal year 2004

The Committee reviewed the proposed *FY* 2004 budget of $679,000 (*F&A Endnote 7*) and recommends its approval by Council. A transfer of $79,000 from the Working Capital Fund is recommended to reduce the total annual contribution to $600,000, setting the 2004 fees at $100,000 per Contracting Party. A modest increase of about 3% in annual fees over the previous year is consistent with the guideline generally accepted at the PICES Eighth Annual Meeting (Decision 99/A/2(ii)).

g. Forecast budget for fiscal year 2005

The *FY* 2005 forecast budget of $725,000 was examined by the Committee and is submitted to Council for information only. Per the guideline adopted in 1999, the 2005 contributions would be set at $103,000 per Contracting Party. A transfer of about $107,000 from the Working Capital Fund would be required to balance funds. A transfer of this magnitude will only be possible if additional funds can be raised.

Agenda Item 8. Report of Study Group on *PICES Capacity Building*

At PICES XI, Council established a Study Group on *PICES Capacity Building* under the

direction of Science Board to develop a capacity building strategy and an implementation plan for the Organization (Decision 02/S/5). The report of the Study Group (*SB Endnote 14*) was circulated to the Chairmen of the Scientific Committees and CCCC Program on August 21, 2003. F&A reviewed the document and noted that PICES is currently engaged in numerous capacity building activities. While agreeing in principle to the need to expand capacity building activities, the Committee cautions that the current budget warrants careful consideration of the demands placed on the Organization before initiating additional activities.

Agenda Item 9. PICES Intern Program

The Committee reviewed the current status of the Intern Program and recommends that interested Contracting Parties give equal consideration to both administrative and scientific staff when making nominations. It was also suggested that all Contracting Parties should advertise the Program broadly to ensure the selection of high quality candidates.

The Committee recommends keeping the stipend at the current level of $2,000 per month, and given the modest stipend, advises that Contracting Parties consider whether personal circumstances warrant supplementation.

Agenda Item 10. PICES Visiting Scientist Program

The Visiting Scientist Program, while attractive to the Organization, has not drawn interest. F&A suggests that Science Board be requested to develop specific project proposals. These proposals should be sent to each Contracting Party. When circulating these proposals, it should be pointed out that relocation to the Secretariat may not be required.

Agenda Item 11. Schedule and financing of future Annual Meetings

At PICES XI, Council requested that the Russian Federation explore the possibility of holding the Fourteenth Annual Meeting in 2005, and inform the Secretariat on this matter by May 31, 2003 (Decision 01/A/4(ii)). A letter from Dr. Lev Bocharov indicated Russia's willingness in hosting PICES XIV, and further proposed that the meeting be held in Vladivostok. The Committee concurs and recommends that the meeting be scheduled from September 30 to October 8, 2005.

F&A recommends that in keeping with the six-year rotation cycle, Japan be invited to explore the feasibility of hosting PICES XV in 2006, and inform the Secretariat on this matter by May 31, 2004.

Canada indicated a preference to hold the Annual Meeting in 2008, to link it to the celebration of the centennial anniversary of the Pacific Biological Station. This would require an alteration to the existing rotation cycle.

F&A reviewed the current registration fee structure and recommends that fees for the next Annual Meeting be set at the following level:

Type	CDN $
Registration fee	225
Early registration fee	150
Students	50

The Committee believes that this increase is warranted by the growing monetary needs of the Organization. Fees will be collected by the Secretariat and credited to the Working Capital Fund. These funds will be used to support the Intern Program and other high priority projects.

Canada re-iterated its proposal from PICES XI to discontinue the practice of transferring funds from PICES to member countries to partially cover Annual Meeting costs. The proposal was discussed, but no recommendation was made.

Agenda Item 12. Space, facilities and services for the Secretariat

Space and general administrative services are provided to the Secretariat by the Government of Canada through Fisheries and Oceans Canada (DFO). The original agreement commenced on April 1, 1992, and continues indefinitely with a review every three years. In 2001, PICES and

DFO signed a new agreement that covers the period between April 1, 2001, and March 31, 2004. Considering a rise in postage fees and a substantial increase in the size of PICES mail-outs, PICES and DFO consented to adjust the agreement, effective April 1, 2002. According to the amended agreement, PICES is to pay an annual sum of $28,000 (in quarterly payments of $7,000), which includes $23,500 for postage. Figures for telephone and fax lines ($2,500) and janitorial/ maintenance services stay the same.

In June 2001, PICES registered "*pices.int*" as its domain name to maintain the Home Page and e-mail addresses. The initial cost of equipment and installation was $2,700. The monthly cost of operation is about $140.

Agenda Item 13. Administrative matters

Tax levy for Canadian personnel

Tax levies are an important source of alternative "revenue" for PICES, but this practice currently extends only to the foreign personnel. It was noted that other international organizations with headquarters in Canada, like NAFO and INPFC, have had such a practice for all staff members. Adoption of such a practice by PICES would greatly increase PICES' revenue (with the current level of salaries, to about $70,000 per year). Canada was requested to explore the feasibility of an amendment to the Headquarters Agreement that will allow the extension of the tax levy practice to all staff of the Secretariat.

Tax exemption for PICES in member countries

Tax rebates from the federal and provincial governments in Canada are another important source of alternative "revenue" for PICES (*e.g.*, about $10,000 in 2001 and $14,000 in 2002). It would be beneficial for PICES' financial status if the Organization could be exempt from sales tax in some of our other member countries, especially the US. The United States will explore the possibility of tax exemption for PICES.

Canadian "Acceptance" for foreign personnel

From the first foreign staff being hired at the Secretariat, they and members of their families have been granted a special "Acceptance" status by the Canadian Department of Foreign Affairs and International Trade. Unfortunately, such a status is only granted on an annual basis, even though there is proof that the foreign staff are offered a 3-year or 5-year term of office. The process of having to renew this status every year creates great personal and administrative inconvenience, because not only is the staff and family without any personal identification during the process, but the provincial medical insurance also promptly discontinues medical coverage on the day the "Acceptance" expires, and it takes 3-6 months to re-instate the coverage. Canada will inform the Secretariat of the process required to request a change in the term of "Acceptance" status.

US Visa for foreign personnel

The United States recognizes PICES as an international organization, yet treats PICES' Russian staff as a "Russian diplomat" instead of an international organization employee when issuing visas. The United States was requested to resolve this problem.

Agenda Item 14. Appointment of Finance and Administration Committee Chairman

According to the Rules of Procedure (Rule 15), "*The Chairman of the Finance and Administration Committee (F&A) shall be appointed by the Council from amongst the Committee's members for a term of two years and shall be eligible for re-appointment only once for a successive term.*" Dr. Richard J. Marasco of U.S.A. was appointed as the F&A Chairman at PICES VII in 1998 (Fairbanks, U.S.A.), and re-appointed at PICES IX in 2000 (Hakodate, Japan). At PICES XI, at the recommendation of F&A, Council extended his term for one year (Decision 02/A/7). Russia stated that Dr. Marasco is doing an excellent job as the F&A Chairman and suggested that Council extended his term for one more year. This motion was supported by all countries.

Agenda Item 15 Adoption of F&A report and recommendations to Council

The Committee approved the F&A Report and its recommendations to Council.

F&A Endnote 1

Participation List

Canada
- Robin Brown (advisor)
- Laura Richards

Japan
- Tatsu Kishida (advisor)
- Tokimasa Kobayashi
- Motobumi Manabe (advisor)
- Tokio Wada (advisor)

People's Republic of China
- Not represented

Republic of Korea
- Keun-Oh Kim (advisor)
- Yong-Ju Lee (advisor)
- Hyun-Churl Lim

Russia
- Igor I. Shevchenko

U.S.A.
- Elizabeth J. Tirpak

Other
- Richard J. Marasco (Chairman, F&A)
- Alexander Bychkov (Executive Secretary)

F&A Endnote 2

F&A Committee Meeting Agenda

1. Welcome and opening remarks
2. Adoption of agenda and meeting procedures
3. Audited accounts for fiscal year 2002
4. Annual contributions
   a. National contributions for 2003 and beyond
   b. Proposed changes to PICES' Rules of Procedure and Financial Regulations
   c. Analysis of inflation-adjusted annual contributions from 1992-2002
5. Fund-raising activities
6. Completion of items from the report of PICES Review Committee
   a. Interim Science Board/Governing Council Meeting
   b. Review of current publication practices of the Organization
   c. Re-naming of positions at the PICES Secretariat
7. Budget
   a. Estimated accounts for fiscal year 2003
   b. Interest and other income
   c. Home Leave and Relocation Fund
   d. Trust Fund
   e. Working Capital Fund
   f. Proposed budgets for fiscal year 2004 and fiscal year 2005
8. Report of Study Group on *PICES Capacity Building*
9. PICES Intern Program
10. PICES Visiting Scientist Program
11. Schedule and financing of future Annual Meetings of the Organization
12. Space, facilities and services for the Secretariat office
13. Administrative matters
    a. Tax levy for Canadian personnel
    b. Tax exemption for the Organization in member countries
    c. Canadian "Acceptance" status for foreign personnel
    d. US visa for foreign personnel
14. Appointment of F&A Chairman
15. Adoption of F&A report and recommendations
16. Other business

F&A Endnote 3

Auditor's report (2002) to the Organization

To the Council of the
North Pacific Marine Science Organization

We have audited the statement of financial position of North Pacific Marine Science Organization as at December 31, 2002 and the statement of operations and changes in fund balances for the year then ended. These financial statements are the responsibility of the organization's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In our opinion, these financial statements present fairly, in all material respects, the financial position of the organization as at December 31, 2002 and the results of its operations and changes in fund balances for the year then ended in accordance with generally accepted accounting principles.

Flader & Greene
Chartered Accountants
9768 Third Street
Sidney, B.C.,
Canada. V8L 3A4

Sidney, B.C.
March 13, 2003

STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2002

ASSETS

	2002	2001
CURRENT ASSETS		
Cash and short term deposits	$ 637,748	$ 559,620
Accounts receivable	21,387	36,240
Prepaid expenses	5,253	2,350
	$ 664,388	$ 598,210

LIABILITIES

CURRENT LIABILITIES		
Accounts payable	$ 9,624	$ 14,401
Funds held for contracting parties (Note 3)	194,000	188,000
	203,624	202,401

FUND BALANCES

WORKING CAPITAL FUND	223,264	180,809
TRUST FUND	127,500	105,000
HOME LEAVE RELOCATION FUND	110,000	110,000
	460,764	395,809
	$ 664,388	$ 598,210

STATEMENT OF OPERATIONS AND CHANGES IN FUND BALANCES
FOR THE YEAR ENDED DECEMBER 31, 2002

	General Fund	Working Capital Fund	Trust Fund	Home Leave Relocation Fund	2002 Total	2001 Total
FUND BALANCES, beginning of year	-	$ 180,809	$ 105,000	$ 110,000	$ 395,809	$ 425,560
SOURCES OF FUNDS						
Contributions from Contracting Parties	560,000	-	-	-	560,000	574,800
Budgeted transfer to General Fund	59,000	(59,000)	-	-	-	-
Additional transfer to General Fund	4,000	(4,000)				
Voluntary contributions and grants (Note 4)	-	115,210	35,301	-	150,511	93,872
Interest and other income (Note 5)	-	110,810	326	2,053	103,189	63,221
FUND BALANCES, before expenditures	623,000	333,829	140,627	112,053	1,209,509	1,157,453
EXPENDITURES						
Personnel services	304,000	17,113	-	-	321,113	307,604
Travel	82,152	-	31,873	-	114,025	104,513
Communication	30,753	-	-	-	30,753	29,879
Contractual services	14,719	-	-	-	14,719	10,490
Printing	68,901	-	-	-	68,901	63,871
Supplies	7,447	-	-	-	7,447	5,720
Equipment	6,512	1,701	-	-	8,213	5,849
Annual Meeting	45,866	4,124	-	-	49,990	113,807
Workshops	58,992	9,058		-	68,050	65,756
Relocation	-	-	-	-	-	4,830
Miscellaneous	3,563	-	-	-	3,563	2,912
PICES X Anniversary	-	31,144	-	-	31,144	33,680
Intern program	-	-	26,986	-	26,968	17,512
Ecosystem Status Report	-	10,581			10,581	-
Unrealized losses on foreign exchange	(6,722)	-	-	-	(6,722)	(4,689)
	616,183	73,721	58,841	-	748,745	761,644
NET FUNDS AVAILABLE	6,817	260,108	81,786	112,053	460,764	395,809
TRANSFER TO WORKING CAPITAL FUND (Note 6)	(6,817)	8,870	-	(2,053)	-	-
INTERFUND TRANSFERS (Note 7)	-	(45,714)	45,714	-	-	-
FUND BALANCES, end of year (Note 8)	-	$ 223,264	$ 127,500	$ 110,000	$ 460,764	$ 395,809

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2002

1. PURPOSE OF ORGANIZATION

The North Pacific Marine Science Organization (PICES) is an intergovernmental non-profit scientific organization whose present members include Canada, Japan, the People's Republic of China, the Republic of Korea, the Russian Federation and the United States of America. The purpose of the organization is to promote and coordinate marine scientific research in order to advance scientific knowledge of the North Pacific and adjacent seas.

2. ACCOUNTING POLICIES

The financial statements are prepared in accordance with the North Pacific Marine Science Organization's Financial Regulations and are prepared in accordance with Canadian generally accepted accounting principles. The following is a summary of the significant accounting policies used in the preparation of these financial statements:

(a) Fund Accounting

The Working Capital Fund represents the accumulated excess of contributions provided from Contracting Parties over expenditures in the General Fund. The purposes of the General Fund and Working Capital Fund are established by Regulation 6 of the Organization Financial Regulation.

The Trust Fund was established in 1994 for the purpose of facilitating participation of a broad spectrum of scientists in activities of the Organization.

The Home Leave Relocation Fund was established in 1996 to pay relocation and home leave expenses of new employees and their dependents to the seat of the Secretariat and removal after period of employment has ended, and to provide home leave for international staff. This fund is set at $110,000.

(b) Capital Assets

Capital assets acquired by the Organization are expensed in the year of acquisition.

(c) Income Tax

The Organization is a non-taxable organization under the Privileges and Immunities (International Organizations) Act (Canada).

(d) Foreign Exchange

Transactions originating in foreign currencies are translated at the exchange rate prevailing at the transaction dates. Assets and liabilities denominated in foreign currency are translated to equivalent Canadian amounts at the current rate of exchange at the statement of financial position date.

3. FUNDS HELD FOR CONTRACTING PARTIES

The funds held for contracting parties are advance contributions from Japan ($97,000) and U.S.A. ($97,000) for their 2003 fees.

4. VOLUNTARY CONTRIBUTIONS AND GRANTS

	Working Capital Fund	Trust Fund
NMFS contribution to NPESR/VSP	$ 22,976	-
GEM/EVOS contribution to NPESR/VSP	13,691	-
GEM/EVOS contribution to VOS Workshop	6,006	-
GLOBEC contribution to Gijon Symposium	3,052	-
Grant from Alfred P. Sloan Foundation	69,485	-
Grant from SCOR for PICES X	-	7,840
Contributions to Intern Program:		
Fisheries and Ocean Canada	-	10,000
Alaska Fisheries Science Center, NMFS	-	15,164
TINRO - Center	-	2,297
	$ 115,210	35,301

5. INTEREST AND OTHER INCOME

	Working Capital Fund	Trust Fund	Home Leave Relocation Fund
Interest income	$ 1,974	326	2,053
Income tax levies	28,670	-	-
GST, PST & WCB rebates	14,334	-	-
Other Income	98	-	-
Douglas & McIntyre Rebate	18,488	-	-
Registration fees	37,246	-	-
	$ 100,810	326	2,053

6. TRANSFER TO WORKING CAPITAL FUND

Pursuant to Financial Regulation 6 (iii), the Working Capital Fund is to be increased by the surplus in the General Fund.

Pursuant to the decision of the Governing Council, $2,053 was transferred to the Working Capital Fund to restore the Home Leave Relocation Fund to a maximum level of $110,000.

7. INTERFUND TRANSFERS

Pursuant to decision 02/A/3(iii) of the Governing Council, an amount to keep the Trust Fund at the level of $100,000 was transferred from the Working Capital Fund. In addition, Council approved the transfer of $27,500 to bring the Trust Fund balance to $127,500.

8. WORKING CAPITAL FUND SURPLUS

Pursuant to decision 02/A/3(ii) of the Governing Council, $110,500 of the funds held in the Working Capital Fund will be transferred to the General Fund to reduce 2003 contributions.

9. COMMITMENTS

General administrative and communications services are provided to the Secretariat of the Organization by the Government of Canada through the Department of Fisheries and Oceans. The agreement was amended April 1, 2002 and continues until March 31, 2004. The fixed cost for services is $28,000 per year which are paid quarterly as invoiced.

10. FINANCIAL STATEMENTS

A statement of cash flows has not been presented, as the required information is readily apparent from the other financial statements presented and the notes to the financial statements.

F&A Endnote 4

Payment Schedule of National Contributions

	Canada	China	Japan	Korea	Russia	U.S.A.
1992[1]	June 9, 92	Sept. 29, 92	March 23, 92			April 24, 92
1993	Dec. 14, 92	**July 30, 93**	March 12, 93			Jan. 8, 93
1994	Feb. 22, 94	March 14, 94	Jan. 28, 94			Feb. 14, 94
1995	Jan. 4, 95	**May 29, 95**	March 4, 95		**July 18, 95**	March 21, 95
1996	Feb. 21, 96	**May 23, 96**	Jan. 12, 96	**July 9, 96**	Feb. 21, 96	Feb. 29, 96
1997	Dec. 20, 96	March 27, 97	**April 21, 97**	**May 6, 97**	**Oct. 8, 97**	Jan. 20, 97
1998	Feb. 3, 98	**May 8, 98**	Jan. 13, 98	**Dec. 5, 98; Jan. 6, 99**[2]	**July 22, 98**	**May 7, 98**
1999	Nov. 30, 98	**Nov. 26, 99**	March 29, 99	**Aug. 16, 99**	**Dec. 13, 99**	Jan. 27, 99
2000	Feb. 9, 00	**Aug. 29, 00**	Nov. 30, 99	**June 1, 00**	**Nov. 2, 00**	Jan. 18, 00
2001	Jan. 24, 01	**Dec. 10, 01**	Dec. 13, 00	**Aug. 23, 01**	**May 18, 01**	Jan. 3, 01
2002	Jan. 21, 02	**Oct. 8, 02**[4]	Nov. 27, 01	**Aug. 26, 02**	**June 10, 02**[3]	Dec. 24, 01
2003	Jan 13, 03	**Oct. 2, 03**[5]	Dec. 11, 02	**May 5, 03**	**Apr. 2, 03**[6]	Dec. 6, 02

1 partial year from March 23-December 31, 1992;
2 partial payment in 1998, remainder paid in 1999;
3 partial payment (72%), remainder paid October 10, 2002;
4 partial payment (95.7%), remainder paid October 3, 2003;
5 partial payment (78%), remainder still unpaid;
6 partial payment (96.5%), remainder paid July 18.

F&A Endnote 5

External funding and special contributions for various PICES projects in 2003

Continuous Plankton Recorder (CPR) Program

- A grant of US $185,000 from the North Pacific Research Board (U.S.A.) was received to maintain the east-west transect of the PICES Continuous Plankton Recorder (CPR) survey of the North Pacific and the southern Bering Sea from July 2003 to June 2005.
- The Gulf of Alaska Ecosystem Monitoring and Research Program (GEM) of EVOS (Exxon Valdez Oil Spill Trustee Council, U.S.A.) agreed to fund the sample collection and analysis for the north-south transect of the PICES CPR survey from 2004 to 2006, at a level of US $120,000 per year.

North Pacific Ecosystem Status Report

- Alaska Fisheries Science Center (AFSC) of National Marine Fisheries Service (NMFS, NOAA, U.S.A.) and EVOS/GEM Program contributed US $12,450 and US $32,600 ($16,000 from US *FY* 03 and $16,600 from

US *FY* 04) respectively, to support the development of the North Pacific Ecosystem Status Report.

Reminder: Earlier AFSC contributed US $24,260 (US $9,260 in 2001 and US $15,000 in 2002), and EVOS/GEM provided US $10,000 to finance the production of a pilot North Pacific Ecosystem Status Report.

Census of Marine Life Report

- A grant of US $45,000 from the Alfred P. Sloan Foundation (approved in 2002), will be used in 2003 to produce a report for the Census of Marine Life entitled "Marine life in the North Pacific Ocean: The known, unknown and unknowable". This report is closely linked to the North Pacific Ecosystem Status Report.

Ecosystem modeling

- A grant from the Nakajima Foundation (approved in 2001) was used to finance a MODEL/REX Workshop on "Improvements to the PICES NEMURO model" (January 24-27, 2002, Nemuro/Yokohama, Japan) and a MODEL workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model" (March 3-6, 2003, Yokohama, Japan).
- Japan Fisheries Research Agency provided a grant of JPY 6,000,000 (from April 2003 to March 2006) to support international collaboration on the development of a model on the coupled response of lower and higher trophic level ecosystems for climate variability in the North Pacific. This grant will be used to convene 3 workshops – two in Japan (2003 and 2005) and one in the United States (2004).

Biogeochemical data integration and synthesis

- IOC (Intergovernmental Oceanographic Commission) provided US $6,000 to PICES for the publication of "Guide of best practices for oceanic CO_2 measurements and data reporting" being prepared by the PICES WG 17 on *Biogeochemical data integration and synthesis* to ensure a large print run. This publication is expected in 2004.

Intern Program

- In addition to their annual fees, Canada and U.S.A. contributed $10,000 and $17,200, respectively, to finance the 2003 PICES Intern Program.

Reminder: So far, 3 countries have contributed to the Trust Fund to support the Intern Program: Canada - $27,500 (2000-2002), the Russian Federation - $2,300 (2002), and the United States - $34,500 (2000-2002).

Travel grants for scientists from countries with "economies in transition"

- SCOR (Scientific Committee on Oceanic Research) approved two grants to support the travel of scientists from countries with "economies in transition" to scientific meetings organized by PICES: US $7,000 (US $5,285 was expensed through PICES) for the PICES/GLOBEC/ICES Zooplankton Production Symposium (May 19-23, 2003, Gijón, Spain) and US $5,000 for PICES XII (October 10-18, 2003, Seoul, Republic of Korea).

Other

- The Southwest Fisheries Science Center (National Marine Fisheries Service, NOAA, U.S.A.) offered US $18,200 to facilitate the gathering and coordination of potential international PaCOS (Pacific Coastal Observing System) contributions, and to design basic governance structure options for coordinating biological observations between the United States, Canada and Mexico.
- GLOBEC contributed about $4,630 to finance the production of a special joint PICES/GLOBEC issue of PICES Press that focused on results from the PICES Eleventh Annual Meeting and the Second GLOBEC Open Science Meeting, held sequentially in Qingdao, People's Republic of China, in October 2002.

F&A Endnote 6

Review of PICES Publication Program

Executive Summary

At the request of PICES, a review of the PICES publication program was conducted from September 16-19, 2003. During its first 10+ years, PICES has published a growing number of documents now totaling more than 65 (14 peer-reviewed) in six different publication series and 22 issues of the newsletter, PICES Press. Considering the very small PICES Secretariat staff (4 plus an intern), the publication record of high-level scientific materials is exceptional, and the staff has made creative use of co-publishing ventures to advance the Organization's publishing program. However, the workload for the Secretariat staff has become a serious burden that must be addressed and alleviated. Most important is the addition to the Secretariat staff of a professional editor to assume control of editorial production duties, and who can introduce up-to-date editorial methods and new desktop publishing technology to the Organization. Also important will be an updating of the PICES website so PICES publications can be made broadly available worldwide on it. This may necessitate utilizing a contract webmaster and, in the future, perhaps a part-time staff webmaster. Additionally, PICES staff, when augmented with a full-time editor, can take several steps to emphasize PICES identity and recognition of its publications. In the future, PICES may need to hire a second full-time staff member who would attend to website management as well as assisting with editorial duties.

Background

The North Pacific Marine Science Organization (PICES) was established in 1992 to promote international cooperative research efforts to solve key scientific problems in the North Pacific Ocean. In slightly over 10 years, PICES has become a recognized and major international science organization, and its publication activities have expanded significantly in recent years to advance and support its goals.

Accordingly, in 2002, the PICES Review Committee recommended an external review of current publication practices and needs of PICES. At the 2002 Annual Meeting, the Finance and Administration Committee supported this action and requested that the Executive Secretary secure the external review of these activities and examine both the financial and technological aspects of PICES's approach to publishing. The review was to examine:

- PICES Publications -- Annual Report, newsletter, Scientific Report Series, primary journal publications, meeting announcements/flyers, and abstract books;
- Costs, methods, and efficiencies of distributing these publications;
- The human, financial, and technological resources used to produce and distribute PICES publications;
- Efficiencies in each of these areas that could be achieved via new or altered technology;
- Plans (and costs) for the Executive Secretary on the implementation of such changes.

PICES Publications Review Team

At the request of PICES, a critical review of the Organization's publication program was conducted from September 16-19, 2003 by two officials with the U.S. Department of Commerce's National Marine Fisheries Service (NMFS): W. L. Hobart, Chief, NMFS Scientific Publications Office, and G. J. Duker, Director, Publications Program, NMFS Alaska Fisheries Science Center. The NMFS has been involved in the editing and publication of peer-reviewed marine science literature since its founding in 1871.

The review team has examined PICES' publications and publishing procedures developed in the first 10 years of service, and has identified strengths that can be reinforced and needs that must be addressed as PICES moves into its second decade of growth.

PICES Publications

PICES regularly publishes seven categories of general, scientific, and technical information in the following publications:

1) **PICES ANNUAL REPORT** – This document provides detailed reports of both the administrative and scientific components of the Organization. Reports from the Governing Council, Finance & Administration Committee, and planning reports from Scientific and Technical Committees, Scientific Programs, and Working Groups are included.

2) **PICES SCIENTIFIC REPORTS** – This information series includes PICES workshop proceedings, data reports, planning reports, etc. Issues are usually reviewed by convenors or committee members and have full-color graphics.

3) **SPECIAL ISSUES** – These publications (approximately four per year) are published cooperatively with peer-reviewed scientific journals. Individual manuscripts provide extensive detail and research findings.

4) **BOOKS** – These hard-bound volumes are peer-reviewed or journal quality publications that are produced for PICES by recognized professional publishing houses.

5) **PICES PRESS** – This semi-annual newsletter highlights current PICES research, describes the general activities of PICES, and lists new PICES publications. It is published in full color.

6) **COLLECTED MEETING ABSTRACTS** – This series provides abstracts of oral presentations and posters from meetings organized and sponsored by PICES. This information lacks extensive detail and may be preliminary or partial, but it is an unofficial record of information planned for the meetings.

7) **PICES ECOSYSTEM STATUS REPORTS** – These reports summarize the current state or knowledge on different topics by North Pacific region and also receive peer reviews.

In slightly over 10 years the PICES Secretariat has published 27 Scientific Reports (25 of them in the PICES Scientific Report Series), coordinated and edited 10 Special Issues (5 in *Progress in Oceanography*, 2 in *Journal of Oceanography*, 1 in *Deep-Sea Research II*, 1 in *Marine Environmental Research* and 1 in the *Canadian Journal of Fisheries and Aquatic Sciences*; 3 more Special Issues are in progress and will be published in early 2004). PICES has also produced 2 books, published 11 Annual Reports, 16 volumes of collected abstracts (12 for Annual Meetings and 4 for large inter-sessional symposia), and 22 issues of the PICES Press newsletter. The current cost to PICES for printing these publications is about CD$ 90,000 per year.

PICES Staffing

The entire staff of the PICES Secretariat includes four regular members: Executive Secretary, Deputy Executive Secretary, Deputy on Administration, and Administrative Assistant. In addition, an intern is on staff via the PICES Intern Program. Given such a small staff, the editorial production that they have been able to achieve, without a full-time editor, is phenomenal. Because the PICES Secretariat serves also as PICES editors, the increasing level of editorial production has taken over an inordinate amount of their time.

Complicating and aggravating this development is the problem that all science editors have authors for whom English is a second language. These manuscripts require 4-5 times more editorial attention and effort to prepare them for publication. And because PICES is an international organization, a large percentage of the manuscripts it publishes fall into this category. This growing editorial load, which cannot be avoided, has become a serious drain on the time of the PICES Secretariat that needs to be resolved.

PICES Publishing

PICES utilizes two methods for publishing its documents: direct publishing and co-publishing. In direct publishing, PICES has established contracts with local (British Columbia) printers to produce its Annual Reports, PICES Scientific Report series, newsletter (PICES Press), and abstract volumes.

Co-publishing has been developed by the PICES Secretariat to utilize the expertise of recognized book and/or journal publishers and reduce the unit cost of publishing its peer-reviewed science. This type of arrangement both increases the distribution of Special Issues and adds prestige to the journal publisher that works with PICES. Co-publishing, for PICES, has proven to be an effective way to off-load some editorial work (onto journal and book editors) and editorial production and distribution costs (onto journal publishers). To ensure publication within 12-16 months, the PICES Executive and Deputy Executive Secretary routinely serve as coordinating guest editors with these journals.

Review Observations

The reviewers were surprised to learn, given the large output of high-quality science publications, that PICES did not have a professional editorial staff, and that routine editorial work (including the extensive re-writing and revision of many manuscripts prepared by scientists for whom English is a second language) had to be performed by the PICES executives. They certainly deserve commendation for coping effectively with a difficult and growing editorial workload and for finding creative and successful ways to deal with those tasks. We firmly believe, however, that PICES is at an editorial crossroads, and that it must add more resources to handle the increasing editorial needs of the North Pacific community. The alternative, reduction in the output of important North Pacific science, would be a poor option.

The extent and variety of PICES publications and the volume of contributions published seem very well adapted to the mission and goals of the organization, to the scope of its activities, and to PICES geographical range. The newsletter, PICES Press, is an effective tool for communication to PICES constituents. Likewise, the Scientific Reports, Annual Reports, and Annual Meeting Abstracts well serve PICES needs.

Co-publishing, the utilization of outside agencies (i.e., university or Sea Grant presses) and private publishers (peer-reviewed scientific journals) to publish and disseminate PICES science has been very creative and efficient and should be continued and expanded if possible. Using such outlets brings greater recognition and prestige to both the publisher and to PICES. Perhaps of equal importance is that it shifts large publishing costs to those outside organizations and thereby allows PICES to reach a broad audience at a much lower cost than if it had to do the publishing itself in separate publications.

The current use of guest editors and outside peer-reviewed journals is a most appropriate way to publish PICES science, and we were impressed with the extent to which the PICES Secretariat has successfully employed this technique. Likewise, the use of hard-cover books, published by private organizations, has been successfully used to make special topics readily available to the scientific community. The acceptance of these PICES initiatives by the private sector is a fine testament to the high level of PICES scientific communications and to the Organization itself.

We were further impressed with the judicious use of historical materials. Science is not conducted in a vacuum; rather, it is a continuous process whose foundations can be traced back in time through earlier publications. And the review of those early foundational works and initiatives often stimulates the creative thoughts that lead to further scientific advancements.

The proposed North Pacific Ecosystem Status Report is also an exceptionally ambitious project that will require a considerable investment in editorial work. The concept is an excellent one, and it is somewhat analogous to the “Our Living Oceans” (OLO) publications of the U.S. National Marine Fisheries Service. The OLO

began as a biological report (on the fisheries status) (http://spo.nwr.noaa.gov/olo99.htm), and it has been extended into an Economic Report and now (in press) a report on the Status of Marine Habitats. However, the PICES North Pacific Status Report covers a vastly broader realm and additional aspects that the OLO does not address, and it will provide a fine benchmark that can be used to chronicle and track North Pacific environmental issues.

Recommendations

PICES editorial needs and practices have obviously grown over time, and there are some important steps that can be taken now that will help update PICES editorial practices and allow it to cope effectively with future publishing needs.

PICES Staff and Management

It quickly became obvious in our review that the current professional staff of PICES is seriously overloaded with editorial duties required by the very large volume of materials (both informal and peer reviewed) that are generated by scientists for whom English is a second language at best. These contributions are extremely valuable, but they require an immense amount of time to put them into readable form while not changing the intent of the author.

This overloading of the PICES Secretariat seriously limits its participation in other activities, and PICES is long overdue to add at least one professional editor to coordinate and perform these and other important editorial duties. PICES has several options to obtain the needed editorial expertise.

1) The obvious step would be to hire a full-time professional editor with a strong background in the biological sciences. The cost would likely be in the salary range of US$45,000-70,000, not including benefits (retirement, health program, etc.). Not only would such a staff person be able to strengthen PICES editorial work and products, but they would very likely be able to achieve significant cost savings in publications production.
2) Alternatively, PICES could establish an official "PICES Editorial Board" of volunteer scientists/editors and charge them with editing manuscripts and providing them in publishable form (a stipend might be provided for such work). However, we do not view this as a good option because few scientists have the time to spend on such "extra" work unless their agency grants them the time to perform such duties. In most cases, scientists are heavily taxed already in preparing their own manuscripts.
3) PICES could seek out local (Victoria or Vancouver, B.C.) university students to perform editorial duties at low or no cost as part of their university studies. Our experience with such an option, however, is that this is only a short-term "answer" to a large editorial workload, and it also does not give an organization the needed editorial continuity.
4) PICES could hire professional contract editors to perform the needed editorial duties. This has been done by the CalCOFI organization, but they only have one publication per year, generally, whereas PICES has many. It is also likely that there would be little cost savings with this option, but it could greatly ease the editorial demands now placed on the PICES Secretariat.
5) PICES could also establish a contract with a company that provides professional editorial work for a fee. Again, there would be little cost savings and insufficient editorial continuity (the company would likely assign different editors to different editorial projects). Our experience with this option is that it can be used to process a one-time editorial overload (or backlog), but that it is not the best long-term solution.

Finally, our experiences over the years with each of these alternatives to solve editorial needs that have grown over the years leaves no doubt that the most appropriate option to handle PICES' extremely high editorial workload is to hire a full-time editor for the PICES staff. This would give the further benefit of allowing PICES to plan for future publications, handle its now-large publishing enterprise, bring consistency to its

editorial products, and achieve appropriate recognition for PICES publications and programs.

Additionally, a publications professional on the PICES staff could redesign some of the PICES publications and find ways to reduce the use of 4-color printing, both of which together could reduce the costs of some PICES publications as much as 50-70%. Further, such an individual could explore the use of 3- to 5-year renewable printing contracts. Seeking such bids on printing contracts would also help reduce PICES printing costs. Managing such printing procurement processes is a laborious one that PICES current staff does not have time to conduct.

Publication Standards

PICES does not have a "Style Manual" for use internally (in manuscript editing) and externally (for authors to follow). All editorial offices have such a manual or follow one of the standard ones. Standard style guides and other important reference materials are listed in Appendix 1, and PICES can augment them by adapting its own style guide to serve its needs. Use of a manual will also help authors prepare their manuscripts in a format that will require less editorial work. Examples of specialized style manuals are available from many sources (e.g, Alaska Fisheries Science Center and the Council for Biological Editors) and these can be customized to meet the PICES needs. We therefore recommended that the PICES Secretariat develop an online style manual for its authors, editors, and contributors, and this would be a first task for a new editor.

Another practice that saves time is editing in manuscript form (double-spaced, page width text). Once edited, the manuscripts should then be put into page format. It is far more difficult and time consuming to try to edit text when it is already set into a publication's format.

Publication Identity and Recognition

Agency recognition is an important issue in scientific publishing. Many PICES publications, from Scientific Reports to the hardbound books and journal articles, lack sufficient PICES identity. While there is nothing wrong with this, "per se", it does not accord PICES full credit for the work it has generated or supported. In some cases, PICES-generated articles have a "contribution number" for a different organization which gives most credit to the other organization, and readers do not know of PICES' involvement.

For PICES own publications, pertinent information, such as mission statement, a list of PICES publications, contact information, etc. should be featured consistently in a common place. Another recognition item to include would be a short statement of "How to cite this document".

Examples of these identity signatures or statements used by other agencies are given in Appendix 2.

In many of the peer-reviewed Special Issues co-published by PICES and private journals, authors have not always acknowledged PICES, and this should be done. It can be as simple as a footnote or as an acknowledgment paragraph, and PICES should recommend inclusion of such recognition by authors of publications that it funds or sponsors.

The visibility and prestige of PICES or any scientific organization is linked to how many times its name is published – this is especially true of the times where a Google "simple search" is a primary means of finding literature. Many agencies or societies ensure receiving proper credit by assigning a "contribution number" to each of their publications. We recommend that PICES explore an appropriate way to place a similar tag onto its related publications (i.e., "This paper is PICES Symposium Contribution Number X" or similar wording).

There are additional ways to achieve greater recognition of PICES goals and accomplishments. For example, a PICES Style Guide should also specify the consistent use of the PICES logo on all of its publications—

where, when, and how it is to be used—so readers will become familiar with its use and placement and will automatically recognize PICES publications. We also recommend that the Secretariat explore the possibility of having related marine science organizations put a link on their websites to the PICES website.

Publication Archiving

Because of the continuing growth and demand for PICES publications, online archiving (posting PICES publications on the PICES website) was identified as a key issue. The ability of the PICES Secretariat to produce Adobe pdf versions of all of its publications is supported by the reviewers. It is recommended that PICES work with their existing printers to produce pdf files of its publications for use on the PICES website. It is also recommended that PICES contract a commercial vendor (e.g., Ikon Office Solutions) to scan documents that do not currently exist in a pdf format.

The cost of this service varies (e.g., US$100 minimum at US0.25 per page up to 2,000 pages) and is subject to a number of set-up charges – similar to a printer. Emphasis should be placed on providing a high quality, tagged, searchable pdf for Web use. The cost (>US$15,000) of purchasing the appropriate hardware (e.g., Canon ImageRunner 5000) and software (e.g., 'ecopy') to do this function in-house is not supported at this time. Additional staffing would also be required to fully utilize and justify this type of system.

Additional Issues

The Worldwide Web now serves as the major avenue for international dissemination of information products (e.g., PICES publications). Unfortunately, the PICES website is currently out-of-date and the lack of timely information is undoubtedly frustrating for those seeking information. Our discussions indicated that a re-design is underway but it must be considered that any re-design will require considerable effort by the staff of the Secretariat to make the web site a valuable resource. A crucial step may be to "appoint" a webmaster and provide the training needed for this position. The emphasis should be on selecting someone who is interested in web development and management and who already possesses some of the skills needed for the position. Based on the current workload of the PICES Secretariat, the more obvious step would be to hire (or contract) a part-time web developer (<US$5,000 per year) to manage the PICES web site. This outsourcing would be similar to the current practice for the creation of the PICES Press.

The issue of PICES "content management" also needs to be addressed by the PICES Secretariat. The content of both the PICES Press and the Annual Reports may provide the foundation for providing up-to-date website content. An example of this type of system can be found on the Alaska Fisheries Science Center's website (http://www.afsc.noaa.gov) where much of the web content is derived from the Center's "Quarterly Report".

During our review it became clear that the PICES Secretariat staff relies heavily on Microsoft WORD, a word processing program, for the lay-out (design) and production of its internally produced publications. While effective for long text-intensive documents, MS WORD has several shortcomings when compared to full-fledged desktop publishing (DTP) software programs. Fundamentally, MS WORD lacks the fine control over kerning or linespacing and graphic placement that is available in DTP programs. The time spent in work-around issues with MS WORD could be eliminated with the integration of a true DTP program into the PICES publications program. Examples of state-of-the-art DTP programs include Adobe FrameMaker or PageMaker (US$500), Corel Ventura (US$630), and QuarkXPress (US$650). Adobe InDesign has added more long-document publishing capabilities, but those options are still new and it is still primarily considered a program for short documents.

Due to their complexity, these programs have a steep learning curve. However for book length publications (e.g., some PICES Scientific Reports, Abstract Books, or other complex,

structured documents), these DTP programs offer features to cope with repeating elements (e.g., headers and footers), table of content and index generation, page numbering, and integration of graphics and perhaps other elements including spreadsheet and database elements that are characteristic of PICES publications. An up-to-date DTP system would be needed by a new PICES editor, and this individual would already have the knowledge to integrate PICES editorial products into it.

Once a PICES editor is on staff, thought should be given to publishing the PICES Press quarterly, rather than twice a year. The additional issues would give the organization better and more timely communication with its constituents. This would not be an option without additional staff, however.

Summary

This review has identified several strengths in PICES editorial operations, particularly the use of co-publication with outside publishers and the achievement of a high rate of publication with a limited staff. However, PICES editorial workload now requires the addition of another full time staff position to manage its editorial program and to inaugurate a new and modern desktop publishing system. PICES' ongoing efforts to upgrade its website, and particularly to place its publications on its website will be beneficial and should be expedited as time and funding permit. The goal should be to eventually have all PICES publications available online. In addition, special efforts should be made to better identify appropriate publications as PICES Contributions so the organization gets full credit for its published science.

Below is an itemized list of our recommendations for strengthening and augmenting PICES publication program:

- Hire a full-time professional editor to manage the PICES publication program.
- Establish or modify an existing editorial style manual for contributors and editors to follow.
- Update the PICES website.
- Have printers provide pdf files so new PICES publications can be placed on its website.
- As time and money allow, contracts to have earlier PICES publications scanned at high resolution, so all will eventually be posted and accessible on the PICES website.
- Utilize a contract or part-time webmaster to re-design and update the PICES website.
- Continue development of co-publishing and guest editor arrangements.
- Direct the new PICES editor to make publication design modifications to save printing costs.
- Employ up-to-date desktop publishing programs to save time and funds in publication editing and production.
- Direct the new PICES editor to explore use of long-term (3-5 years) printing contracts and put them out for competitive bids to achieve cost savings.
- Task the new PICES editor with developing a standard identification and recognition program for PICES publications and contributions.
- Explore the possibility of having other marine science organizations put links on their web pages to the PICES web page.

APPENDICES

Appendix 1

Editorial offices use a variety of reference books to ensure publication and editorial consistency. NMFS offices generally use the CBE Style Manual and the GPO Style Manual, along with other specialized publications. Below is a list of resources that are used for different aspects of scientific writing and editing.

Recommended Reference Books

Writing

Hunter, J. (editor). 1990. Writing for fishery journals. American Fisheries Society, 5410 Grosvenor Lane, Bethesda, MD. 102 p.

Strunk, W., Jr., and E. B. White. 1979. The elements of style, 3rd edition. Macmillan Publishing Co., New York.

Tichy, H. J. 1967. Effective writing: For engineers-managers-scientists. John Wiley & Sons, Inc., New York.

Word Usage

Bernstein, T. M. 1965. The careful writer: A modern guide to English usage. Atheneum, New York. 487 p. (A common sense approach to the English language. Unfortunately this book is out of print).

Copperud, R. H. 1980. American usage and style: the consensus. Van Nostrand Reinhold Company, New York, NY.

Dictionaries

Webster's third international dictionary, unabridged. 1964. Merriam-Webster, Inc., Springfield, MA.

Webster's ninth new collegiate dictionary, desk top. 1983. Merriam-Webster, Inc., Springfield, MA. (This dictionary is revised periodically and is considered an update of the larger Webster's third international.)

Style Manual

Council of Biological Editors (CBE) Style Manual Committee. 1995. CBE style manual: a guide for authors, editors, and publishers in the biological sciences, 6th edition. Cambridge University Press, Cambridge UK. 825 p. (In addition to serving as the standard style manual for many biological journals, this book includes useful information on writing scientific papers.).

Government Printing Office style manual. 1984. Superintendent of Documents, U.S. Gov. Print. Office, Washington, DC.

Sabin, W. A. 1992. The Gregg reference manual, 7th edition, 502 p.

Scientific Names

Rice, D. W. 1998. Marine mammals of the world: Systematics and distribution. Soc. Mammal. Spec. Publ. 4, 231 p.

Robins, C. R. (Chairman), R. M. Bailey, C. E. Bond, J. R. Booker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1991. A list of common and scientific names of fishes from the United States and Canada. Am. Fish. Soc. Spec. Publ. 20, 183 p.

Turgeon, D. D. (Chair), A. E. Bogan, E. V. Coan, W. K. Emerson, W. G. Lyons, W. L. Pratt, C. F. E. Roper, A. Scheltema, F. G. Thompson, and J. D. Williams. 1988. Common and scientific names of aquatic invertebrates from the United States and Canada: Mollusks. Am. Fish. Soc. Spec. Publ. 16, 277 p.

Williams, A. B. (Chair), L. G. Abele, D. L. Felder, H. H. Hobbs, Jr., R. B. Manning, P. A. MacLaughlin, and I. Pérez Farfante. 1989. Common and scientific names of aquatic invertebrates from the United States and Canada: Decapod crustaceans. Am. Fish. Soc. Spec. Publ. 17, 77 p.

Appendix 2

Mock-ups of "identity" information that can be provided in PICES Scientific Reports.

Appendix 2A – Recommended example of how to provide a PICES mission statement and identify PICES publications on the back cover of PICES publications (e.g., Scientific Report Series).

Appendix 2B – Recommended example on how to provide contact information and a list of recent publications on the inside back cover of PICES publications.

Appendix 2C – Recommended example of how to provide contact and "how to cite" details on the inside of the front cover of a PICES Scientific Report.

Appendix 2A

PICES SCIENTIFIC AND TECHNICAL PUBLICATIONS
(Recommendation for PICES Scientific Reports back cover information)

The North Pacific Marine Science Organization (PICES) was established in 1992 to promote international cooperative research efforts to solve key scientific problems in the North Pacific Ocean.

PICES regularly publishes various types of general, scientific, and technical information in the following kinds of publications:

PICES ANNUAL REPORT – This document provides detailed reports of both the administrative and scientific components of the Organization. Reports from the Governing Council, Finance and Administration Committee and planning reports from Scientific and Technical Committees, Scientific Programs, and Working Groups are included.

PICES SCIENTIFIC REPORTS – This information series includes PICES workshop proceedings, data reports, planning reports, etc.

SPECIAL ISSUES – These are peer-reviewed publications (approximately four per year) published in conjunction with scientific journals. Individual manuscripts provide extensive detail and research findings.

BOOKS – These are peer-reviewed or journal quality publications.

PICES PRESS – This semi-annual newsletter highlights current PICES research, describes the general activities of PICES, and lists new PICES publications.

ANNUAL MEETING ABSTRACTS – This series provides abstracts of oral presentations and posters given at PICES Annual Meetings. This information lacks extensive detail and may be preliminary or partial.

PICES ECOSYSTEM STATUS REPORTS – These reports summarize research on different topics by North Pacific region.

Appendix 2B

RECENT PICES SCIENTIFIC REPORTS
(Recommendation for inside back cover)

Copies of this and other PICES Scientific Reports are available from
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000,
Sidney, British Columbia
Canada. V8L 4B2
E-mail: secretariat@pices.int
On-line versions of most PICES Scientific Reports can also be found at
http://www.pices.int/Library/scireps.asp.

PICES SCI. Rep. – List all current reports (Provide names of editors, etc.).

1
2

23 Taylor, F.J.R., and V.L. Trainer (editors). 2002. Harmful algal blooms in the PICES region of the North Pacific. PICES Sci. Rep. 23, 152 p.

Appendix 2C

PICES SCIENTIFIC REPORTS
(Recommendation for inside front cover)

Published since 1993, the PICES Scientific Report series includes workshop proceedings, data reports, planning reports, etc.

A limited number of copies are available from
PICES Secretariat
c/o Institute of Ocean Sciences
P.O. Box 6000,
Sidney, British Columbia,
Canada. V8L 4B2
E-mail: secretariat@pices.int
Online versions of most PICES Scientific Reports can also be found at
http://www.pices.int/Library/scireps.asp.

Publication in the PICES Scientific Report series does not preclude later publication in scientific journals in a revised form.

This document should be cited as follows:

Taylor, F.J.R., and V.L. Trainer (editors). 2002. Harmful algal blooms in the PICES region of the North Pacific. PICES Sci. Rep. 23, 152 p.

F&A Endnote 7

Budget for fiscal year 2004

Category	**Allotment**
Personnel Services	352,000
Annual Meeting	20,000
Special Meetings	68,000
Travel	85,000
Printing	77,000
Communication	32,000
Equipment	10,000
Supplies	7,500
Contractual Services	24,000
Miscellaneous	3,500
Total	679,000

Source	**Contribution**
Contributions from six Contracting Parties	600,000
External funds for PICES projects with completion in 2004	67,500
Transfer of Working Capital Fund surplus	11,500
Total	679,000

2004 Annual Fee for each Party	**100,000**

REPORT OF SCIENCE BOARD/GOVERNING COUNCIL INTERIM MEETING

The first PICES Interim Science Board meeting, with the participation of Governing Council, was held at the Victoria Conference Center, Victoria, Canada, from April 7-9, 2003. The Science Board Chairman, Dr. Ian Perry, welcomed participants and thanked them for their dedication and commitment to PICES for participating in the meeting. He noted that despite the 10-year history of PICES, this was the first joint meeting between Science Board and Governing Council. It is an important meeting, as it provides an opportunity to discuss larger issues for PICES, in particular relating to future directions of the Organization. It also provides the PICES Chairman and Governing Council with an opportunity to improve their understanding of the basis for discussions and recommendations of Science Board. The participants are identified in *SB-IM Endnote 1*, and the agenda is provided in *SB-IM Endnote 2*.

Agenda Item 1. Updates from the Committees and Programs

BIO Committee

The BIO Chairman, Dr. Vladimir Radchenko, presented his Committee's interim report (full BIO report is included elsewhere in this Annual Report). The main items were related to the development of the BIO Strategic Plan, preparations for BIO sessions at PICES XII, progress of Working Group 14 on *Effective sampling of micronekton*, and the Advisory Panel on *Micronekton sampling inter-calibration experiment*, membership concerns with the Advisory Panel on *Marine birds and mammals* (MBM-AP), and a proposal for a workshop on the ecosystems of subarctic seas.

In discussion, it was noted that the membership of the MBM-AP significantly lacks participation from Russia, Korea and China. It was recommended that the MBM-AP Co-Chairmen contact Dr. Jinping Zhao (China) and Dr. Hyung-Tack Huh (Korea) to seek suggestions for members from China and Korea; Dr. Radchenko will provide suggestions from Russia. Council members were requested to help support the participation of scientists nominated from their countries.

FIS Committee

The FIS Chairman, Dr. Yukimasa Ishida, presented his Committee's interim report (full FIS report is included elsewhere in this Annual Report). The main points were related to preparations for PICES XII scientific sessions, activities of Working Group 16 on *Climate change, shifts in fish production, and fisheries management*, and possible future working group topics. There is a strong interest among FIS members and other committees to establish a working group on ecosystem-based management. An action item on this topic is described under the MEQ Committee report below.

MEQ Committee

The MEQ Chairman, Dr. John E. Stein, presented his Committee's interim report (full MEQ report is included elsewhere in this Annual Report). The main points were related to topic sessions for PICES XII and ICES' interest in participating in these sessions, development of the MEQ Strategic Plan, and activities of Working Group 15 on *Ecology of harmful algal blooms (HABs) in the North Pacific*.

It was agreed that the description of the roles and responsibilities of a proposed Section on Harmful Algal Blooms (to replace WG 15) need to be discussed by MEQ and presented to Science Board for consideration at PICES XII.

As this is the final year for Dr. Stein as MEQ Chairman, the Committee needs to discuss and nominate a new Chairman, for election at PICES XII.

Interest was expressed, particularly by Korea and China, in expanding PICES involvement in the science associated with North Pacific aquaculture issues. Participants at the meeting recognized that many of the issues associated with the role of aquaculture in marine ecosystems are currently shared or will be shared by all PICES member countries. This is an important issue with several aspects which are not addressed by PICES at present. This topic was discussed later in this meeting under Agenda Item 4.5.

As with FIS, MEQ expressed a strong interest in ecosystem-based management approaches. At least two options were considered: (1) a Working Group co-sponsored by more than one Scientific Committee (or possibly under Science Board), or (2) multiple Working Groups sponsored by individual committees which would each consider specific aspects of ecosystem-based management. Dr. Perry noted that this topic could potentially serve as the basis for a new Scientific Program in PICES. The PICES Chairman suggested that POC might also be interested in this issue. PICES Committees/Programs interested in ecosystem-based management were requested to discuss their interest and the potential format for such a Working Group among their committee members, and develop draft Terms of Reference prior to PICES XII. These suggestions would then be circulated for decision at PICES XII.

POC Committee

Dr. Michael G. Foreman presented the POC interim report on behalf of the POC Chairman, Dr. Kuh Kim (full POC report is included elsewhere in this Annual Report). The main points were related to preparations for PICES XII and suggested sessions for PICES XIII, and activities of Working Group 13 on *CO_2 in the North Pacific Ocean*, Working Group 17 on *Biogeochemical data integration and synthesis*, and the North Pacific Data Buoy Advisory Panel (NPDB-AP).

It was noted that the NPDB-AP needs a Co-Chairman from the western Pacific. As with the MBM-AP, the Technical Coordinator of the Panel was requested to contact Drs. Zhao (China), Huh (Korea), Shevchenko (Russia) and Ishida (Japan) to seek their help in identifying potential members for this Panel. Council members are requested to help support the participation of scientists nominated from their countries.

For the proposed PICES-CLIVAR workshop on "Scale interaction of climate and marine ecosystems" at PICES XIII, the POC Chairman (or Dr. Foreman) was requested to circulate the draft workshop description to the Chairmen of the other Committees and Programs to invite their co-sponsorship (this includes the CCCC Program and in particular the MONITOR Task Team). In addition, a PICES biologist, preferably from the western Pacific, is being sought to act as co-convenor of this workshop. Suggestions are invited from Committee Chairmen.

For the proposed session on " Application of global ocean observing systems to physics, fisheries and ecosystems" at PICES XIII, again the POC Chairman (or Dr. Foreman) was requested to circulate the draft session description to the Chairmen of the other Committees and Programs to invite their co-sponsorship.

TCODE

The TCODE Chairman, Dr. Igor Shevchenko, presented his Committee's interim report (full TCODE report is included elsewhere in this Annual Report). The main points were related to expanding the Bering Sea metadatabase to cover the North Pacific, updating the keywords for this metadatabase, preparations for PICES XII, and updates to the data inventory on the TCODE web page (http://tcode.tinro.ru/).

In the discussion that followed, it was noted that TCODE has done an excellent job with assembling a list of web links to databases for meteorological, oceanographic, and biological information in the North Pacific. It was recommended that member countries periodically check and update changes in these web links. Scientific Committees and the CCCC Program were requested to help TCODE in identifying keywords prior to PICES XII. The

TCODE Chairman will e-mail the other Committee and Program Chairmen with examples and a request for help.

TCODE was requested to verify the web links to the data sources, and to include links to the Argo Project as necessary. Scientific Committees and the CCCC Program were asked to check these links on the TCODE web page and to provide TCODE with suggestions for new links prior to PICES XII.

CCCC Program

The CCCC Co-Chairman and Chairman of NEXT (NEMURO Experimental Planning Team), Dr. Harold P. Batchelder, presented the report on NEXT (full CCCC and NEXT reports are included elsewhere in this Annual Report). A draft NEXT plan was developed by the Chairman and circulated to NEXT members in late January 2003. The draft was intended to be provocative (or controversial) so that NEXT members would react strongly in favour or in opposition, but in either case would react and respond to the plan. For whatever reasons, the initial responses were few, although those who did respond generally favoured most elements of the plan. Subsequently, the Chairman learned that some members of NEXT and other scientists that had read the plan had difficulties with some suggestions of the plan. Those scientists have agreed to provide specific written responses to the plan, and the Chairman is currently awaiting these more specific responses and suggestions for modifying the plan. NEXT will complete the task as outlined in the terms of reference prior to PICES XII. The NEXT recommendations will be forwarded to the CCCC Program for distribution to the Task Teams prior to PICES XII, and will be one of several considerations used in developing the CCCC Integration Plan.

Dr. Perry felt that NEXT is an initiative of the CCCC Program, which should report to the CCCC Executive Committee (CCCC-IP/EC). The Committee should then use these recommendations to build towards the integration of the CCCC Program. In the discussion, it was agreed that NEXT should report to the CCCC-IP/EC at PICES XII. A report on implementing the NEXT recommendations and program integration would then be presented at either the Science Board meeting during PICES XII, or at the next interim Science Board meeting.

The discussion following the presentation considered whether to have a major symposium on integrated/synthesized results of CCCC studies in spring 2005, or in spring 2006. The Executive Secretary noted that time was very short if the symposium would be held in spring 2005. Dr. Batchelder expressed a preference for having the meeting in spring 2006, but noted that he would solicit input on the timing of this meeting from CCCC-IP/EC members by correspondence, and respond to the PICES Secretariat with a recommendation.

The term of the CCCC Co-Chairman from the western Pacific is expiring and a new Co-Chairman must be identified at PICES XII.

Agenda Item 3. Updates on interactions with other organizations

Details on the interaction between PICES and relevant international organization and programs can be found in the Science Board Annual report and Report on Administration (*GC Endnote 3*) included elsewhere in this Annual Report.

Specific recommendations from the interim meeting are listed below:

- PICES should invite the Chairman of the NPAFC Committee on Scientific Research and Statistics to make a presentation on the status of salmon at the PICES North Pacific Ecosystem Status Report workshop in August 2003.
- PICES has a general interest in a symposium on the marine mortality of salmon in 2005/06, but would favour a minor role, letting NPAFC and NASCO develop the specifics and invite PICES to comment.
- The MEQ Chairman was requested to contact the appropriate ICES Working Group regarding a proposal to co-convene a workshop or topic session at PICES XIII on harmful bio-invasions. The MEQ Chairman was also asked to discuss with WG 15 the

potential for ICES participation in the workshop on "Harmful algal blooms - harmonization of data" at PICES XII.

- The PICES Secretariat was requested to send a letter to the ICES Secretariat inviting ICES to send representatives to participate in the sessions on "Ecosystem-based management science and its applications in the North Pacific" and on "Aquaculture in the ocean ecosystem" at PICES XII (in particular suggesting Dr. Stefan Gollasch for the latter).
- The BIO Chairman was requested to advise the Co-Chairmen of the Advisory Panel on *Micronekton sampling inter-calibration experiment* to re-assess the costs of their proposed experimental plan and re-submit the proposal to the North Pacific Research Board in fall 2003, and suggest potential alternative sources of funding.
- The PICES Secretariat was requested to explore the possibility of common interests that the Pacific Sciences Association and PICES may share with regard to PICES XIII activities.

Agenda Item 4. Implementation of PICES Review Committee Report

At PICES XI, Council endorsed the PICES (10 year) Review Committee Report and its recommendations. Discussion at the interim Science Board meeting focused on the implementation of this report.

Dr. George Boehlert noted the need to define principal areas of responsibility of Committees, and to show how these are linked to their Strategic Plans. Many problems are identified and it may be useful for PICES to investigate for ideas in other organizations.

Dr. Boehlert asked to what degree in the PICES Secretariat had attempted to make use of secondment in staffing. The Executive Secretary reported that this had been pursued with little success.

Mr. Qian-Fei Liu suggested that it would be valuable for PICES to review the progress in implementing the Review Committee report and to make adjustments on an annual basis. This is similar to the concept of having a Strategic Plan for PICES and knowing which proposed activities fit that plan.

Specific items from the Review Committee report were discussed:

Study Group on *PICES Capacity Building*

Dr. Batchelder presented a draft report of this group on behalf of the Chairman, Dr. Warren Wooster. The main recommendations included:

1. Develop fiscal resources for capacity building, including travel costs;
2. Develop a web-based compendium of training/education opportunities;
3. Enhance opportunities for both young and experienced scientists to participate in PICES activities;
4. Strengthen the commitment of PICES member nations to support PICES and to improve coordination of national involvement in PICES;
5. Develop methodology workshops to improve inter-comparability of methods and train analysts in accepted methods;
6. Establish a permanent Data Management Team to ensure compatibility of national and international data management efforts;
7. Establish a permanent interdisciplinary modeling group to synthesize and integrate available large data sets, determine gaps, and propose new studies;
8. Create a common working environment, including data, techniques, methods, software tools, mathematical models, computing power for sharing among all scientists involved.

Dr. Perry thanked the Study Group for their initial report. In the discussions that followed, SB asked the Study Group to consider the following:

- Identify what could be done with (1) "unlimited" funding; (2) with "limited" funding; and (3) with "no additional funding", e.g. having students participate in local PICES workshops. Which workshop/training topics would be recommended to occur first, which later? –

i.e. which potential workshop topics should be considered most important?

- Suggestions which establish "permanent" bodies, such as numbers 6 and 7, are less attractive;
- Suggestion number 3 implicitly includes numbers 1 and 2, and might be considered the highest priority. What does the Study Group recommend to implement these suggestions?
- What does the Study Group recommend to implement suggestion number 4?
- Suggestion number 8 is a subset of suggestion number 5. What does the Study Group recommend to implement these suggestions?

Other comments from the general discussion included:

- It would be useful to have training courses organized in Russia (*e.g.* data management for biologists);
- PICES needs to communicate, in particular with government officials, about what has been done and what will be done in the future to improve the authority and credibility of PICES. A 2-page glossy brochure may be helpful.
- PICES might consider developing books for graduate students from its various reports.
- Enhanced financial opportunities may be facilitated by improving the PICES web site.
- An expanded Intern Program which includes scientific interns, not simply administrative interns, might be valuable.
- It may be useful to request that member nations involve scientific program officers from their funding agencies at PICES Annual meetings.

The Study Group was requested to have their final report available to the Committees and Program by August 31, 2003. It will then be circulated to members of Standing Committees and the CCCC Program for discussion and recommendations to Science Board at PICES XII. In addition, Council members are asked to provide information on funding opportunities for capacity building within member nations to the Study Group, to be included in their report.

Vice-Chairman of Science Board

Dr. Perry recommended the establishment of the position of Science Board Vice-Chairman and proposed a set of rules for this position. This proposal was approved, and the Executive Secretary was requested to modify PICES regulations to identify this new position (for details see Agenda Item 15 in the Governing Council Report and Decision 03/A/6). In the discussion that followed, it was noted that a major role of the Vice-Chairman of Science Board is to assist with the co-ordination of the scientific activities of PICES.

Dr. Vladimir Radchenko was elected Vice-Chairman of Science Board by acclamation. His term will expire at the conclusion of PICES XIII.

Communication and PICES web site

The PICES web site is seriously out dated and in need of a major overhaul, but PICES Secretariat staff do not have the skills to do this task. There are three issues: immediate updating of material; on-going updating of material; and longer-term re-design of the web site. Science Board discussed how these might be accomplished, considering the limited resources available.

There was general agreement that this form of communication is extremely important, and should be a priority within PICES. Suggestions included appointing a member of the Secretariat to manage the web site; developing a template of the type of information to request from PICES Committees to put on the web site, but this detailed development and maintenance of a high-quality web site can be very expensive. One approach may be to contract a web designer to develop the basic site, which could then be maintained by Secretariat staff. It was recognized that the Secretariat cannot be responsible for determining what information goes onto the web site. As a communication issue, the CCCC Program would like the Secretariat to develop a *ListServ* system to improve distribution of their information.

The following actions were suggested:

- The Secretariat is requested to develop a plan (for discussion at PICES XII) to maintain the web site. This would include re-allocating duties of current employees and identifying what would happen to their present duties.
- Dr. Richard Marasco will identify what is required to develop 2 levels of web site design for PICES: a "top level" site, and a "basic level" site, and provide this to the Secretariat and Science Board.
- The Committees and Programs of PICES are requested to discuss and identify what information is necessary to include in the PICES web site, in particular from their Committee, and how this information should be provided to the web site (i.e. the "flow" of information from Committee to web page). Committee/Program responses should be provided to the Secretariat and Science Board by August 1, 2003, for circulation prior to PICES XII.
- Members of Science Board and Governing Council are requested to provide the Secretariat (within 2 months) with suggestions of the information that is necessary to present on the uppermost levels of the PICES web site.

"Vision" and coordination issues

The "PICES Strategic Plan" (prepared by Science Board in 1998) was discussed and compared with the recent ICES Strategic Plan. In particular, the PICES Plan was felt to be an operational or implementation plan, *i.e.* it describes the roles and responsibilities of the Committees, Programs, and "Officers" of PICES. It is mostly "backward-looking", in that it describes what has happened in the past and how the present activities derive from past activities. Furthermore, the existing PICES Plan must be updated annually, while the ICES Strategic Plan is more encompassing. The ICES Plan has an overall mission statement ("to advance the scientific capacity to give advice on human activities affecting, and affected by, marine ecosystems") and 10 goals which are divided into 5 sections, followed by 3 steps to implement these goals.

Participants at the meeting believed that PICES should have a forward-looking strategic plan/vision statement. Dr. Huh suggested that such a statement should not be restricted only to issues concerning the waters north of 30°N, since Korea and China, in particular, plus potentially other countries, are interested in processes occurring further south. Mr. Liu noted that for PICES to consider expanding its activities it should examine new funding opportunities with other organizations such as FAO. The geographical location of China and the budget limitations have restricted participation by Chinese scientists. Dr. Marasco expressed the desire to engage all of the contracting parties in the development of the PICES Strategic Plan.

Dr. Kobayashi noted that Dr. Huh raised an important issue. Contracting parties may have different expectations of the Organization, and that a committee similar to the previous Review Committee might help. Dr. Radchenko noted that there are big differences between ICES and PICES: the ICES plan emphasizes stability but the PICES Plan must consider future development. He suggested that strategic plans from each Standing Committee are required first, and then the Organization can work on implementing the plans. Dr. Zhao noted that different regions may have different scientific issues, and that Governing Council might concern itself with regional issues, whereas the Scientific Committees should deal with scientific disciplinary issues. Others suggested that the Science Board Strategic Plan provides a good starting point for a final PICES Strategic Plan, and also that some of the information for a PICES Strategic Plan was discussed in the PICES Review Committee report.

In the end, it was agreed that a Study Group on *PICES Strategic Issues* be formed under the direction of the Governing Council, to develop a Strategic Plan for the Organization (see Agenda Item 7 in the Governing Council Annual report for Terms of Reference and membership). It was suggested that the first draft report should be circulated in time to get feedback from Standing Committees at PICES XII. The final product is expected by the interim meeting in

2004, or PICES XIII if no interim meeting takes place.

Aquaculture in PICES

Consideration of aquaculture science within PICES was mentioned a number of times during the meeting. It was noted, in particular that at present, scientific issues associated with the development of aquaculture are discussed in different PICES Committees. There is considerable interest in this topic generally, especially in China and Korea, and the lack of a clear place for aquaculture within PICES is sometimes seen as a disadvantage in attracting participation from these member countries.

Dr. Laura Richards suggested that establishing a Working Group on *Scientific issues of aquaculture* might be a suitable means to focus and define scientific issues associated with aquaculture within PICES. Dr. Boehlert noted that PICES should consider both the science of production and the science of marine environment associated with aquaculture. Therefore, he suggested that such a Working Group might be considered jointly by MEQ and FIS. Dr. Ishida reported that FIS has not yet discussed this issue in detail, and noted that the existing recommendation of FIS to consider a Working Group on *Ecosystem-based management* may preclude an opportunity to create another Working Group under FIS. This problem may be resolved if the proposed working groups were co-sponsored by more than one Committee. Dr. Radchenko noted that BIO has some interest in the issue as well, and perhaps the topic is so broad that it should be considered as a Working Group under Science Board.

MEQ and FIS were requested to lead joint discussions about forming a Working Group on *Scientific issues of aquaculture* within PICES, with additional input from BIO. POC was asked to consider if they are also interested in co-sponsoring this Working Group. A report that includes the potential issues/questions that such a Working Group might address, and draft Terms of Reference, is to be provided to Science Board for consideration at PICES XII.

Agenda Item 5. North Pacific Ecosystem Status Report

Dr. Perry reviewed the progress to date (*SB-IM Endnote 3*). Dr. Ishida reported that Japan was invited to prepare draft chapters on the Kuroshio/Oyashio and western Subarctic Pacific, and will identify Chapter Lead Authors. Dr. Shevchenko reported that TINRO has material concerning this report for these regions. Contacts include Drs. Elena Dulepova, Yury Zuenko, and Igor Melnikov. Dr. Marasco noted that it may ultimately be desirable to separate the Bering Sea into eastern and western chapters. Dr. Kobayashi suggested that a clear process for publishing this document will be necessary and that Governing Council should approve the report. He also requested an Executive Summary of the whole report and a correction to a footnote concerning the name of the body of water between the Japanese archipelago and the Korean peninsula. Dr. Batchelder noted that it is desirable for time series data used to have the figures available in digital format, perhaps from the PICES web server. Dr. Kashiwai suggested that the NPESR could be considered part of a PICES/GOOS initiative. The output must meet expectations of users and be exciting products. All aspects of PICES activities could potentially be included in NPESR.

Agenda Item 6. Identifying future major PICES programs

Dr. Kashiwai reviewed the procedures agreed upon within PICES for the development of new major programs (SB-IM Endnote 4). General issues for discussion of such programs include whether they are single or multiple programs, and whether they can expect special funding.

Dr. Richards noted that some of the suggested procedures followed from earlier discussions, and that perhaps this discussion on the next major program(s) should wait until the report of the Study Group on *PICES Strategic Issues* has been completed. Dr. Boehlert suggested that the next major program should target all PICES member countries, and that more than one major program could occur concurrently.

It was agreed that:

- The report of the Study Group on *PICES Strategic Issues* should be developed prior to any extensive work on developing new PICES programs;
- PICES Scientific/Technical Committees and the CCCC Program should discuss what they see as possible new issues/topics for a major PICES program at PICES XII;
- The North Pacific Ecosystem Status Report can be expected to identify gaps in information and understanding in the North Pacific that might be good candidates for future major PICES programs.

Agenda Item 7. Global Ocean Observing System (GOOS) and PICES

The IOC Global Ocean Observing System (GOOS) is a permanent global system for observations, modelling and analysis of marine and ocean variables, to support operational ocean services worldwide. GOOS' objective is to provide descriptions of the present state of the oceans, including living resources; continuous forecasts of the future conditions of the sea for as far ahead as possible; and the basis for forecasts of climate change. GOOS sees ICES and PICES as important regional programs which will assist with the GOOS objectives. ICES already has an IOC-ICES Steering Group for GOOS (see http://www.ices.dk/iceswork/wgdetail.asp?wg=SGGOOS). They have expressed considerable interest in having PICES participate in developing activities related to the IOC-ICES GOOS program. ICES is developing pilot projects for GOOS in the North Sea and (probably) in the Gulf of Maine. This Steering Group has invited PICES to participate in their meeting in early April 2003, with the hope that pilot projects on GOOS might also be established in the Pacific. Present GOOS-related activities within PICES are conducted mostly by the MONITOR Task Team of the CCCC Program. In addition, there are at least 4 other programs that would make obvious candidates to put forward as Pacific contributions to GOOS, potentially with PICES involvement: NEAR-GOOS in the western Pacific; ACCEO in the California Current region; and CAOS (Coastal Alaska Observation System) and EVOS-GEM in the Gulf of Alaska. Of these, the EVOS-GEM program appears to be the most advanced and with a reasonable amount of money available for its implementation. Dr. Phillip Mundy of the EVOS-GEM program has been supported by PICES to participate in the 2003 ICES GOOS Steering Group meeting. The participants discussed whether the activities of MONITOR are sufficient at present, and if not, how PICES might develop more active participation, or a program, to support GOOS in the Pacific.

Participants were unclear of the specific plans of GOOS activities in the North Pacific, and in particular what it is that GOOS is expecting of PICES. Long-term observing systems in the Pacific are a strong interest of PICES - perhaps PICES could offer advice to GOOS regarding its implementation in the Pacific. In addition, PICES could provide the scientific rationale for the ecosystem observations (what, where, and how often).

It was recommended that the Science Board Chairman contact GOOS to ask for details of GOOS' plans for the North Pacific, and in particular what they are expecting of PICES. This might be followed up with an invitation to GOOS to make a detailed presentation at the MONITOR Workshop at PICES XII, and to the Science Board and Governing Council on the potential for GOOS-PICES interactions.

Agenda Item 8. Update on plans for PICES XII and XIII

Plans for PICES XII were reviewed, and allocation of funding for invited speakers was resolved.

It was also agreed that Topic Sessions and Workshops at PICES XIII (2004) need to be *finalized* rather than *developed* at PICES XII (2003) in Seoul, so Committees and Task Teams need to do their preparation before the meeting. Proposals must include a title, convenors, description, duration in days, and potential invited speakers. POC has proposed a session already and MEQ is planning a session on aquaculture but no details are available.

Agenda Item 9. Discussion of work plans leading up to PICES XII

The Executive Secretary presented summaries of the publication plans and meeting plans of the various PICES Committees and groups. All items listed as new (since PICES XI) were approved by Science Board and subsequently by Governing Council. In the case of the invitation from SOLAS to co-sponsor their session at the 2004 TOS/ASLO 2004 Ocean Research Conference, Science Board agreed to co-sponsor but could not guarantee supplemental funding at this time.

Dr. Ishida was requested to contact the Chairman of WG 16 to clarify if they plan to publish their report as a book, and if so to encourage then to develop the publication details soon.

Agenda Item 10. Any other business

A brief discussion was held on the appropriateness of an interim Science Board / Governing Council meeting in 2004. Consensus was that this meeting had been useful and that another meeting would be considered if the agenda items warranted it.

SB-IM Endnote 1

Participation List

Vera Alexander (Chairman, PICES)
Douglas Bancroft (Canada, advisor)
Harold P. Batchelder (Co-Chairman, CCCC-IP)
George Boehlert (U.S.A., national delegate)
Alexander Bychkov (Executive Secretary)
Michael G. Foreman (representative, POC)
Hyung-Tack Huh (Korea, alternate delegate)
Yukimasa Ishida (Chairman, FIS)
Makoto Kashiwai (Co-Chairman, CCCC-IP)
Tokimasa Kobayashi (Japan, national delegate)
Qian-Fei Liu (China, alternate delegate)
Richard J. Marasco (U.S.A., national delegate)
Stewart (Skip) M. McKinnell (Deputy Executive Secretary)
R. Ian Perry (Chairman, Science Board)
Sixi Qu (China, advisor)
Vladimir I. Radchenko (Chairman, BIO)
Laura Richards (Canada, national delegate)
Igor Shevchenko (Chairman, TCODE)
Jin Ping Zhao (China, Science Board member)

SB-IM Endnote 2

Science Board / Governing Council Interim Meeting Agenda

Monday, April 7

1. Welcome, introductions, logistical details, purpose of meeting
2. Updates from Scientific Committees and Programs
   - 2.1. BIO (Radchenko)
   - 2.2. FIS (Ishida)
   - 2.3. MEQ (Stein)
   - 2.4. POC (Foreman)
   - 2.5. TCODE (Shevchenko)
   - 2.6. CCCC (Batchelder, Kashiwai)
3. Updates on interactions with other organizations
   - 3.1. NPAFC
   - 3.2. ICES
   - 3.3. SCOR and IOC
   - 3.4. North Pacific Research Board
   - 3.5. UBC – Fisheries Centre
4. Implementation of PICES Review Committee Report
   - 4.1. General discussion
   - 4.2. Draft report of Study Group on *PICES Capacity Building* (Batchelder)
   - 4.3. Position of Science Board Vice-Chairman (Perry)
   - 4.4. Communication and PICES web site (Perry)
   - 4.5. Vision and co-ordination issues:
   - strategic plan / vision for PICES (to include issues of greater direction by Science Board) (led by Perry)

- strategic plan / vision for Scientific and Technical Committees (Committee Chairmen)
- co-ordination among Committees and Programs (led by Perry)

Tuesday, April 8

5. North Pacific Ecosystem Status Report (led by Perry)
6. Discussion of a process for identifying the major program(s) to follow the CCCC program (Kashiwai)
7. PICES efforts in support of GOOS in the Pacific (led by Perry)
8. Update on plans for PICES XII and PICES XIII (Perry, Bychkov)

Wednesday, April 9

9. Discussion of Workplans from now until PICES XII, including update on plans for publications and special meetings (All)
10. Any other business
11. Review of draft meeting report (Perry)

SB-IM Endnote 3

PICES North Pacific Ecosystem Status Report

At PICES IX (Hakodate, 2000), Governing Council created a Study Group on North Pacific Ecosystem Status Report and Regional Analysis Centers (RAC). The Study Group was to:

1. Devise a detailed outline for the first North Pacific Ecosystem Status Report;
2. Identify key contributors (individuals and organizations);
3. Identify existing data source for inclusion in the Report;
4. Examine the process and implications of how those data would be synthesized in the Report;
5. Estimate the production, printing, and distrbution costs of the document;
6. Examine the function, products, and positive and negative implications of RACs.

In Hakodate, the PICES Finance and Administration Committee identified the North Pacific Ecosystem Status Report (NPESR) as one of its high priority items for fund-raising. At PICES X (Victoria, 2001), the proposal from the Study Group to develop such an ecosystem status report was discussed, modified, and accepted by Science Board (chaired by Ms. Patricia Livingston). Science Board and Governing Council established a timetable for this activity: to have a pilot version of the report available for discussion by the end of 2002, and the first report available by the end of 2003.

Activities to date

A revised template was developed for the structure and content of the NPESR, which was circulated for discussion in 2002. Three approaches were developed to gather the information necessary for the report:

1. use existing published summaries where available, if possible written (or at least carefully edited) by regional experts;
2. for international regions where published summaries are not available, convene regional workshops with local experts to present summaries of the ecosystem components and to discuss general issues of ecosystem status;
3. for national regions where published summaries may not be widely available, encourage local experts to assemble and summarise those summaries that do exist, and/or convene a local workshop in which local experts could present and discuss views and ecosystem status.

The “Draft for Discussion” resulting from these approaches was circulated at PICES XI. Comments were mixed: some Committees were highly supportive, whereas others had concerns over who was to do the work and the lack of a synthesis chapter to provide comments. Governing Council had a thorough discussion, and raised concerns regarding the process for review of the report.

The National Marine Fisheries Service (NMFS, U.S.A.) and the Gulf of Alaska Ecosystem Monitoring and Research Program (GEM) of EVOS (Exxon Valdez Oil Spill Trustee Council, U.S.A.) contributed US $15,000 and US $10,000 respectively, to finance the development of the NPESR. In addition, PICES prepared and submitted a proposal for the Census of Marine Life (CoML) to support additional activities regarding what is known, unknown, and unknowable about marine life in the North Pacific, for which the information in the NPESR is a foundation. This CoML proposal was funded US $45,000, which is providing significant resources to the NPESR/CoML workshops and publication. At PICES XI, a Working Group was proposed and approved to produce the first report (due end of 2003). Details of this Working Group are:

Title: North Pacific Ecosystem Status Report, and Working Group under Science Board
Duration: November 2002 - January 2004
Terms of Reference:

1. Prepare the full North Pacific Ecosystem Status Report, for review at PICES XII in October 2003, and for completion in December 2003;
2. Prepare the report for the PICES - CoML project on "Marine life in the North Pacific Ocean: The known, unknown and unknowable";
3. Recommend mechanisms to facilitate the data management requirements of the North Pacific Ecosystem Status Report;
4. Recommend how to implement production of the North Pacific Ecosystem Status Report as a regular activity of PICES.

Membership includes: Dr. Ian Perry (Science Board Chairman), Chairmen of the Standing Scientific Committees and Program, invited experts, and Dr. Skip McKinnell (Deputy Executive Secretary).

Plans proposed for 2003 include:

- Activate the Working Group: Membership in this WG includes Science Board as an Editorial or Steering Board. In addition, it is proposed to invite "Chapter Lead Authors". These Chapter Lead Authors would be regional experts who would lead the writing of the Regional chapters.
- Regional workshops are planned for the Yellow Sea – East China Sea Region, and the Okhotsk Sea and adjacent seas. The first is titled "Workshop on "Variability and status of the Yellow Sea and East China Sea ecosystems" and is supported by PICES, KORDI and CoML. It will be held at KORDI in Ansan, Korea, on April 28-29, 2003. The 3rd PICES Workshop on Okhotsk Sea and adjacent areas, June 4-6, 2003, in Vladivostok, Russia will be the second NPESR regional workshop in 2003.
- June 2003 is the deadline proposed for the Chapter drafts to be submitted. An outline of a synthesis will then be prepared based on these chapters, and circulated among the WG in July. A Workshop is scheduled for August 25-27, 2003, at the PICES Secretariat, to which Science Board and all Chapter Lead Authors will be invited, to discuss and prepare the NPESR synthesis chapter, which will also be a major contribution to the CoML report. The draft NPESR (including the synthesis chapter) will be circulated for discussion in September 2003.
- A 2-day MONITOR workshop (co-sponsored by EVOS) to "Examine and critique a North Pacific Ecosystem Status Report" will be held just prior to PICES XII. This workshop will provide a formal review of the draft NPESR, and in particular, will discuss how to operationalise the preparation of the NPESR as an on-going activity of PICES.
- Discussions of this draft report will also take place during PICES XII, especially amongst the Committees, Science Board, and Governing Council.
- A second CoML workshop will be convened in November 2003, to prepare the final report to CoML.
- Publication of this first report is planned for the end of 2003.

SB Endnote 4

Process of identifying the major program(s) to follow the CCCC program

Process

Before considering the process of identifying the Scientific Program(s) to follow the CCCC Program, the Organization needs to agree on a design policy that includes the following issues:

- Will it be a 2nd phase of the existing CCCC Program or an entirely new program?
- Will it consist of a single program (with multiple umbrellas), or multiple programs (each with a single umbrella)?
- Will it be planned with or without special research funds, or as a response to a formal Request for Advice with cost sharing among the PICES member countries?
- Will it consider the output from CCCC Synthesis?

Governing Council must consider these elements of a design policy for the next PICES major scientific program.

A starting point of discussion on the procedure for development of a new PICES scientific program can be found in the *PICES Handbook for Chairmen and Convenors*, (Chapter A. Guidelines for Chairmen, Section VI. Scientific Programs), which states:

PICES has the responsibility to identify research priorities and problems pertaining to the area of interest, as well as appropriate methods for their solution. Coordinated research programs and related activities of common interest shall be undertaken through national efforts of the Contracting Parties. The following processes should be undertaken when developing a joint research project:

1. A Workshop should be undertaken to develop a Science Plan based on identified key scientific questions.
2. A Workshop should be undertaken to develop an Implementation Plan based on a scientific strategy that includes program management and a schedule for the program.

The agenda and participants of each workshop must be determined based on the requirements of each plan.

Science Plan

The scientific questions that form the Science Plan are critical for the success of the research program.

In the world, there are many things not elucidated, or yet to be elucidated. However, for many people, it is not clear what are unknown matters. If one can clearly point out what is not known, we can say that research has already started. Furthermore, when the unknown matter is captured clearly in the form of a problem, we can see that the way to the solution is already open. Questions that already take the form of problems can, in most cases, be solved. But, when we solve a problem on one subject, it does not always deepen our understanding on that subject. It is up to methodology to formulate the problem such that solution results in real deepening of our understandings. (Translation from Kenichi Shiragami, 1972)

Therefore, the Science Plan cannot be an assortment of unrelated scientific questions raised by individuals seeking a funding opportunity. The answer to these questions must give the best available scientific foundation for the decisions of member countries on urgent matters of marine policy for preventing global warming or for mediating resultant disaster caused by it. The Science Plan of a major research program of a science organization must give an updated reason of existence for the organization.

Science Board should have a set of criteria for prioritizing scientific plans, *e.g.*:

- Meet needs of member countries;
- Increase value of PICES activities in support of research;
- Strengthen support of cooperative programs of PICES;
- Provide opportunity for PICES initiatives;

- Attract the interest of excellent scientists;
- Contribute to better participation in PICES activities.

These criteria should be considered during the identification of scientific questions and the development of a scientific strategy.

The national interests of PICES member countries in marine sciences of the North Pacific are not identical because of their geographical position in the North Pacific, the relation to downstream/upstream influences of the major oceanographic features of the North Pacific, and the differences in marine policy of their governments. It is therefore natural and necessary for PICES, as an intergovernmental scientific organization, that major scientific programs planned and implemented by PICES, should meet the needs of its members. To ensure that this is achieved, at least three options can be considered:

- Approval by Governing Council of the Science Plan developed through a workshop under the initiative of Science Board;
- Composition of planning workshops based on national reports of requirements of the new scientific program from member countries;
- Development of the Science Plan based on the questions posed by member countries in the form of formal written requests for scientific advice.

The first option is a standard procedure for decision-making by PICES. However, when considering that the existing scientific questions of the CCCC Program can also be found among the discussion papers that led to the establishment of PICES, the identification of scientific questions to be addressed in the next major program should proceed on broadly based intra-national discussion among marine scientists in each member country. This first option does not necessarily lead to the successful implementation of the program.

The second option outlines the minimum requirement for better participation from all member countries in a new major PICES scientific program. If it can be assumed that the major research efforts in a new program are to be covered by the activities of the national programs funded by member countries, the existence of contributing national programs is a crucial pre-condition for establishing a new major PICES scientific program. Therefore, national reports from member countries describing their requirements for a new major scientific program of PICES are required to establish and fund the component national programs.

The third option is a very strong challenge for PICES because answering such scientific questions cannot be undertaken by scratching through existing information, but requires the creative scientific production with authorship of scientists or sponsorship of the organization. Thus, even if PICES does not evolve into a science funding organization, the Organization still needs its own research money to conduct its own research program. Raising funds from outside sources for its research program may result in the implementation of scientific programs that are also of interest to outside sponsors, as in the case of the North Pacific Ecosystem Status Report.

The most appropriate way for PICES to have funds for its own research programs is via this third option. This must be considered and challenged with perspective to develop the advisory function of the Organization.

The scientific questions must be prioritized so as to increase the value of PICES activities in support of marine research. Valuable characteristics of PICES activities in support of marine research can include:

- A multi-disciplinary approach in marine science;
- Basin-scale research coordination in northern North Pacific;
- Fisheries-oriented marine science integration;
- Membership of almost all the northern North Pacific rim countries;
- 10-years experience in the study of ecosystem dynamics,
- On-going long-term ecosystem monitoring stations (more than 5),

- Well-established cooperative relations with other international fisheries organizations in the area concerned; etc.

The Science Plan of a major research program must draw on the best use of these characteristics of the Organization and make best use of, and strengthen the support of, on-going and planned cooperative programs of the Organization, which include:

- Data exchange;
- CPR survey;
- PICES GOOS Programs;
- Iron Fertilizing Experiments;
- North Pacific Ecosystem Status Report; and
- Capacity Building Program.

The scientific scope of a new scientific program must reflect the scientific strategy of PICES, appearing in the Strategic Plan of Science Board, that can provide opportunity for PICES initiatives, which may include:

- Human dimensions;
- Ecosystem approach in resources management; and
- Marine birds and mammals.

In principle, a scientific organization consists of scientists who are led by excellent scientists. Therefore, it is crucially important for the success of a Program to keep attracting excellent scientists and to have their commitment as leaders. This situation cannot be realized without a formulated set of excellent scientific questions addressed by the Program. For the Program to be able to contribute to better participation, the scientific questions addressed by the Program need to include leading questions within the scientific scope of Scientific Committees.

We can receive potential key scientific questions with description of background, needs and seeds, from the following sources:

- PICES National Delegates with national scientific interests, concerning what scientists are requested to answer by taxpayers and decision-makers;
- Scientific Committees and their substructures;
- Remaining or new questions arising from CCCC Program synthesis
- Presentations by individual scientists at scientific sessions and workshops during the Annual Meeting, or recommendations arising from Symposia or Topic Sessions.

The structuring and prioritizing of scientific questions is the most important component of a Science Plan that can be identified as a part of the Scientific Strategy. It is tightly connected with the sub-structuring of the Program Implementation Panel. Thus, when selecting categorical items for the structuring of scientific questions, we need to select categories that are also appropriate for establishing the sub-structure of the Program Implementation Panel. In CCCC these were grouped as:

- Development of methods (*e.g.* MODEL Task Team);
- Comparative studies among national/local programs (*e.g.* REX Task Team);
- Multi-national collaboration on specific fields (*e.g.* BASS Task Team);

Others include:

- Scientific initiatives on frontier area (*e.g.* human dimension-oriented);
- Specific umbrella program-oriented (*e.g.* atmospheric transport of iron dust);
- Specific disciplinary-oriented (*e.g.* sub-arctic/sub-tropic gyre interaction); etc.

The role of model development in the CCCC Program is not only for hypotheses testing but also for sensitivity studies to identify important ecosystem processes. The most important ecosystem process is the eco-physiological response of key species to the full range of environmental variability that they will experience in the future. It means that intense laboratory rearing studies and/or special field incubation experiments are needed, as are currently being performed by China GLOBEC. These process studies are key to constructing a Mechanistic Model, by which the CCCC Program is intending to overcome the limitations of superficial empirical correlation, and to obtain predictive power beyond regime shifts.

There have been many activities of PICES Scientific Committees in support of the CCCC Program implementation. The activity and results of the Working Group on *Marine Birds and Mammals* is one of the examples. CCCC/IP needs to make an effort to incorporate marine birds and mammals into North Pacific ecosystem models, and to identify hypotheses relating to the role of marine birds and mammals in the response of North Pacific ecosystem to climate change. CCCC/IP should encourage scientists on marine birds and mammals to identify key questions and to join in the practical program implementation.

Comparative study is an efficient approach to identify the specific characteristics of the object concerned. Thus, comparative studies are listed as an important task in many international or inter-program coordinating plans. In the CCCC Program, the REX Task Team is responsible for the comparative studies among North Pacific ecosystems. However, a comparative study cannot be performed by mere exchange and comparison of outputs from separate research projects on the subjects to be compared. It needs specific scientific questions, data from common tools and protocols, common base models, and common methods of analyses.

One of the key words for the next generation of the CCCC Program may be human dimensions. The Earth system is characterized as **the Planet of Water** among the other planets of the solar system, and the existence of the human race, that has been causing the change in greenhouse gases and global warming. Thus, it is reasonable that, for the study of global climate change, we need to include human dimensions into the Earth system. What does it mean to incorporate human dimensions into the CCCC Program? In the case of science in general, to incorporate human dimensions may mean the amalgamation of natural sciences and social sciences.

Bearing in mind the distance between, for example, biological oceanography and chemical oceanography, the distance between marine sciences and social sciences seems far beyond feasible amalgamation. Thus, at present, for PICES as a marine science organization, to incorporate social sciences will be far beyond its scientific scope. Furthermore, we cannot see the effort of constructing a human society model, while we are struggling to construct a North Pacific marine ecosystem model. A possible challenge can be the incorporation of fisheries as a component into ecosystem models.

The first challenge, associated with incorporating fisheries into an ecosystem model, is to have a system composed of components each having its own goal function to be optimized, *i.e.* shift from a mechanistic model, like an automated factory system, to an animistic model, composed of relatively independent elements with capricious interactions among them. The second challenge is to compose an ecosystem model from components having inner system dynamics that exhibit plasticity in the life cycle. Intensive biology-oriented process studies will be needed for this approach.

For the successful implementation of the next generation CCCC Program, the enhancement of scientific creativity of PICES has crucial importance. Difficulties experienced in the CCCC Program implementation, that limited scientific creativity and efficient program progress, are:

- National scientific programs do not necessarily include scientific questions on basin-scales or questions requiring comparative studies, and therefore have no funding for them;
- The CCCC Program lacks dedicated research funds except for workshops or symposia, and national programs or member countries have no funds that can be transferred to the CCCC Program;
- The contribution by scientists to the CCCC Program is, in many cases, neither authorized nor encouraged by their employer.
- PICES is an inter-governmental organization that focuses on equality among member countries rather than on performance or scientific excellence, and thus the chairmanship of the implementation structure is limited to three-year terms and leaders are not eligible for re-election. This

makes it difficult to keep excellent leading scientists in key posts of the Program.

In order to overcome these difficulties, it is necessary to have strong support for the next generation CCCC Program from member countries, including high priority for the funding of CCCC contributing programs, promotion of the program by allocating transferable funds, or catering to member countries' request of advice on a specific scientific question to be addressed to the Program. At the same time, PICES needs to change its calling card from "*Inexpensive Organization*" to "*Creative Organization*" instead, and to change operational practices to fit it.

Implementation Plan

The major components of the Implementation Plan, and thus the agenda of the workshop to develop the Implementation Plan, will be:

- Establishment of an Implementation Panel;
- Action plan as an organized set of workplans for sub-structure of the Implementation Panel;
- Cooperation with other international Programs;
- Relation to international umbrella Programs; and
- Time schedule that recognizes program phases.

In the first stages of the CCCC Program, the sub-structure of the Implementation Panel was established as Task Teams, after developing an Implementation Plan, and along with separately determined terms of reference for each Task Team. Thus, the first stages of the CCCC Program lacked an organized workplan among the Task Teams, and the Implementation Plan lacked an organized research plan. Therefore, any workshop to develop an Implementation Plan must deal first with the establishment of sub-structures of its Implementation Panel. The core of the Implementation Plan must be a set of research plans to answer scientific questions given to the sub-structure of the Implementation Panel, and thus becomes the major agenda of the workshop to develop the Implementation Plan.

The CCCC Program is using models as a tool of program integration. The MODEL Task Team found it necessary to create a basic model for comparative studies and hypotheses testing, and has developed a basic lower trophic level ecosystem model, NEMURO, through a series of intensive practical workshops. The program code, parameter values and forcing factor dataset for typical stations, are open for use by the scientific community on the NEMURO Website.

This model is one of the major achievements of the CCCC Program and is evolving to include higher trophic level models, and to be embedded into a 3-dimensional ocean circulation model. The family of NEMURO models is expected to be the major tool in the CCCC Integration Plan. For this family of NEMURO models to be a community tool for ecosystem studies, there must be consistency among models of different ranks, *i.e*. among box models, 1-D models, 2-D models and 3-D models. This could not be achieved during the first stage of the CCCC Program.

Among marine biologists and even among ecosystem modelers, there is recognition that ecosystem models are special tools for ecosystem modelers only. This is the largest obstacle for models to be the core of program integration. There must be a protocol for biologists to use a sophisticated ecosystem model as scientific equipment, like a sophisticated chemical analyzer that a biologist cannot construct or repair. This will make it possible for a model-familiar biologist to be a good program synthesizer, while an ecosystem modeler cannot always be a good program coordinator.

Dr. George Hunt (University of California, Irvine) is proposing a Research Plan: *Ecosystem Studies of Sub-Arctic Seas Program*, including the Bering Sea, the Barents Sea, the Newfoundland/Labrador Shelf, the Sea of Okhotsk and the Oyashio shelf region, *i.e.* seasonally ice-covered, sub-arctic seas thought to be sensitive to decadal-scale and secular changes in climate. This proposal includes an important part of the PICES region and also encompasses PICES plans for comparative

studies between ICES-CCC and PICES-CCCC Programs. We need to discuss and decide how to consider this proposal.

Judging from the sequence of discussion that led to the foundation of PICES, it is quite natural and reasonable that PICES initiated its first research program as one of the regional programs of GLOBEC. The scientific question on dynamic response of the North Pacific ecosystems to large scale climate variability, is nothing but the scientific concern that pushed member countries to establish PICES, and is also the central question of GLOBEC.

However, GLOBEC is one of the international research programs dealing with the response of the ocean to climate changes. Each of these programs has its own focal questions based upon a specific discipline. Thus the choice of GLOBEC as an umbrella automatically confined the scientific scope of the CCCC Program within that of GLOBEC, which does not necessarily have a direct focus on the response of ocean circulation to climate variability of the atmosphere, or on the response of chemical cycling to the climate variability. Therefore, although the Key Scientific Questions of the CCCC Science Plan can be interpreted as including questions on physical oceanography or chemical oceanography, the CCCC Program has been failing to attract scientists from the Physical Oceanography and Climate Committee and the Marine Environmental Quality Committee.

As a consequence, the CCCC Program lacked scientific questions and hypotheses from the point of view of physical oceanography; *e.g.* "How do the interannual or decadal changes in winter monsoon over the Subarctic Pacific affect the strength and distribution of upwelling velocity?", "How does it change the productivity, geographical extent, and seasonal cycle of subdivisions of Subarctic Pacific ecosystems?", and "How do the interannual or decadal changes in winter monsoon over the North Pacific affect the circulation and inter-gyre water-mass exchange?" We must note that the next stage of the CCCC Program may not need to limit its umbrella only to GLOBEC.

Finally, the Implementation Plan of the first stage of the CCCC Program failed to indicate the total duration of the program and the need for revision of the time schedule. I hope this article can ignite your inspiration for a new PICES scientific program.

REPORT OF SCIENCE BOARD

The Science Board met on October 12, 2003 (13:00-14:30), to review the agenda and discuss initial items relating to the coming PICES scientific sessions. Science Board met again on October 17 (08:30-18:00) to deal with the remainder of the agenda, including items with financial implications for 2004 and beyond. Dr. Stewart M. (Skip) McKinnell served as rapporteur for both meetings. (See *SB Endnote 1* for list of participants).

October 12, 2003

The Science Board Chairman, Dr. Ian Perry, welcomed members and called the meeting to order. The agenda was discussed and adopted as presented, with the addition of an item under "Other business" pertaining to a recent request for scientific advice received from the United States (*SB Endnote 2*).

Best Presentation Awards and Closing Session (Agenda Item 3)

Dr. Perry reviewed the criteria for Best Presentation Awards and the procedure for the Closing Session, based on the procedures adopted for PICES X. It was restated that young scientists should be the recipients of all but the Science Board Award. At PICES XII, Committee Chairmen, with the help of the Secretariat, identified potential "young scientists" (younger than 35 years). Science Board decided on a revised procedure to determine the Best Poster Award. Each Committee would nominate one member to serve on a Poster Award Committee, which would provide Science Board with the name of the winning poster. For PICES XII, the Poster Award Committee consisted of Drs. Susan E. Allen, Richard D. Brodeur, Jeffrey M. Napp, Elizabeth A. Logerwell, David L. Mackas and Dong-Beom Yang.

Science Board noted the difficulties in determining young scientists for Best Presentation Awards, and therefore recommends that the Secretariat include a checkbox on the Registration Form to help identify scientists under 35 years of age (*e.g.*, "If you wish to be eligible for presentation awards, and the work is primarily yours, and you are less than 35 years of age, and you are the presenter, please check this box").

It was reiterated that the Closing Session would consist of Best Presentation Awards, a brief review of highlights from PICES XII, and a look towards PICES activities in the coming year, including the theme and possible Topic Sessions for the upcoming Annual Meeting, and a few final words of thanks from the PICES Chairman. Committee Chairmen were reminded to provide a list of Topic Sessions approved by their Committee to the Science Board Chairman before the Closing Session.

Procedures to enhance documentation of PICES scientific sessions (Agenda Item 4)

The procedure to enhance the documentation of PICES scientific sessions was discussed, following the recommendations of last year's Science Board report (*SB Endnote 3*). Science Board members agreed to be responsible for relevant sessions and to ensure that session convenors completed their descriptions prior to the conclusion of PICES XII.

Governing Council decisions and Science Board recommendations from PICES XI (Agenda Item 5)

Science Board reviewed and accepted the status report on decisions and recommendations from PICES XI, which were of relevance to Science Board (*SB Endnote 4*).

October 17, 2002

Dr. Perry opened the second Science Board meeting, and welcomed the participation of Dr.

Suam Kim, the CCCC Co-Chairman elect. Science Board extended thanks to the outgoing CCCC-IP Co-Chairman, Dr. Makoto Kashiwai, for his much appreciated service to PICES. A certificate was presented to Dr. Kashiwai at the Closing Session of PICES XII in recognition of his long and outstanding service.

Reports of Committees and Programs under Science Board, and items with financial implications for 2004 and beyond (Agenda Item 6)

Science Board discussed reports from its Committees and Programs. The following membership changes, new subsidiary groups, inter-sessional meetings, publications, travel support requests, and related items were endorsed by Science Board and forwarded to Governing Council for approval.

Membership changes (Agenda Item 6a)

Science Board notes the following membership changes:

BIO: Hidehiro Kato replaces Atsushi Tsuda as Japanese member

FIS: Elizabeth A. Logerwell replaces Anne B. Hollowed as US member

MEQ: Joan Kean-Howie replaces Steve Samis as Canadian member

Science Board recommends the following Chairmanship changes:

BIO/MBM-AP: William J. Sydeman (U.S.A.) to replace Douglas F. Bertram (Canada)

MEQ: John E. Stein (U.S.A.) to extend term for 1 additional year (to October 2004)

CCCC-IP: Suam Kim (Korea) to replace Makoto Kashiwai (Japan)

CCCC/BASS: Kerim Aydin (U.S.A.) to replace Gordon A. McFarlane (Canada)

CCCC/MONITOR: Phillip Mundy (U.S.A.) to replace David L Mackas (Canada)

CCCC/REX: Douglas E. Hay (Canada) to replace William T. Peterson (U.S.A.).

Science Board recommends that all membership lists be confirmed prior to each Annual Meeting and be included as Appendices in the Annual Report. This will help maintain a historical record of Committee membership, and may help to improve participation.

In addition, Science Board advises Governing Council that a large turnover of Science Board members is scheduled for 2004 (6 of 8 Chairmen).

Existing and proposed new subsidiary bodies (Agenda Item 6b)

Science Board recommends that:

- WG 14 on *Effective sampling of micronekton* continue its activities and produce a final report in 2004;
- WG 15 on *Ecology of harmful algal blooms in the North Pacific* be disbanded (see recommendation on the HAB Section below);
- WG 16 on *Climate change, shifts in fish production and fisheries management* continue its activities and produce a final report in 2004.

The following are recommended by Science Board as new subsidiary bodies:

Science Board discussed the joint proposal from FIS and MEQ for a Working Group on ecosystem-based management (*MEQ Endnote 5*). After discussion, it concluded that the proposal, as presented, was not sufficiently focused to allow Science Board to recommend establishing a Working Group. However, recognizing the potential importance of the topic, Science Board recommended establishing a Study Group on *Ecosystem-based management science and its application to the North Pacific*, jointly under FIS and MEQ. The Terms of Reference for this Study Group are described in *SB Endnote 5*.

Science Board discussed the joint proposal from MEQ and FIS to form a Working Group on marine aquaculture (*MEQ Endnote 6*). After some modifications to the proposed Terms of Reference, Science Board recommended the formation of a Working Group on *Mariculture in the 21st century – The intersection between ecology, socio-economics and production*,

jointly under MEQ and FIS. The Terms of Reference are provided in *SB Endnote 6*.

Science Board discussed the proposal from MEQ to form a Section under MEQ on harmful algal blooms (*MEQ Endnote 4*), and recommended that a Section on *Harmful algal blooms and their impacts* be formed with the Terms of Reference described in *SB Endnote 7*. This also implies that WG 15 on *Ecology of harmful algal blooms in the North Pacific* will be disbanded.

The CCCC-IP Executive Committee proposed that the BASS and REX Task Teams be concluded in 2004, culminating with a joint workshop on "Linking open ocean and coastal ecosystems II" at PICES XIII. A new Task Team would then be formed with new Terms of Reference and membership to conduct the combined work of the former BASS and REX Task Teams. The name of this new Task Team is proposed to be "**C**limate **F**orcing **a**nd **M**arine **E**cosystem Response" (CFAME). Science Board is in general agreement with this suggestion, and recommends that CCCC-IP discuss this issue and report to Science Board with a proposal, possibly at the 2nd interim Science Board meeting in spring 2004. Implementation of this recommendation would then take place at PICES XIII.

In addition, the CCCC-IP Executive Committee proposed that the MONITOR Task Team be removed from the CCCC Program and elevated to a Technical Committee, similar to TCODE. The justification is that the function of MONITOR extends beyond the duration of the CCCC Program. MONITOR has assumed the primary responsibility of the evaluation (and perhaps future versions) of the North Pacific Ecosystem Status Report, as well as providing guidance for present and future monitoring programs in the North Pacific. Should this recommendation be approved, it is suggested that each scientific committee (BIO, FIS, MEQ, POC) the other Technical Committee (TCODE) and each scientific program (CCCC) designate one official representative to the new MONITOR Technical Committee. Science Board noted that this change would be cost neutral, except for an additional member added to Science Board. Science Board recommended this change to Governing Council, and if accepted, that revised Terms of Reference and membership be developed for discussion by Science Board, possibly at the 2nd interim Science Board Meeting.

Proposed sessions and workshops for PICES XIII (Agenda Item 6c)

Proposals for scientific sessions and workshops at PICES XIII were discussed, and are presented below under Agenda Item 7 (PICES XIII Annual Meeting).

Inter-sessional workshops, Working Group and CCCC Program meetings (Agenda Item 6d)

Meetings to be convened in 2003 and 2004:

- A PICES/CoML *Regional marine life expert* workshop, November 17-19, 2003, Victoria, Canada;
- A PICES/PaCOS/AOOS/GEM workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific", November 20-22, 2003, Victoria, Canada;
- A IOCCP/PICES workshop on "Ocean surface $p(CO_2)$, data integration and database development", January 14-17, 2004, Tsukuba, Japan (POC/WG 17);
- A PICES-IFEP workshop on "*In situ* iron enrichment experiments in the eastern and western subarctic Pacific", February 11-13, 2004, Victoria, Canada (approved in 2002);
- A Canada-SOLAS/PICES-IFEP Session on "Response of the upper ocean to mesoscale iron enrichment" at the TOS/ASLO 2004 Ocean Research Conference, February 15-20, Honolulu, U.S.A. (BIO);
- A SCOR/IOC/PICES/GLOBEC Symposium on "Quantitative ecosystem indicators for fisheries management", March 31-April 3, 2004, Paris, France (approved in 2002);
- A NOAA/GCP/PICES workshop on "Understanding North Pacific carbon-cycle change: Data synthesis and modeling", June 2004, Seattle, U.S.A. (POC/WG 17);
- Co-sponsor a NEAR-GOOS Workshop in conjunction with the 6th WESTPAC

Symposium, April 19-23, 2004, Hangzhou, China (POC, MONITOR);

- A MODEL workshop on "The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific" (partial funding from Japan Fisheries Research Agency), August 2004, Seattle, U.S.A. Purpose is to document and distribute the NEMURO model code, and to edit *Ecological Modeling* manuscripts;
- A PICES/NOAA workshop to discuss issues relating to the request for advice to PICES from the United States, June 2004, likely in U.S.A. (see Agenda Item 15).

Proposals for beyond 2004:

- Co-sponsor with GLOBEC a symposium on "Climate variability and sub-Arctic marine ecosystems", spring 2005, Victoria, Canada (tentatively). Science Board recommends at minimal costs to PICES.
- A CREAMS/PICES workshop on "Japan/East Sea circulation: What we know and how well can we forecast?", summer 2005, near Vladivostok, Russia (POC). Purpose is to develop closer links between models and observations in this region, to assess available models, and to provide training.
- Co-sponsor with NPAFC a Symposium on "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems", fall 2005, Korea (FIS). NPAFC is expected to be the lead organization. Science Board recommends that a Steering Committee be formed including the Chairmen of NPAFC/CSRS and PICES Science Board, plus additional members drawn from relevant Committees (*SB Endnote 8*). Travel costs and possibly shared facility costs are expected.
- Co-convene a theme session on "Fisheries, ecology and life history of small pelagic fish" (note the focus is on cold-water pelagics rather than sardine and anchovy) at the ICES Annual Science Conference in September 2005, Aberdeen, Scotland. Dr. Douglas E. Hay is suggested as the PICES co-convenor.
- Co-sponsor with ICES a symposium on "Marine bioinvasions", proposed for spring 2006, likely on the east coast of the United States (*SB Endnote 9*). ICES is expected to take the lead. Science Board believes this is an important global issue which would benefit from collaboration with ICES (MEQ).
- A 3-day symposium on CCCC Synthesis April 2006, Honolulu, U.S.A.
- Co-sponsor a 4th International Zooplankton Production Symposium, spring 2007, Hiroshima, Japan (likely with GLOBEC and ICES) (BIO).

Proposed publications (Agenda Item 6e)

PICES Scientific Report Series, 2004:

- Report for the Census of Marine Life on "Marine life in the North Pacific Ocean: The known, unknown and unknowable";
- Report from the MONITOR workshop on "Examine and critique a North Pacific Ecosystem Report";
- Final report of WG 14 on *Effective sampling of micronekton*;
- Proceedings of the 3rd PICES workshop on "Okhotsk Sea and adjacent areas";
- Guide of best practices for oceanic CO_2 measurements and data reporting (WG 17);
- Reports from the 2004 IFEP workshop.

PICES Scientific Report Series, 2005:

- Final report of WG 16 on *Climate change and fisheries management.*

Special issues of primary journals in 2004 and beyond:

- *Journal of Oceanography* - invited papers on JGOFS North Pacific synthesis (jointly with JGOFS);
- *Journal of Marine Systems* - selected papers from the 2002 BIO/POC/FIS Topic Session on "The importance of biophysical coupling in concentrating marine organisms around shallow topographic";
- *Progress in Oceanography* - selected papers from the PICES/CREAMS Workshop on "Recent progress in studies of physical processes and impact to the Japan/East Sea ecosystem";

- *ICES Journal of Marine Research* - selected papers from the ICES/PICES/GLOBEC Zooplankton Production Symposium on "Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans";
- *Ecological Modelling* (2005) – selected papers on NEMURO and NEMURO.FISH models.

Other:
- North Pacific Ecosystem Status Report;
- Book on *History of PICES*.

Travel support requests (Agenda Item 6f)

PICES XIII:
- Science Board: approximately $5,000 per Committee and the CCCC Program for invited speakers at PICES XIII.
  In addition:
  POC: 2 invited speakers to the PICES/CLIVAR workshop;
  CCCC: 2 invited speakers to the workshop on "Linking open ocean and coastal ecosystems II" (high priority);
  CCCC: 2 invited speakers to the CCCC Topic Session on "The impacts of large-scale climate change on North Pacific marine ecosystem" (high priority).

Inter-sessional meetings:
- Science Board: 1 invited PICES speaker to the symposium on "Quantitative ecosystem indicators for fisheries management", April 2004 (high priority);
- POC: 2 scientists to participate in the joint IOCCP/PICES workshop on "Ocean surface $p(CO_2)$ database and data integration", January 2004, Tsukuba, Japan;
- POC: 1 scientist to participate in the joint NOAA/GCP/PICES workshop on "Understanding North Pacific carbon cycle change: Data synthesis and modeling", June 2004, Seattle, U.S.A.;
- CCCC: MONITOR Co-Chairman to represent PICES at POGO-5, November 18-20, 2003, Tokyo, Japan (no cost to PICES);
- CCCC: 1 scientist to attend the MODEL Workshop on "The development of a model on coupled responses of lower and higher trophic levels for climate variability in the North Pacific", August 2004, Seattle, U.S.A. (some funding support may be available from APN proposal if it is successful);
- CCCC: Co-Chairmen of CCCC-IP to participate in the 2nd interim Science Board meeting, spring of 2004;
- POC: 2 scientists to participate in the CREAMS/PICES workshop on "Japan/East Sea circulation: What we know and how well can we forecast?", summer 2005, near Vladivostok, Russia.

- Trust Fund travel requests:
  BIO: 1 Russian scientist to attend the MBM-AP workshop on "Combining data sets on diets of marine birds and mammals II" at PICES XIII, to alleviate concerns about a lack of Russian participation;
  MEQ: 1 Russian and 1 Chinese scientist to attend the workshop on "Developing a North Pacific HAB data resource II" at PICES XIII, to build capacity for HAB reporting in these countries;
  TCODE: 1 Russian scientist to participate in the meeting of the ICES Study Group on "Development of Marine Data Exchange Systems using XML", May 2004, Oostende, Belgium.

- Science Board Chairman requests funding to attend:
  - Symposium on "Quantitative ecosystem indicators for fisheries management", March 31-April 3, 2004, Paris, France;
  - 2nd interim Science Board Meeting;
  - ICES Annual Science Conference, September 2004, Vigo, Spain;
  - PICES Thirteenth Annual Meeting, October 14-24, 2004, Honolulu, U.S.A.

Science Board reviewed the above requests and suggested the following criteria be used by the Science Board Chairman to assist in prioritizing the requests:
- Consider whether the proposed activity will contribute to the strategic plans of PICES;
- Balance travel support requests among PICES Committees and Programs; and

- Use PICES funds to bring people to PICES rather than for sending them to other meetings.

Other items with financial implications (Agenda Item 6g)

Science Board wishes to draw the attention of Governing Council to two items:

- BIO Advisory Panel on *Micronekton sampling gear intercalibration experiment* is planning two experiments (cruises in 2004 and 2005); funds to be requested from the North Pacific Research Board;
- CCCC/MODEL has submitted a grant proposal to the Asia Pacific Network. One component of this proposal is a training workshop prior to PICES XIII. This includes a commitment from PICES to support travel of 2 Canadian scientists to this workshop (if APN grant approved).

High priority projects (Agenda Item 6h)
No such projects were discussed.

Relations with other organizations and programs (Agenda Item 6i)

The Standing List of International Organizations and Programs facilitates PICES interactions with other programs and indicates high priority organizations/programs to whose meetings PICES should regularly send a representative (See *SB Endnote 10* for the revised list).

PICES Committees and Programs identified the following organizations/programs as having the highest priority:

BIO: ICES/WGZE, GLOBEC, GOOS, IWC
MEQ: ICES, AMAP, SCOR/GEOHAB, APEC/MRC
FIS: AFS/CAR, IPCC, ICES, NPAFC, GLOBEC/SPACC
POC: CLIVAR, Argo, CREAMS, WESTPAC, NEAR-GOOS, JGOFS, GOOS, GCOS, WMO/DBCP;
CCCC: GLOBEC, GOOS, NEAR-GOOS, GEM, SAHFOS, CoML, ICES-GLOBEC, NPAFC, IATTC, IPHC, IGBP/OCEANS, NPRB;
TCODE: GLOBEC, GOOS, JGOFS

PICES has worked hard over the past year to establish stronger relationships with ICES, SCOR, IOC, IGBP, NPAFC and GOOS. These efforts are beginning to result in closer collaborations with a number of these organizations.

Science Board recommends that Dr. Hidehiro Kato be appointed as the PICES observer to the International Whaling Commission meetings.

Additional proposed recommendations (Agenda item 6j)

- POC noted the difficulties that the North Pacific Data Buoy Advisory Panel is having with participation, in particular from Asia. An Asian Co-Chairman might help, and is urgently needed. Science Board requests Governing Council's help in finding an appropriate Co-Chairman.
- Plans are being developed for CREAMS III, this time to include biological activities. CREAMS requests PICES help with organizing this program (*e.g.*, a western PaCOS project). A proposal is to be developed and presented at the 2nd interim Science Board meeting.
- Science Board invites NPAFC to regularly present information on the state of Pacific salmon to PICES. Such information could be presented to FIS or MONITOR, and be a contribution to the North Pacific Ecosystem Status Report.

Documentation of PICES science (Agenda Item 6k)

Summaries of the sessions and workshops held at PICES XIII are included elsewhere in this Annual Report.

Other items (Agenda Item 6l)

Science Board agrees with the BIO and CCCC recommendation to support the initiative for a workshop to "To identify global synchrony in fluctuations of zooplankton populations" (*SB Endnote 11*).

Science Board agrees with MEQ that IOC/ICES should be invited to co-sponsor the workshop on "Developing a North Pacific HAB data resource II" and the Topic Session on "Natural and anthropogenic introduction of marine species" at PICES XIII. Science Board also supports the proposal from POC that the International Ocean Carbon Coordinated Project (under IOC and SCOR) be invited to co-sponsor the Topic Session on "Impacts of climate change on the carbon cycle in the North Pacific".

PICES Thirteenth Annual Meeting (Agenda Item 7)

The following list of sessions and workshops to be convened at (or in conjunction with) PICES XIII was endorsed:

Science Board Symposium ($^3/_4$ day)
Beyond the continental slope - complexity and variability in the open North Pacific Ocean (SB Endnote 12)

MEQ Workshop (1 day)
Developing a North Pacific HAB data resource - Phase II (MEQ Endnote 9)

CCCC Workshop (2 days)
Linking open ocean and coastal ecosystems II (BASS Endnote 4)

CCCC/REX Workshop (1 day)
Seasonal cycles of plankton and nutrients around the North Pacific Rim (REX Endnote 3)

CCCC/MODEL Workshop (4 days)
This is a proposal to APN for "International workshop on climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food webs and implications for marine fish production in the North Pacific Ocean and marginal seas". Funding should be known by April 2004.

CCCC/MODEL Workshop (1 day)
This workshop will prepare a strategy and products for future NEMURO and NEMURO.FISH training sessions. If the APN proposal is successful, this workshop will not be necessary.

MBM-AP Workshop (1 day)
Combining data sets on diets of marine birds and mammals - Phase II (MBM-AP Endnote 4)

PICES/CLIVAR Workshop (2 days)
Scale interactions of climate and marine ecosystems (POC Endnote 5)

BIO contributed papers (½ day)

BIO Topic Session (1 day)
Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else? (BIO Endnote 6)

BIO Topic Session (½ day)
Role of gelatinous zooplankton in coastal and oceanic ecosystems (BIO Endnote 7)

FIS contributed papers (½ day)

FIS/BIO Topic Session (1 day)
Hot spots and their use by migratory species and top predators in the North Pacific

MEQ Topic Session (1 day)
Natural and anthropogenic introduction of marine species (MEQ Endnote 7)

MEQ Topic Session (½ day)
Marine protected areas (MEQ Endnote 8)

POC Topic Session (1 day)
Impacts of climate change on the carbon cycle in the North Pacific (POC Endnote 7)

POC/MONITOR Topic Session (1 day)
Application of Global Observing Systems to physics, fisheries and ecosystems (POC Endnote 6)

TCODE E-poster Session
Data visualisation of open ocean processes

CCCC Topic Session (1½-days)
CCCC, GLOBEC, and GLOBEC-like results: First steps toward a synthesis of impacts of large-scale climate change on North Pacific marine ecosystems (CCCC Endnote 3)

CCCC/MODEL Topic Session (½ day)
Modelling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans (MODEL Endnote 3)

Selection of PICES XIV Theme (Agenda Item 8)

Science Board decided that the theme for PICES XIV (October 2005, Vladivostok, Russia) should be "Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions" (see description in *SB Endnote 13*).

Report from Study Group on *PICES Capacity Building* (Agenda Item 9)

Science Board had a brief discussion of this report, as not all Committee members had seen the report. Comments were generally favourable, and the funding issue was widely recognized. CCCC-IP suggested requesting Governing Council to increase the annual dues of the Contracting Parties, with increases going towards PICES capacity building. Additional comments included concern that academic scientists must find their own funds to participate in PICES; the need to encourage participation by young and senior scientists (often with few funding opportunities) and Program Funding Managers; to support extended training visits, and to hold "summer courses". Further comments were requested by the end of November. Subsequent to the Science Board meeting, the Study Group report (*SB Endnote 14*) was approved by correspondence. Science Board thanked the Chairman of the Study Group, Dr. Warren Wooster, and its members for the fine report and their work on behalf of this issue.

Science Board further recommends that a proposal be developed for a Young Scientists Workshop that would bring together "early career" scientists from around the North Pacific (a wider geographic focus is possible with co-sponsorship from ICES). External funding would need to be sought for this activity. Concerns were expressed regarding abilities in English for young Asian scientists. The selection process must be carefully considered.

North Pacific Ecosystem Status Report (Agenda Item 10)

A "Draft for Discussion" North Pacific Ecosystem Status Report was presented to the MONITOR workshop, where it received good discussion. The report of this workshop is expected to recommend a process for future production of this report. Comments on the Ecosystem Status Report from the Scientific Committees were requested by the end of November 2003.

Report from Study Group on *PICES Strategic Issues* (Agenda Item 11)

The report of this Study Group arrived too late for sufficient discussion in most of the Committees. Comments have therefore been requested by the end of November 2003.

PICES web site revisions (Agenda Item 12)

All committees appreciated the efforts by the Secretariat to improve the PICES web site. Comments were requested by the end of October.

Inter-sessional Science Board meeting (Agenda Item 13)

Science Board considers the 1st inter-sessional Science Board meeting to have been a success. Several current items warrant further discussion, Science Board therefore recommends that a 2nd inter-sessional Science Board meeting be held in spring 2004 (dates and location to be decided). Potential agenda items include:

- PICES Draft Strategic Plan - Action Plans
- Update on US request for advice
- BIO: Update on MIE-AP experiment and NPRB proposal
- POC: CREAMS III and PICES support
- CCCC:
  - Terms of Reference and details of membership for the CFAME (Climate

Forcing and Marine Ecosystem Response) Task Team
  - MONITOR Task Team's move out of the CCCC Program to become a Technical Committee - membership and Terms of Reference reconsideration
  - Update on APN proposal
  - Dissolve CCCC-IP
- Results from the PICES/PaCOS workshop
- Discussion on how to develop next major PICES program, and to include human dimensions
- Issues of participation and Committee membership renewal
- Report from Study Group on *PICES Capacity Building*, and a Young Scientist workshop
- NPAFC – PICES Symposium

Discussion of steps towards next major program (Agenda Item 14)

This item was deferred until a possible 2nd interim Science Board meeting.

Other business (Agenda Item 15)

A request for scientific advice was received from the United States (*SB Endnote 15*). Science Board recommends that PICES accept this request, and that it will be beneficial to PICES. Science Board suggests the following process for responding to this request:

- Form a Study Group under Science Board titled "Potential implications of recent regime shifts in the North Pacific for fisheries", with a 1-year duration.
- The Study Group would assess the request, and then begin to assemble the information and data relevant to responding to this request, and develop a draft document for discussion. It would also develop plans for a workshop to be held in late June 2004 to discuss this document and to gather broader input.
- Following the workshop, the Study Group would finalize the report. This report would then be circulated within PICES for review. It would be completed and delivered to the United States by PICES XIII in October 2004.

The proposed Terms of Reference for this Study Group to address are:

- Examine the request and clarify what can be delivered by PICES;
- Gather appropriate information to respond to the request, develop a draft document for discussion, and develop plans for a June workshop;
- Conduct the workshop and provide a final written report by summer 2004, for review by PICES.

Potential Chairman: Dr. Jacquelynne R. King (Canada).

Best Presentation and Poster Awards

Dr. Lawrence Hamilton (U.S.A.) won the Best Presentation Award in the Science Board Symposium for his presentation entitled "Ecosystem-society interactions in the North Atlantic: Human dimensions of fishery collapses".

The Best Poster Award went to Mr. Dong-Hwa Sohn for her poster titled "Stock identification of chum salmon (*Oncorhynchus keta*) using trace elements in otoltihs" (co-authored by S. Kang, and S. Kim.

SB Endnote 1

Participation List

Members

R. Ian Perry (Chairman, Science Board)
Vladimir I. Radchenko (Chairman, BIO)
Yukimasa Ishida (Chairman, FIS)
John E. Stein (Chairman, MEQ)
Kuh Kim (Chairman, POC)
Makoto Kashiwai (Co-Chairman, CCCC-IP)
Harold P. Batchelder (Co-Chairman, CCCC-IP)
Igor I. Shevchenko (Chairman, TCODE)

Invited observers

Ming-Yuan Zhu (invited, China) (October 17 only)
Suam Kim (Co-Chairman-elect, CCCC-IP) (October 17 only)
Susan E. Allen (representing POC, AM October 17 only)
Stewart (Skip) M. McKinnell (Deputy Executive Secretary, PICES, rapporteur)

SB Endnote 2

Science Board Agenda

October 12, 2003 (13:00 – 14:30)

1. Welcome and opening remarks
2. Adoption of agenda
3. Review of procedures for best presentation awards and closing ceremonies
4. Review of procedures to enhance documentation of PICES scientific sessions
5. Completion of PICES XI and interim meeting decisions and recommendations by Governing Council and Science Board

October 17, 2003 (08:30 – 18:00)

6. Reports of the Science Board Chairman, Scientific and Technical Committees, CCCC-IP, Working and Study Groups with regard to activities, proposals, and items having financial implications for 2004 and beyond:
   a) Brief summary report of the groups' activities in the past year
   b) Proposed list of any future groups along with Terms of Reference and a list of potential members
   c) Proposed Topic Sessions, Symposia and Workshops for the next Annual Meeting, including draft session descriptions and proposed Convenors
   d) Inter-sessional meetings proposed for 2004 and beyond
   e) Proposed publications for 2004 and beyond
   f) Travel support requests
   g) Other items with financial implications
   h) High priority projects
   i) Relations with other international programs/organizations
   j) Proposed recommendations and draft text on other items to be included in the Science Board report to Council
   k) Documentation of PICES science
   l) Other items
7. PICES Thirteenth Annual Meeting
   a) PICES XIII theme and Science Board Symposium
   b) PICES XIII draft schedule of sessions and workshops
8. Selection of PICES XIV theme
9. Discussion of report from Study Group on *PICES Capacity Building*
10. Discussion of draft North Pacific Ecosystem Status Report
11. Discussion of report from Study Group on *PICES Strategic Issues*
12. Discussion of PICES web site revisions
13. Possible interim Science Board meeting
14. Discussion of steps towards next major PICES scientific program(s)
15. Other business
    - Request for scientific advice from the United States
16. Adoption of the Science Board report and recommendations to Council

SB Endnote 3

Review of procedures to enhance documentation of PICES scientific sessions

(From: PICES Annual Review 2001, SB Endnote 11, p. 52)

For the last few years, PICES has only included information of the proposed Topic Sessions for the upcoming year in its Annual Report, and has not provided details regarding the actual scientific sessions after their conclusion, particularly with regard to any key discussions or recommendations that such sessions might have generated. It became clear to those who are preparing reviews of PICES scientific accomplishments over the last decade, that we have not well-documented the science contained in our Annual Meetings, with the exception of papers that were compiled later into PICES Scientific Reports or other publications.

If we are to better track the state of our knowledge and future needs for improvement, it seems we should have a better system for documenting our scientific sessions and the discussions and recommendations that come from those. One possible system would be that employed by ICES in their Annual Report. (See a copy of their latest annual report on the web at http://www.ices.dk/products/AnnualRep/2001annualreport.pdf). The section devoted to the Annual Science Meeting puts forth the following information:

- keynote lectures and abstracts
- science meeting agenda (session schedules)
- details of each scientific session

The last item, details of each scientific session, contains an organized description of each session that includes:

- purpose of the session (derived from the initial session description);
- details of the content of the papers presented in summary form;
- summary of the discussions and conclusions of the session with regard to: research gaps that need to be filled; recommendations for future sessions or groups, or work; recommendations for other actions; and
- list of the documents (author and title) presented.

PICES has struggled to enhance the discussions at our Topic Sessions, and if we ask convenors to document the sessions and the discussions, we may see a better organization of Topic Sessions in this regard. We would also have a more organized way to provide scientific recommendations for action to the parent Committee(s) that sponsored the session.

Recommendation: Session convenors be asked to provide a summary of their session that includes the four points listed above, and these summaries be included in the PICES Annual Report. This practice would begin with the PICES Eleventh Annual Meeting in 2002. Also, session convenors should be requested to include a fixed amount of discussion time at the end of their sessions (15 minutes) in order to provide for proper discussion of the papers and issues raised by the papers.

SB Endnote 4

Completion of PICES XI decisions and recommendations

02/S/1: Inter-sessional meetings, Working Group and CCCC Program workshops

The following inter-sessional meetings were convened or co-sponsored:

- A 4-day MODEL Workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model" (co-sponsored by Nakajima Foundation), March 3-6, 2003, in Yokohama, Japan;

- A 5-day international inter-comparison on "Underway and drifting/mooring-based pCO_2 measurement systems" (co-sponsored by several Japanese agencies/institutes), March 10-14, 2003, in Hazaki, Japan;
- A 3-day interim meeting of Science Board/Governing Council, April 7-9, 2003, Victoria, Canada;
- A 4-day PICES/GLOBEC/ICES Zooplankton Production Symposium on "The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Oceans" (co-sponsored by SCOR), May 20-23, 2003, in Gijón, Spain;
- A 1-day Workshop on "Climate variability, zooplankton abundance and distribution – comparative opportunities from the world's oceans" was held immediately prior to the Zooplankton Production Symposium to develop suggestions for follow-up collaborative projects with ICES and GLOBEC, May 19, 2003, in Gijón, Spain;
- A 3-day Third PICES Workshop on "Okhotsk Sea and adjacent areas" (co-sponsored by TINRO-Center and CoML), June 4-6, 2003, in Vladivostok, Russia;
- A 3-day "North Pacific Ecosystem Status Report" Workshop, August 25-27, 2003, Victoria, Canada.

The following workshops were held in conjunction with the PICES Twelfth Annual Meeting in Seoul, Republic of Korea:

- A 2-day Workshop on "Status of Yellow Sea and East China Sea ecosystems" (co-sponsored by CoML), October 9-10, 2003;
- A 2-day MONITOR Workshop to "Examine and critique a North Pacific Ecosystem Status Report" (co-sponsored by EVOS/GEM), October 10-11, 2003;
- A 1½-day WG 15/TCODE Workshop on "Harmful algal blooms - harmonization data" (co-sponsored by IOC), October 10-11, 2003;
- A 1-day MBM-AP Workshop on "Combining data sets on distribution and diets of marine birds and mammals", October 10, 2003;
- A 1-day BASS Workshop to "Examine linkages between open and coastal systems", October 15, 2003;

Preparation and arrangements are in progress for:

- A 3-day PICES/CoML "Regional marine life expert" Workshop, November 17-19, 2003, Victoria, Canada;
- A 3-day Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" (co-sponsored by EVOS/GEM, SWFSC/NMFS), November 20-22, 2003, Victoria, Canada;
- A 4-day MODEL Workshop on "Summary and synthesis of contributions from NEMURO and NEMURO.FISH" (funded by a grant from Japan Fisheries Research Agency), December 14-18, 2003, Yokohama, Japan;
- A 5-day IOCCP/PICES Workshop on "Ocean surface pCO_2, data integration and database development" (co-sponsored by several Japanese agencies), January 13-17, 2004, Tsukuba, Japan;
- A 3-day IFEP Workshop on "*In situ* iron enrichment experiments in the eastern and western subarctic Pacific", February 10-12, 2004, Victoria, Canada;
- A 1-day joint Canadian-SOLAS/PICES-IFEP session on "Response of the upper ocean to mesoscale iron enrichment" at the TOS/ASLO Ocean Research Conference, February 15-20, 2004, Honolulu, U.S.A.;
- A 4-day International Symposium on "Quantitative ecosystem indicators in fisheries management", March 31-April 3, 2004, in Paris, France.

02/S/2: Travel support

- Drs. Ian Perry (Science Board Chairman) and Makoto Kashiwai (CCCC Co-Chairman) participated in the International Open Science Meeting on "Ocean biogeochemistry and ecosystems", in Paris, France, in January;

- Dr. F.J.R. "Max" Taylor (WG 15 Co-Chairman) represented PICES at the annual meeting of the ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors*, in Vancouver, Canada, in March;
- Dr. John Stein (MEQ Chairman) represented PICES at the annual meeting of the ICES WG on *Introductions and transfers of marine organisms*, in Vancouver, Canada, in March (paid by NMFS);
- Dr. Phillip Mundy (MONITOR member) represented PICES at three sequential ICES meetings (Regional Ecosystem Study Group for the North Sea, the ICES-EuroGOOS Planning Group on the North Sea Pilot Project, the ICES/IOC Steering Group for GOOS) related to monitoring activities in Nantes, France, in April;
- Dr. Ian Perry (Science Board Chairman) and two members of the Science Board attended the PICES Interim Science Board/Governing Council Meeting, in Victoria, Canada, in April;
- Dr. Elizabeth Logerwell (FIS member) represented PICES at the NPAFC Research Planning and Coordinating Meeting, in Seattle, U.S.A., in May;
- Drs. Ian Perry and David Mackas (invited speaker) traveled to Gijón, Spain, in May, for the PICES/GLOBEC/ICES Zooplankton Production Symposium;
- Partial travel support was provided to 27 scientists from countries with "economies in transition" (11 paid by the Trust Fund and 16 by a SCOR travel grant) to attend the PICES/GLOBEC/ICES Zooplankton Production Symposium;
- Full or partial travel support was provided to 11 participants (1 from Canada, 1 from China, 3 from Japan, 3 from Korea, 2 from U.S.A. and 1 from Mexico) to attend the "North Pacific Ecosystem Status Report" Workshop, in Victoria, Canada, in August;
- Dr. Vladimir Radchenko (Science Board Vice-Chairman) represented PICES at the 36th SCOR Executive Committee, in Moscow, Russia, in September (paid by Russian government);
- Dr. Ian Perry represented PICES at the 2003 ICES Annual Conference, in Tallinn, Estonia, in September;
- Dr. Ian Perry travelled to Seoul, Republic of Korea, in October, for PICES XII;
- Full or partial travel support (paid by PICES and co-sponsoring programs and organizations) was provided to 3 invited speakers for the Science Board Symposium, and 15 invited speakers for scientific sessions and workshops at PICES XII, in Seoul, Republic of Korea, in October;
- Partial travel support (paid by the Trust Fund and a SCOR travel grant) was provided to 33 scientists (1 Canadian, 11 Chinese, 1 Japanese, 4 Korean, 15 Russian and 1 U.S.) to attend PICES XII. The majority of these scientists are younger than 35 year of age;
- Dr. Elizabeth Logerwell will represent PICES at the NPAFC Eleventh Annual Meeting, in Honolulu, U.S.A., in October;
- Dr. Sei-ichi Saitoh (MONITOR Task Team Co-Chairman) will represent PICES at the POGO Fifth Annual Meeting, in Tokyo, Japan, in November;
- Full or partial travel support will be provided to 2 scientists to attend the workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific", in Victoria, Canada, in November;
- Full or partial travel support will be provided to 2-3 scientists to participate in the PICES/CoML "Regional marine life expert" Workshop, in Victoria, Canada, in November.

02/S/3: Publications

Publications produced after the Eleventh Annual Meeting include:

PICES Reports:
- PICES 2002 Annual Report;
- PICES Scientific Report No. 24 (July 2003): *CO_2 in the North Pacific*; this report is the final effort of PICES WG 13 and summarizes the research and technical activities that have been conducted by member nations of PICES to synthesize CO_2

data in the North Pacific, and provides a comprehensive picture of the distribution of anthropogenic CO_2 in this region;

- PICES Scientific Report No. 25 (July 2003): *Climate Change and Carrying Capacity Program / Report of BASS/MODEL on Trophic models of the subarctic Pacific basin ecosystems*;
- PICES Scientific Report No. 26 (in progress, November 2003): *Climate Change and Carrying Capacity Program* / *Report of the 2003 MODEL workshop to "Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes"*;
- PICES Scientific Report No. 27 (in progress, December 2003): *Climate Change and Carrying Capacity Program* / *Report of the 2002 MONITOR Workshops on "Requirements and methods for early detection of ocean change* and *Monitoring from moored and drifting buoys"*;
- PICES Scientific Report No. 28 (in progress, December 2003): *Marine life in the North Pacific Ocean: The known, unknown and unknowable* (report for the Census of Marine Life).

Special issues of primary journals:

- *Canadian Journal of Fisheries and Aquatic Sciences* (December 2002, section in Vol. 59, No. 12) - selected papers from the 2001 FIS Topic Session on "Migration of key ecological species in the North Pacific Ocean" (Guest editor: J. Irvine); the section includes 4 papers by authors from Canada, Japan and Mexico;
- *Deep-Sea Research Part II* (December 2002, Vol. 49, Nos. 24-25) on "North Pacific Biogeochemical Processes" - a collection of contributed papers from JGOFS-related field programs in the North Pacific (Guest editors: T. Saino, A. Bychkov, C.T.A. Chen and P. Harrison); the issue includes an overview and 27 papers by authors from Canada, Japan, Russia and China-Taipei, but majority of papers (21) are from Japan;
- *Journal of Oceanography* (August 2003, Vol. 59, No. 4) - selected papers from the 2002 PICES Symposium on "North Pacific transitional areas" (Guest editors: S. McKinnell, M. Kishi, D. Lluch-Belda, A. Miller and Y. Watanabe); the issue includes 10 papers by authors from Japan, Mexico, U.S.A. and PICES;
- *Progress in Oceanography* (September 2003, Vol. 57, Nos. 3-4) - selected papers from the 2001 BIO Topic Session on "Plankton size classes, functional groups and ecosystem dynamics" dedicated to the memory of the late Prof. Michael M. Mullin (Guest editors: A. Peña and A. Bychkov); the issue includes 11 papers by authors from Canada, Chile, Japan, Korea and U.S.A.;
- *Marine Environmental Research* (September 2004, Vol. 57, Nos. 1-2) - papers resulting from the 1999 MEQ Practical Workshop (Guest editor: R. Addison); the issue includes 9 papers from all PICES member countries;
- *Fisheries Oceanography* (September 2003, Vol. 12, Nos. 4-5) – papers resulting from the 2002 GLOBEC/PICES joint Symposium (2nd GLOBEC Open Science Meeting), Qingdao, China, October 2002.

Peer-review process was initiated for four special issues to be published in 2004:

- *Progress in Oceanography* - selected papers from the 2002 PICES/CREAMS workshop on "Recent progress in studies of the Japan/East Sea ecosystem" (Guest editors: S. McKinnell, K.-R. Kim, M. Terazaki and A. Bychkov); 13 papers have been submitted by authors from Japan, Korea, Russia and U.S.A.;
- *Journal of Oceanography* – a collection of invited papers on *JGOFS North Pacific Synthesis* (Guest editors: T. Saino, A. Bychkov, C.T.A. Chen and P. Harrison);
- *Journal of Marine Systems* - selected papers from the 2002 BIO/POC/FIS Topic Session on "The importance of biophysical coupling in concentrating marine organisms around shallow topographies" (Guest editors: R. Brodeur and J. Dower); 5 papers have been submitted by authors from Israel, Japan, Mexico and U.S.A.;

- *ICES Journal of Marine Research* - selected papers from the PICES/GLOBEC/ICES Zooplankton Production Symposium on "Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans" (Guest Editors: R. Harris, T. Ikeda, S. McKinnell, L. Valdes and W. Peterson); 42 papers have been submitted.

PICES Press - Newsletters

- Vol. 11 No. 1 – a joint PICES/GLOBEC issue focused on the results from PICES XI and the 2nd GLOBEC Open Science Meeting held sequentially in Qingdao, People's Republic of China, in October 2002;
- Vol. 11, No. 2 – regular issue.

02/S/4: Future of current Working Groups and Scientific Programs

- Working Groups and the CCCC Program are continuing.

02/S/5: New PICES Groups

- No new groups were formed at PICES XII.

SB Endnote 5

Proposal for a Study Group on
Ecosystem-based management science and its application to the North Pacific

Proposal: Study Group under FIS & MEQ
Title: Study Group on *Ecosystem-based management science and its application to the North Pacific*
Short title: SG-EMB
Duration: November 2003 - October 2004 (with possible 1 year extension)

Terms of Reference:

1. To review and describe existing and anticipated ecosystem-based management initiatives in PICES member nations and the scientific bases for them.
2. To identify emerging scientific issues related to the implementation of ecosystem-based management.
3. To develop recommendations for a Working Group to focus on one or more issues identified in (2) above.
4. To report the results to Science Board at PICES XIII.

Recommended Co-Chairmen for the Study Group are Drs. Glen Jamieson (Canada) and Chang-Ik Zhang (Korea).

SB Endnote 6

Proposed Working Group on
Mariculture in the 21st Century – The intersection between ecology, socio-economics and production

Proposal: Working Group under MEQ & FIS
Title: *Mariculture in the 21st Century – The intersection between ecology, socio-economics and production*
Short Title: WG on *Marine aquaculture*
Duration: November 2003 to October 2006
Terms of Reference:

1. To review and report on the current status and projected trends in aquaculture in marine and estuarine regions of PICES that substantively contribute to world aquaculture.
2. To develop an overview of current and emerging issues, with respect to environmental and ecosystem function, sustainability of production (*e.g.*, carrying capacity of ecosystems), and socio-economics.
3. To convene a workshop on "Scientific issues for sustainable aquaculture in the PICES

region". A product from the workshop would be recommendations for a PICES Action Plan on scientific issues of mariculture.

Recommended Co-Chairmen for the Working Group are Drs. Ik-Kyo Chung (Korea), Carolyn Friedman (U.S.A.), and a scientist suggested by Chinese delegates.

SB Endnote 7

Proposal for a Section on *Harmful algal blooms and their impacts*

Proposal: Section under MEQ
Title: Harmful algal blooms and their impacts
Short title: HAB-S
Terms of Reference:

1. To develop and implement annual bloom reporting procedures that can be consistent with ICES procedures and therefore incorporated into HAE-DAT and used to update the North Pacific Ecosystem Status Report. This will be important in assessing impacts of HAB events and as a research tool to understand patterns that will eventually lead to an increased prediction capability.
2. To exchange national reports of HAB incidents and development in order to inform PICES of new toxins, new developments, and new approaches. Both toxin producing and nontoxic (but harmful) algal species should be included.
3. To focus on specific needs for scientific advice among PICES member countries by identifying topics of interest, and providing syntheses of the available scientific information on those selected topics. Example topics for discussion and synthesis might include:
   a. Mitigation practices to reduce the impact of HABs;
   b. Numerical model development of harmful algal bloom initiation and transport for predictions and forecasts;
   c. Relationship between oceanographic processes and HAB formation (*e.g.*, how the physics of nutrients, trace metals tie into bloom formation);
   d. Organism identification using molecular biological techniques;
   e. Discussion of possible changes to certain monitoring techniques (for example, cell numbers *vs*. toxin levels);
   f. Species introductions including issues of anthropogenic sources (*e.g.*, ballast water) or natural systems (*e.g.*, species range extension).
4. Together with TCODE, to develop a meta-database that describes HAB monitoring and research efforts in each PICES member country.
5. Support the harmonization of methods for identifying HAB species. This could include intercalibration workshops co-sponsored by PICES and ICES.
6. Development of early warning systems for the detection of HABs. This could include discussion of ocean observing systems and techniques.
7. To educate the community (managers, students) about biology and ecology of HAB organisms. For example, an in-depth study and documentation of selected HAB species ("top ten") could include information about physiology, taxonomy, etc. of each of the species.

Recommended Co-Chairmen: Drs. Hak-Gyoon Kim (Korea) and Vera Trainer (U.S.A.).

Note: A "Section" represents a sub-committee under a Scientific Committee that has a longer lifespan than a Working Group. Its purpose is to provide input to the parent Scientific Committee on specific issues for which expertise may be lacking in the parent committee. Sections should be reviewed periodically to ensure they continue to meet their objectives.

SB Endnote 8

Joint NPAFC–PICES Symposium on
"State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems"

A 2-day joint BASS/NPAFC workshop on the role of salmon and associated species in linking open ocean and coastal systems was originally proposed for immediately prior to PICES XIII (Honolulu, U.S.A.). The new suggestion is, instead, to hold a major joint-symposium in 2005, with the working title "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems". The proposed location would be Korea, in conjunction with the NPAFC Annual Meeting. Development of the symposium (if approved) objectives and key questions to be addressed will take place in early 2004, and the final organization will occur at NPAFC and PICES Annual Meetings in 2004. A Steering Committee should be formed consisting of representatives from NPAFC and PICES. The symposium would be planned for 3 days, and the proceedings would be published.

SB Endnote 9

Invitation from ICES to co-sponsor a symposium on "Marine bioinvasions"

Marine bioinvasions are a recognized and growing threat to our native biodiversity. They are a major threat to marine habitats, and have negatively impacted economic use of marine resources. Scientific understanding is needed to identify, control, and prevent marine bioinvasions. Transport and introduction of non-indigenous species is a world-wide conservation issue, and also represents a fascinating scientific challenge requiring new approaches and techniques. The ICES and PICES scientific communities have a great deal to contribute on this issue, and there are genuine opportunities for partnership with researchers associated with other organizations and programmes.

A symposium on "Marine bioinvasions" will be held at a location to be decided on the east coast of the United States for 3 days in early 2006.

Topics to be addressed include:

- patterns and distribution of marine bioinvasions,
- ecological impacts,
- evolutionary consequences,
- transfer vectors and pathways,
- risk assessment,
- molecular approaches,
- biological control, and
- special topics.

This will be a symposium with a limited number of invited keynote or plenary speakers, who will provide perspective, insight, and challenges to the participants. Presentations selected from submitted abstracts will include about 60 20-minute talks. Presenters will be asked to submit papers for publication in a special issue of the *ICES Journal of Marine Science*.

SB Endnote 10

Revised Standing List of International Organizations and Programs

PICES is expanding its relationships with international scientific organizations and programs around the world. At the same time, there is the need to improve integration, coordination, and communication with regional scientific research efforts in the North Pacific that are aligned with the PICES ecosystem research focus. These regional programs may involve several PICES member countries and cover international areas of high ecological

importance. Annually, the Science Board examines and revises the Standing List of International Organizations and Programs. Additionally, it selects a subset of organizations and programs that are considered to have the highest priority (marked by *) for PICES with respect to scientific cooperation and facilitation in the coming year. 2003 additions to the list are AOOS (Alaska Ocean Observing System), PaCOS (Pacific Coastal Observing System), and PNW-IOOS (Pacific North West Integrated Ocean Observing System). This list will be used in part to assist the Executive Secretary and Science Board in decisions regarding travel to the meetings of other international organizations.

ACIA	Arctic Climate Impact Assessment Program (ACIA of AMAP)
AFSCAR*	American Fisheries Society Program on Climate and Aquatic Resources
AMAP*	Arctic Monitoring and Assessment Program (AMAP)
AOOS	Alaska Ocean Observing System (AOOS)
APEC*	Marine Resources Conservation WG (MRC), Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fisheries Commission
Argo*	International Program for deployment of profiling floats (linked with GOOS)
CLIVAR*	Climate Variability and Predictability Program
CoML*	Census of Marine Life
CREAMS*	Circulation Research in the East Asian Marginal Seas
DBCP	Data Buoy Cooperation Panel
ECOR	Engineering Committee on Oceanic Resources
FAO	Food and Agriculture Organization
GCOS*	Global Climate Observing System
GEM*	Gulf of Alaska Ecosystem Monitoring and Research Program
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GIPME	Global Investigation of Pollution in the Marine Environment
GLOBEC*	Global Ocean Ecosystem Dynamics
GOOS*	Global Ocean Observing System
IASC	International Arctic Science Committee
IATTC*	Inter-American Tropical Tuna Commission
ICES*	International Council for the Exploration of the Sea
ICSU	International Council of Scientific Unions
IGBP*	International Geosphere-Biosphere Program
IGOSS	Integrated Global Ocean Services System
IOC*	Intergovernmental Oceanographic Commission
IODE	International Oceanographic Data and Information Exchange
IPCC*	International Panel on Climate Change
IPHC*	International Pacific Halibut Commission
IWC	International Whaling Commission
JGOFS*	Joint Global Ocean Flux Study
NAFO	North Atlantic Fisheries Organization
NASCO	North Atlantic Salmon Conservation Organization
NEAR-GOOS*	North East Asian Regional GOOS
NOWPAP	Northwest Pacific Action Plan
NPAFC*	North Pacific Anadromous Fish Commission
NPRB*	North Pacific Research Board
OCEANS	Ocean Biogeochemistry and Ecosystems Analysis
PaCOS	Pacific Coast Observing System (PaCOS)
PNW-IOOS	Pacific Northwest Integrated Ocean Observing System

PORSEC	Pacific Ocean Remote Sensing Conference
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
SAHFOS*	Sir Alister Hardy Foundation for Ocean Science
SCOPE	Scientific Committee on Problems of the Environment
SCOR*	Scientific Committee on Oceanic Research
SOLAS*	Surface Ocean Low Atmosphere Study
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
UNEP	United Nations Environment Program
WCRP	World Climate Research Program
WESTPAC*	Cooperative Study of the Western Pacific, IOC Sub Committee for the Western Pacific
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment

SB Endnote 11

Invitation to participate in a proposal for a workshop to identify global synchrony in fluctuations of zooplankton population

Submitted to:
ICES (Zooplankton Working Group)
PICES (Biological Oceanography Committee and Climate Change and Carrying Capacity Program)
GLOBEC (Focus I Working Group on Time Series and Retrospective Analyses)

by:
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September 9, 2003

Background

Analyses of the influences of climate variability on local zooplankton populations and those within ocean basins are relatively recent (past 5-10 years). What are lacking are comparisons of zooplankton population variability among the world's oceans, in contrast to such global comparisons of fish populations. At the 3rd International Zooplankton Production Symposium held in May, 2003, in Gijón, Spain, we hosted a workshop titled "Climate variability, zooplankton abundance and distribution – comparative opportunities from the world's oceans", whose purpose was to begin to look at the opportunities for comparing

zooplankton population globally to identify synchrony, and potential driving processes.

The workshop discussed:

- *Key Questions*, such as "Does global synchrony in zooplankton populations exist?" It is also important to note that the workshop recognized the synchrony of zooplankton populations may involve much more than abundance or biomass;
- *Capabilities* for such comparisons, *e.g.*, representative long-time plankton observation programs that could contribute to such comparisons;
- *Impediments* to such comparisons, including the data access issues, methodological differences, structural constraints regarding funding of international comparisons, and lack of understanding and interest on the part of decision makers with regards to the importance of zooplankton to the sustainability of marine ecosystems; and
- *Recommendations* for moving forward with such a comparison.

A manuscript with the results and recommendations from the workshop has been submitted to the *ICES Journal of Marine Science* issue devoted to the Gijón meeting, and is in review.

The workshop agreed that what was needed was to develop a single graph (if possible) that compared zooplankton changes in key regions around the world, similar to the "Kawasaki diagram" which showed global synchrony in sardine populations and has been very important at simulating research on this topic for small pelagic fishes. Even if a single graph cannot be developed, it was felt that the exercise would be worthwhile and would stimulate considerable new interest.

Proposal

We are seeking the support of ICES, PICES, and GLOBEC (which supported the basic concept of this proposal during its recent meeting in June 2003) for this initiative. At present we are seeking expressions of interest and a willingness to participate in this exercise at a future date. Sponsorship eventually might include monetary support for the meeting logistics, travel of participants, publications resulting from the meeting, etc.

We are proposing one workshop, which would involve a relatively small number of people (*e.g.,* 20-25 scientists) representing the key zooplanktonologists around the world. The meeting would be a hands-on working session, with considerable preparation of data and analyses before the workshop. Key regions expected to be represented include those with long-time series observational programs, such as the Benguela Current system, the Humboldt Current system off Peru, and the waters of the North Pacific (PICES) and North Atlantic (ICES). The target date for such a workshop is presently proposed as 2005, in order to allow time to solicit funding, participants, data sources, etc.

At present, therefore, we are seeking the interest of your organization for this initiative, and a willingness to support it with preparation, expressions of interest to help organize it, data, etc. At some future date we would like to work with you to develop a solid proposal and to identify potential costs and funding sources. We believe that such a workshop would be successful and would represent a significant advance to our understanding of whether there is, and what might drive, global synchrony of zooplankton populations.

SB Endnote 12

Theme for PICES XIII (Honolulu, U.S.A.)
"Beyond the continental slope - complexity and variability in the open North Pacific Ocean"

Most of the area of the North Pacific Ocean is in the pelagic realm, beyond the major currents and marginal seas that border the continents. This oceanic region has often been perceived as physically homogeneous and stable with low biological productivity. In reality, it is a spatially and temporally dynamic environment of high complexity. The diversity and structure of open ocean ecosystems are influenced by both horizontal and vertical structure of the ocean's physical and biological properties and by their seasonal cycles. Sharp contrasts in oceanic bottom topography caused by seamounts and islands add additional structure and complexity. In spite of its relatively low primary productivity, the region supports complex ecosystems with high biodiversity, and is home to many endangered species. Marine resources are important to the peoples of the North Pacific and are fished by fleets from many Pacific Rim nations. This session seeks to improve our understanding of the physical, chemical and biological structure and dynamics of North Pacific oceanic waters far beyond the continental shelf, with particular emphasis on the subtropical gyre. The symposium will consider how these complex subtropical oceanic ecosystems are structured and maintained, in light of their generally low productivity. It will provide opportunities to compare and contrast these areas with neighbouring regions of higher productivity. How important are small and meso-scale features, such as fronts and eddies, to the growth, survival and distribution of upper trophic level species? How do ecosystems in the open ocean respond to changes in vertical and horizontal structure? How have sub-tropical waters been affected by recent global changes? What are the major factors causing changes to open ocean ecosystems, particularly in the sub-tropics? What are the physical and biological links between the subtropical gyre and other regions of the North Pacific? What are the human interactions with these systems?

SB Endnote 13

Theme for PICES XIV (Vladivostok, Russia)
"Mechanisms of climate and human impacts on ecosystems in marginal seas and shelf regions"

There are many examples of statistical correlations that demonstrate relations between climate or human impacts and ecosystems. While retrospection may be informative in revealing patterns, it rarely leads to mechanistic understanding required for eventual prediction. This Science Board Symposium instead will focus on physical and biological mechanisms in the marginal seas and shelf regions. Many coastal species have life histories/cycles that rely on specific geographic features and they may be particularly vulnerable to the effects of human activities and climate variability. In order to predict the impacts of climate and human activities we need to understand the mechanisms responsible for shifts in ecosystem structure and function. We will consider "wind to whales" in this session. This theme will provide opportunities to address questions such as: How widespread is bottom-up control of fluxes? At what spatial and temporal scales are: *(i)* trophodynamic demands and food supply in balance?, *(ii)* signals amplified in food webs? and *(iii)* physical processes most important in impacting marine populations? The human impacts that could be considered include, fishing and fisheries enhancement, changes in biodiversity, petroleum development, eutrophication, mariculture, non-point source pollution, and others.

Convenors of the symposium are the members of Science Board.

SB Endnote 14

A PICES strategy for capacity building
(Final report from the Study Group on *PICES Capacity Building*)

At PICES XI, Governing Council approved the proposal to establish a Study Group on *PICES Capacity Building* under the direction of the Science Board, with the following Terms of Reference:

- Identify the capacity building needs of PICES;
- Develop a proposal to address the capacity building needs of PICES, including consideration of possible collaborations with other organizations;
- Draft report is due to Science Board at their next meeting (tentatively the inter-sessional meeting in March-April 2003).

Members of the Study Group are: Warren Wooster (Chairman), Paul J. Harrison (BIO), Gordon H. Kruse (FIS), Alexander Tkalin (MEQ), C.S. Wong (POC), Igor I. Shevchenko (TCODE), Harold P. Batchelder (CCCC), David W. Welch (CCCC) and Alexander S. Bychkov (PICES Secretariat).

Background

To support its goals of promoting and coordinating marine scientific research, PICES must recognize the importance of capacity building, a process intended to make it possible for all PICES member countries and their scientists and institutions to participate fully in, and benefit fully from, the cooperative programs developed by PICES.

Cooperative marine research depends on the combined efforts and continuing involvement of all member countries. This requires the sharing of basic and specialized skills as well as of experience and infrastructure. A central element of capacity building is education and training, for example in methods and skills in data management, modeling, and environmental monitoring. Other elements include the building of appropriate national and regional institutional support structures, the strengthening of infrastructure elements, and the development of communication networks for exchange of data and information.

Of course, each of the member countries of PICES has modern marine scientific institutions and its own educational programs in the field. In addition, the scientific activities of PICES, including its scientific sessions and the work of its scientific committees and other subsidiary bodies, are important contributions to capacity building. PICES has focused in particular on the development of young scientists, helping to increase their exposure to the exchange of scientific information at international scientific meetings and involving them in other activities of the organization. This may now be an appropriate time to consider other possibilities and to develop a more explicit PICES strategy for capacity building.

That strategy should include the elements listed below. Their success, as will then be discussed, will depend on provision of adequate funds, and on coordination of efforts at the national level.

Training and education

Training courses on selected topics could be specified and developed by the Science Board and its committees. These could involve scientists from member and other countries and might take place in different places as requested and supported by countries. In addition, PICES could develop a current web-based compendium of training and education opportunities including graduate student assistantships, post-doctoral fellowships, and visiting scientist positions.

Sharing of methodologies, information, and data

The common use of agreed observational methods is essential for the pooling of data resulting from cooperative programs. The inter-comparability of methods and training in their

use can be improved through the development of methodological workshops. Exchange of scientists on research cruises can also contribute to this goal.

PICES meetings and publications and the PICES web page are important means for sharing information. Sharing of data among PICES countries is being organized by TCODE. That Committee should explore the proposal to create, through a communication network, a common working environment, including data, techniques, methods, software tools, mathematical models, and computing power for sharing among all scientists involved.

Enhanced participation in PICES activities

A goal for PICES should be the full involvement of junior and senior scientists from its member countries in its meetings, workshops, committees, and other subsidiary bodies. Participation in annual meetings of scientific program officers from national funding agencies should also be encouraged. In most cases, this participation should be at national expense and thus its extent will depend primarily on actions at the national level (see below). Full participation could also be promoted by PICES in its practices for establishing membership of these bodies, for example by requiring rotation. An expanded intern program could include scientific as well as administrative assignments.

Bases for a program of capacity building

The PICES budget is stringent, with national contributions, less than half a million US dollars per year, sufficient only to maintain a small secretariat and a limited meeting and publication schedule. Any significant increase in activities that contribute to capacity building will require increased priority at the national level and increased financial support for the organization. Such additional resources could include extra-budgetary contributions from member states and in special cases, grants from international organizations and private foundations.

Full participation of national scientists must include not only increased national priority for such activities, but also the involvement of all relevant national institutions (government, academic, private) and coordination at the national level of their PICES-related activities, so that support for PICES and the accompanying investment of national resources can be optimized.

SB Endnote 15

Request for scientific advice received from the United States

Dr. Vera Alexander
School of Fisheries & Ocean Science
University of Alaska
245 O'Neill Building
Fairbanks, AK 99775-7220

Dear Dr. Alexander:

Members of the fishing industry on the west coast of the United States are concerned over the effect of a climate regime shift on the economic viability of their businesses. Following the strong 1997-1998 El Nino, the North Pacific climate underwent a rapid and striking transition. Upwelling-favorable winds strengthened over the California Current (CC), and the Pacific Decadal Oscillation (PDO) reversed sign and remained negative through the summer of 2002. In the northern CC, the zooplankton biomass doubled and switched from a prevalence of warm water species to cold water species. Coho and chinook

salmon stocks rebounded, and anchovy and osmeriid stocks increased. In contrast, ocean conditions in the Bering Sea and Sea of Okhotsk did not show a strong 1997-1998 shift. In these regions the major shift in climate forcing occurred in 1988-1989. Persistent changes in atmosphere and upper ocean fields along with changes in ecosystem structure suggest that a regime shift may have occurred, similar to shifts observed in 1925, 1947 and 1976; or perhaps, there are alternative explanations for the observed changes. Such shifts can seriously affect the fishing industry and consumers.

These phenomena have given rise to the following questions: 1) has the North Pacific shifted to a different state or regime since the late 1980s? 2) what is the nature of the new state? 3) what are the ecosystem responses? 4) how long can the shift be expected to last? 5) is it possible to predict when the regime will shift back and what indicators should be used to determine when it happens? and 6) what are the implications for the management of marine resources? The United States is requesting that PICES provide it with advice on these issues. It is proposed that a workshop be held on the west coast of the United States in June of 2004. The purpose for convening a PICES workshop is to produce an international consensus on issues relevant to resource management.

The United States hopes that this request is considered favorably by the PICES Governing Council at its upcoming Annual Meeting. The United States as the requesting party is prepared to support the workshop by providing facilities, United States scientists working within the PICES framework, and funds if necessary.

Sincerely,

Richard Marasco
United States Delegate

cc: a.bychkov
i.perry
g.boehlert
w.fox
m.sissenwine
m.tillman

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

The meeting of the Biological Oceanography Committee was held from 14:30-19:30 hours on October 12, 2003. The Chairman, Dr. Vladimir I. Radchenko, called the meeting to order and welcomed members, invitees, and guests (see *BIO Endnote 1* for attendance). Dr. Hidehiro Kato was welcomed as the new BIO Committee member from Japan. The Committee reviewed the agenda, and some items were supplemented by issues arising "at the last moment". Dr. Michio J. Kishi suggested that the next zooplankton symposium should be in Japan in 2007. Dr. David L. Mackas distributed an invitation to participate in a proposal for a workshop to identify global synchrony in fluctuations of zooplankton populations. Dr. R. Ian Perry has distributed a letter with the attached United States request to PICES for scientific advice. The Physical Oceanography and Climate Committee requested a discuss ion on proposals of the 2004 PICES/CLIVAR workshop. Decision was reached to discuss the first two proposals under item 3b, the third and fourth ones under item 16 of the agenda. The approved agenda is presented as *BIO Endnote 2*.

Business arising from last year's meeting (Agenda Item 3)

Status of proposed publications

Dr. Paul J. Harrison informed the Committee that a collection of contributed papers from JGOFS-related field programs in the North Pacific was published as a special issue of *Deep-Sea Research II* on "North Pacific Biogeochemical Processes" (Guest editors: T. Saino, A. Bychkov, C.-T. Chen and P. Harrison) in November 2002 (Vol. 49, Nos. 24-25). The issue includes an overview and 27 papers by authors from Canada, Japan, China-Taipei and Russia, with the majority of papers (21) from Japan.

Dr. Angelica Peña reported that a special issue of *Progress in Oceanography* on "Plankton size classes, functional groups and ecosystem dynamics" (Guest editors: A. Peña and A. Bychkov) was published in June 2003 (Vol. 57, Nos. 3-4). It includes selected papers from the PICES/JGOFS Topic Session at PICES X dedicated to the memory of the late Prof. Michael M. Mullin, the first BIO Chairman. The issue includes 11 papers by authors from Canada, Chile, Japan, Korea and U.S.A.

Dr. Harrison reported that a special issue of *Journal of Oceanography*, on "JGOFS North Pacific Synthesis" (Guest editors: T. Saino, A. Bychkov, C.-T. Chen, and P. Harrison) is in progress, and publication is expected in February 2004. The issue is based on invited papers only. A CD-ROM with data sets obtained during the North Pacific Process Studies will be prepared by the Japan Oceanographic Data Center and circulated later among the PICES scientific community. He also informed the Committee that another issue of *Journal of Oceanography* on "Progress in chemical, biological and geological oceanography" was published in April 2002 (Vol. 58, No. 2). It includes 11 review papers, in particular P. Harrison's paper on the one of the longest time series of any open ocean station, Station P, from the 1950s to 1981. This review summarizes the understanding of the plankton ecosystem for this station and examines interannual variability for the primary producers.

Dr. Richard D. Brodeur reported on the progress of a special issue of *Journal of Marine Systems*. This issue comprises of selected papers from the 2002 PICES XI BIO/POC/FIS Topic Session on "The importance of biophysical coupling in concentrating marine organisms around shallow topographic" (Guest editors: J. Dower and R. Brodeur). The issue will include an introduction and 6 papers by authors from Israel, Japan, Mexico and U.S.A. All papers are reviewed and revised, and will be sent to the journal in December 2003; publication is expected in the summer of 2004.

Dr. Brodeur also reported that the WG 14 final report is nearing completion. Two external reviewers have been arranged. Information gathered from PICES XII will be added to the report, and submission of the final version is anticipated by the year-end.

Status of proposed inter-sessional meetings

Dr. Tsutomu Ikeda reported on the 3rd Zooplankton Production Symposium on "The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Oceans", jointly co-sponsored by PICES, GLOBEC and ICES. The Symposium was held May 20-23, 2003, in Gijón, Spain. This was a very successful meeting, the largest and most exciting zooplankton forum that has ever been convened, with 333 participants from 38 countries from 6 continents. Selected papers from the Symposium will be published as a special issue of the *ICES Journal of Marine Science* in May of 2004. Dr. Kishi suggested that the next Zooplankton Production Symposium be held in Japan in 2007. A BIO recommendation for a meeting theme was requested.

Dr. Mackas reported on a pending proposal for an international workshop to identify global synchrony in fluctuations of zooplankton populations (*SB Endnote 11*). If this proposal is approved, the workshop will be held in 2005 and involve 20-25 scientists. No funds are requested from PICES at this time. A letter of endorsement from BIO was requested. The Committee agreed to issue such a letter to support the proposal.

Dr. George L. Hunt reported on 2 programs (ESSAS – *Ecosystem Studies of Subarctic Seas*, and BEST – *Bering Ecosystem Study*) that are developing. Both are at the "science planning" stage. The first ESSAS meeting was held May 25-28, 2003, in Bergen, Norway, and the second meeting will be convened October 31 – November 1, 2003, in Seattle, U.S.A. ESSAS is planning an international symposium in mid-2005. Along with ICES and GLOBEC, PICES has been asked to be a co-sponsor (in name only, no funds were requested).

Dr. Alexander Bychkov informed the Committee on the international inter-comparison on "Underway and drifting/mooring $p(CO_2)$ measurement systems", held March 10-14, 2003, and SCOR-IOC/GCP/PICES Workshop on "Ocean surface pCO_2 data base and data integration", which was previously planned for October 6-8, 2003, in Tsukuba, Japan, and was postponed until January 14-18, 2004. Details can be found in the WG 17 progress report elsewhere in this Annual Report.

Dr. Radchenko reported on the 3rd PICES Workshop on "The Okhotsk Sea and adjacent areas", held June 4-6, 2003, in Vladivostok, Russia, and co-sponsored by TINRO-Center and Census of Marine Life. This workshop was well attended with 92 scientists from Canada, Japan, Russia and the United States. The abstract book of this workshop contains 91 abstracts. Presentation topics varied widely from the climate and geological aspects of the Sea of Okhotsk bottom structure formation, to the marine mammals' influence of the Greenland turbot fishery in the northern part of the sea. Extended abstracts will be published in the PICES Scientific Report Series and selected papers will constitute a special issue of a primary journal, such as *Progress in Oceanography*.

Dr. Radchenko also reported on the 26th SCOR Executive Committee meeting, which was held September 15-19, 2003, in Moscow, Russia. The PICES report on existing and potential areas of cooperation between SCOR and PICES was presented and met a friendly reception. Among the PICES activities, the iron fertilization experiment results attracted rapt attention. The Executive Committee reviewed progress of some sponsored and related research projects, such as GLOBEC, JGOFS, SOLAS, GEOHAB and IMBER. Working group reports were heard and proposals for four new SCOR Working Groups were discussed: ECOTRACES project (on the rare but biologically important chemical elements circulation in marine environment), on the mesoscale rings, and two proposals from the paleobiology field. The Executive Committee has considered several new proposals for research funding. Priority will be given to the

polar regions and biodiversity issues. It was a broad scientific program in conjunction with the meeting: Presentations on the progress in the Russian oceanographic research took 1.5 days. A half-day Census of Marine Life symposium was held on the last day of the meeting.

Progress report of the Advisory Panel on *Micronekton sampling inter-calibration experiment* (Agenda Item 4a)

The Panel Co-Chairman, Dr. Michael P. Seki presented a summary of the MIE-AP activities (*BIO Endnote 3*). The Panel has developed an ambitious field program that includes two marine cruises. The first will be conducted just before PICES XIII in October 2004, in the ocean near Hawaii (Station ALOHA at 22°45'N, 158°W - the location of the Hawaii Ocean Time Series). Ship time (10 days) aboard the NOAA ship *Oscar Elton Sette* is already covered. The second cruise is planned for 2005, at the higher latitudes in a colder climatic zone, possibly in the Bering Sea and the Gulf of Alaska area. The Japanese research vessel *Oshoro Maru* will be requested for that cruise. A funding proposal will be submitted to the North Pacific Research Board.

The Committee decided to distribute information on the field program among the PICES Committees and CCCC Task Teams to invite them to participate in the organization and conducting of the cruises. Support by other Committees could be necessary, if the cruise will require some monetary support from the PICES Trust Fund. A request could cover the travel costs of the cruise participants, who will be then attending PICES XIII. This request will be directed to the PICES Secretariat after the list of potential cruise participants is compiled.

Progress report of the Advisory Panel on *Marine birds and mammals* (Agenda Item 4b)

The Panel Co-Chairman, Dr. Hidehiro Kato, reported on the MBM-AP activities (*BIO Endnote 4*). The main topic of this progress report was the results from the PICES XII workshop on distribution and diet of selected bird and mammal species on the east and west coasts of the North Pacific. It was concluded that the dietary study on marine birds and mammals (pinnipeds and cetaceans) would contribute to ecosystem monitoring in the North Pacific.

It is suggested that the same type of study be done with different species at a ½-day follow-up workshop at PICES XIII (*MBM-AP Endnote 4*). The Panel also proposed that a 1-day Topic Session on oceanographic "hot spots" be convened at PICES XIII (*MBM-AP Endnote 5*).

At the recommendation of the MBM Advisory Panel, Dr. William J. Sydeman (U.S.A.) was approved as the new Co-Chairman for the Panel to replace Dr. Douglas F. Bertram (Canada).

Other issues discussed were: membership for the Panel and funding of some countries to participate in Annual Meetings, mechanisms for contributing information on marine birds and mammals to the North Pacific Ecosystem Status Report, sharing data on the PICES web site, and exchanging observers with the International Whaling Commission (IWC). Dr. Kato was recommended as the PICES observer at the next IWC Annual Meeting.

Progress report of Advisory Panel on *Iron fertilization experiment in the North Pacific* (Agenda Item 4c)

Dr. Harrison presented an overview of the IFEP-AP activities. The Eastern Subarctic Pacific iron enrichment study at Station P (SERIES-2002) was discussed at the interim meeting held in March 2003, in Sidney, Canada. Phase I of the mesoscale iron enrichment study in the Western Subarctic Pacific was completed in 2001 (SEEDS-2001), and the Phase II study in this region will be in July 2004 (SEEDS-2004). A 3-day PICES IFEP workshop on "*In situ* iron enrichment experiments in the Eastern and Western Subarctic Pacific" will be held February 10-12, 2004, in Sidney, Canada. Specific objectives of the workshop are *(i)* to synthesize results from two recent *in situ* iron enrichment experiments in the Subarctic Pacific (SEEDS-2001 and SERIES-2002); *(ii)* to determine similarity and differences in

biogeochemical and ecosystem responses to iron addition between the Eastern and Western Subarctic Pacific; and *(iii)* to identify specific scientific questions for the longer-term experiment in the Western Subarctic Pacific (SEEDS-2004). A 1.5-day joint Canadian-SOLAS/PICES IFEP session on "Response of the upper ocean to mesoscale iron enrichment" will be convened February 17-18, 2004, at the ASLO/TOS Ocean Research Conference in Honolulu, U.S.A.

Proposals for new subsidiary bodies (Agenda Item 4d)

BIO will not be sponsoring a Working Group after this year. WG 14 on *Effective sampling of micronekton* will complete its task with the scientific report preparation by the end of the year, and has been transformed into the Advisory Panel on *Micronekton inter-calibration experiment* to continue this work. An opportunity to organize a new Working Group was discussed. Dr. Radchenko mentioned that a new Working Group could be formed together with other Committees or the CCCC Task Teams. However, the Terms of Reference draft and a list of potential members are the minimum necessary for fruitful discussion. Such suggestions can also be regarded as the source of Topic Session proposals for BIO for the next Annual Meeting. However, nobody from Committee members expressed any idea on potential issues that a new Working Group might address.

From other Committees, a draft proposal for a Working Group on *Marine aquaculture* was prepared by MEQ and FIS, and distributed by e-mail before the meeting. Another proposal was a joint Working Group on *Ecosystem-based management*. The Terms of Reference of these Working Groups must be preceded by the corresponding Topic Sessions at PICES XII. To discuss these more fully, BIO decided that it was necessary to have written summaries on new Working Groups provided to Committee members before the meeting. It was agreed that BIO is unable to decide at this time but may join the proposed Working Groups later, if they are established and work successfully.

Programs of scientific sessions supported by BIO (Agenda item 5)

Dr. Michael J. Dagg reviewed the program of the POC/BIO Topic Session (S2) on "Physical and biological responses of coastal ocean ecosystems and estuaries to inputs of freshwater". The session would include 12 oral and 10 poster presentations by scientists from five PICES countries: Canada, China, Korea, Russia, and the United States.

Dr. Mackas reviewed the program of the BIO/POC/CCCC Topic Session (S6) on "Latitudinal differences in the responses of productivity and recruitment of marine organisms to physical variability". There would be 2 invited and 32 contributed papers to cover a wide range of spatial scales and processes.

Dr. Radchenko reviewed the program of the MEQ/BIO/FIS Topic Session (S10) on "Ecosystem-based management science and its application to the North Pacific". The session would consist of 17 talks and 4 posters presented by scientists from all PICES member countries.

No information was presented from conveners or BIO Committee members on the MEQ/BIO Topic Session (S4) on "Aquaculture in the ocean ecosystem".

Summaries of the sessions are included elsewhere in this Annual Report.

Science Board recommended that the BIO Best Presentation Award be chosen from the BIO/POC/CCCC Topic Session (S6) presenters.

Topic Session proposals for PICES XIII (Agenda Item 6)

Several potential themes were listed for Topic Sessions at PICES XIII. In order of priority it was agreed by the Committee:

- A ½-day BIO Paper Session; recommended convener: Dr. Vladimir I. Radchenko.
- A 1-day BIO Topic Session on "Mechanisms that regulate North Pacific ecosystems: bottom-up, top-down, or something else?" (*BIO Endnote 5*);

recommended convenors: Andrew Trites (Canada), Michio J. Kishi (Japan), Douglas DeMaster and Jeffrey Napp (U.S.A.), and a scientist from the Western Pacific (TBD).

- A ½-day BIO Topic Session on "Role of gelatinous zooplankton in coastal and oceanic ecosystems" (*BIO Endnote 6*); recommended convenors: Richard D. Brodeur (U.S.A.) and an Asian co-convener (TBD).
- A 1-day FIS/BIO Topic Session on "Hot spots and their use by migratory species and top predators in the North Pacific" (*MBM-AP Endnote 5*); recommended convenors: Hidehiro Kato (Japan), William J. Sydeman (U.S.A.) and a convenor from FIS (TBD).

Under mutual agreement, the topic "Natural and anthropogenic influences on pelagic-benthic coupling in coastal systems" was not regarded for the PICES XIII program and moved to 2005 or beyond. Proposals for a joint FIS/BIO Topic Session on "Use of the ocean environment by migratory species", and BIO Topic Sessions on "Biogeochemical processes" and "Regime shift in the low latitudes" were proposed during the meeting but not given a high rating.

It was also reiterated that BIO supports the request by the MBM Advisory Panel to convene a ½-day workshop on "Distribution and diets of marine birds and mammals: Phase II" (*MBM-AP Endnote 4*).

Theme for PICES XIV (Agenda Item 7)

Six overall themes suggested for PICES XIV (October 2005, in Vladivostok, Russia) were discussed and prioritized by voting. Top two priorities selected from the offered list are: (1) North Pacific links to global processes/studies, and (2) Progress in prediction.

North Pacific Ecosystem Status Report (Agenda Item 8)

The Committee was informed that the North Pacific Ecosystem Status report (approx 250 pp.) is close to completion. BIO supports the inclusion of a separate chapter on marine birds and mammals trends, which will be prepared by the MBM Advisory Panel.

Discussion of report from Study Group on *PICES Strategic Issues* (Agenda Item 9)

A draft of the PICES Strategic Plan (Vision Statement) was prepared by the Study Group on *PICES Strategic Issues* and distributed before the meeting. This document designates the PICES Mission with five central themes: (A) Building a foundation of science; (B) Producing the scientific basis for decision-making; (C) Fostering partnerships; (D) The added value of PICES; and (E) Informing the public; and specific goals, identified within each of these themes. It also includes an implementation strategy with several next steps. Under these implementation measures, the PICES Governing Council will prepare an Action Plan that looks ahead to at least three years. This plan will develop an approach on how to: *(i)* meet needs of member countries; *(ii)* increase value of PICES activities to support research; *(iii)* strengthen support of cooperative programs of PICES; *(iv)* provide opportunity for PICES initiatives; *(v)* attract the interest of excellent scientists; and *(vi)* contribute to better participation in PICES activities.

The linkage between the developing BIO Strategic Plan and the PICES Vision Statement was briefly presented by Dr. Radchenko. Because of time constraints, it was agreed that BIO members should discuss this further via e-mail.

Discussion of report from Study Group on *PICES Capacity Building* (Agenda Item 10)

Dr. Harrison reported on the PICES strategy for capacity building recommended by the Study Group (*SB Endnote 7*). Four proposed elements were discussed: *(i)* training and education; *(ii)* sharing of methodologies, management and data; *(iii)* enhancement of participation in PICES activities; and *(iv)* funding for expanded PICES activities. Comments to Science Board are requested by November 30, 2003.

Identifying future major PICES programs (Agenda item 11)

Dr. Makoto Kashiwai gave a presentation on the need for future major programs for PICES. This material was preliminary published in PICES Press Vol. 11, No. 2. The CCCC Program is entering its synthesis phase, and PICES needs to discuss and determine what will replace it. The BIO members were encouraged to present ideas, in particular on the leading role of the North Pacific Ecosystem Status Report in this process.

PICES web site revisions – information for BIO web page (Agenda item 12)

Ms. Julia Yazvenko (PICES Secretariat) reported on the development of the new PICES web site. Each Committee will have a separate page on this new site. Dr. Hidehiro Kato was nominated as the contact person on scientific content for the BIO web page.

Relations with other international organizations/programs (Agenda item 13)

A listing was made of international programs or organizations that PICES is collaborating with, including SCOR, GLOBEC, SOLAS, GEOHAB and IMBER. It was emphasized that the recent Zooplankton Production Symposium in Spain, jointly sponsored by PICES, GLOBEC and ICES, is an excellent example of how successful our collaborative efforts can be. PICES cooperation with NPAFC, including the field BASIS program, was also recognized as an important issue of scientific development in the North Pacific.

Items with financial implications (Agenda item 14)

Inter-sessional meetings

- A 3-day IFEP Workshop on "*In situ* iron enrichment experiments in the Eastern and Western Subarctic Pacific" to be held February 11-13, 2004, in Sidney, Canada.

Requests for travel funding

- 2 invited speakers for PICES XIII: 1 for the Topic Session on "Mechanisms that regulate North Pacific ecosystems: Bottom-up, top-down, or something else?" and 1 for the Topic Session on "Role of gelatinous zooplankton in coastal and oceanic ecosystems";
- 1 Russian scientist to attend the MBM-AP Workshop on "Distribution and diets of marine birds and mammals: Phase II" to be held in conjunction with PICES XIII.

Publications

- Final report of WG 14 to be published in the PICES Scientific Report Series in 2004;
- Collection of papers from the 2002 BIO Topic Session to be published as a special issue of *Journal of Marine Systems* on "The importance of biophysical coupling in concentrating marine organisms around shallow topographies" in 2004;
- Summary of the workshop to identify global synchrony in fluctuations of zooplankton population (if approved) to be published in the PICES Scientific Report Series in 2005.

Best Presentation Award (Agenda Item 15)

Sachihiko Itoh (Japan) won the BIO Best Presentation Award for his paper (co-authored by T. Sugimoto) entitled "Effect of eddy transport and blocking on migration of small pelagic fishes" at the BIO/POC/CCCC Topic Session (S6) on "Latitudinal differences in the responses of productivity and recruitment of marine organisms to physical variability".

Other business (Agenda Item 16)

PICES/CLIVAR Workshop

Dr. Kelvin Richards reported on the joint PICES/CLIVAR workshop on "Scale interaction of climate and biogeochemical systems" to be held next year at PICES XIII (*POC Endnote 5*). BIO members were requested to help with organizing the workshop. The Committee encouraged members with the necessary expertise to serve for achievement of planned workshop goals.

Request for advice from the United States

Committee members were asked to review and comment on the request for scientific advice

submitted to PICES Chairman Dr. Vera Alexander by the US delegate Dr. Richard Marasco. BIO recognized the high importance of the successful accomplishment of such a task (to study arisen questions and prepare detailed report), and recommended the establishment of a Study Group for the job. Dr. Mackas was nominated as a BIO representative on this group.

Preparation of report to Science Board (Agenda Item 17)

Dr. Radchenko expressed his great appreciation to Dr. Dagg who served as the rapporteur of the meeting.

Meeting was adjourned at 7:40 p.m.

BIO Endnote 1

Participation List

Members:

Richard D. Brodeur (U.S.A.)
Michael J. Dagg (U.S.A., Rapporteur)
Paul J. Harrison (Canada)
Tsutomu Ikeda (Japan)
Hidehiro Kato (Japan)
Woong-Seo Kim (Korea)
Michio J. Kishi (Japan)
David L. Mackas (Canada)
Angelica Peña (Canada)
Vladimir I. Radchenko (Russia, Chairman)
Sinjae Yoo (Korea)
Ming-Yuan Zhu (China)

Observers:

Vera Alexander (PICES Chairman)
George L. Hunt (U.S.A.)
Guennady A. Kantakov (Russia)
Makoto Kashiwai (Japan)
Elena M. Latkovskaya (Russia)
Jeffrey M. Napp (U.S.A.)
Svetlana V. Naydenko (Russia)
Sachi Ohki (Japan)
R. Ian Perry (Science Board Chairman)
Kelvin Richards (U.S.A., CLIVAR)
Michael P. Seki (U.S.A.)
Anatoly Yu. Semenchenko (Russia)
Thomas C. Wainwright (U.S.A.)

BIO Endnote 2

BIO Meeting Agenda

1. Welcome and introduction of members
2. Approval of agenda
3. Business from last year's meeting:
   a. Status of proposed publications
   b. Status of proposed interim meetings
4. Progress reports of existing subsidiary bodies and proposals for new subsidiary bodies:
   a. Progress report of Advisory Panel on *Micronekton sampling inter-calibration experiment*
   b. Progress report of Advisory Panel on *Marine bird and mammals*
   c. Progress report of Advisory Panel on *Iron fertilization experiment in the North Pacific*
   d. Proposals for new subsidiary bodies
5. Programs of scientific sessions supported by BIO:
   a. *Physical and biological responses of coastal ocean ecosystems and estuaries to inputs of freshwater* (POC/BIO)
   b. *Aquaculture in the ocean ecosystem* (MEQ/BIO)
   c. *Latitudinal differences in the responses of productivity and recruitment of marine organisms to physical variability* (BIO/POC/CCCC)
   d. *Ecosystem-based management science and its application to the North Pacific* (MEQ/BIO/FIS)
6. Topic session proposals for PICES XIII
7. Theme for PICES XIV
8. North Pacific Ecosystem Status Report
9. Discussion of report from Study Group on *PICES Strategic Issues*

10. Discussion of report from Study Group on *PICES Capacity Building*
11. Identifying future major PICES programs
12. PICES web site revisions
13. Relations with other international organizations/programs
14. Items with financial implications
15. 2003 BIO Best Presentation Award
16. Other business
17. Preparation of report to Science Board

BIO Endnote 3

Progress report of Advisory Panel on *Micronekton sampling gear intercalibration experiment*

Background

While a number of gears are presently being used to sample micronekton in the North Pacific and other parts of the world's oceans, there has been little effort expended in comparing the relative sampling efficiency and selectivity of these gears. At the recommendation of PICES WG 14 on *Effective sampling of micronekton*, a new PICES field effort to evaluate the efficacy of sampling gears and procedures employed by different agencies to sample micronekton in the North Pacific was launched, and the Advisory Panel on *Micronekton sampling gear intercalibration experiment* (MIE-AP) was established at PICES XI to oversee the field program. The first MIE-AP meeting/workshop was convened from 09:00 – 12:15 hours on October 11, 2003, in conjunction with PICES XII.

Workshop summary

This workshop was the first gathering of the MIE-AP members (see *MIE-AP Endnotes 1* for attendance). After short introductions of the participants, a review of the status of the related WG 14 activities (Dr. Richard D. Brodeur), and the project background (Dr. Michael P. Seki), the discussion turned to the goals, objectives, and status of the intercalibration experiment (*MIE-AP Endnote 2*).

The MIE-AP is currently planning to conduct the experiment in two phases: the first cruise in Central North Pacific waters off Hawaii just prior to PICES XIII in Honolulu, and the second cruise in waters of the Bering Sea (or possibly Gulf of Alaska) during the summer of 2005. The Hawaii cruise will serve two purposes: (1) to compare the performance of different types of sampling gears in an oligotrophic subtropical gyre to see how the choice of gear affects our perspective of the micronekton community; and (2) to use the relatively benign sea conditions of the subtropics to evaluate and refine protocols, logistics, and sampling designs. The northern (Bering Sea) leg will sample a much more productive regime and a faunal community of great interest to many in the PICES member countries. Upon completion, an unprecedented attempt to compare the performance of gears within and between the contrasting environments will highlight the MIE-AP effort.

A commitment for a 10-day shiptime aboard the NOAA ship *Oscar Elton Sette* has been acquired in the first two weeks of October 2004 to support the first leg of the experiment, and a short presentation was made on the facilities and capabilities of the research vessel for the initial phase of the experiment. For the northern cruise in 2005, several scenarios involving other platforms were discussed, including: ships involved with the multinational NPAFC's BASIS project in the Bering Sea, Hokkaido University's R/V *Oshoro Maru*, Japan Fisheries Agency's R/V *Kaiyo Maru*, and Hokkaido National Fisheries Research Institute's "new" *Hokko Maru* scheduled for operation in 2005.

Micronekton gears currently in use by PICES member countries were identified for the experiment. Smaller single warp gear-types included the Methot (5 m^2) net, RMT 8+1, fixed frame 4 m^2 beam trawl, and Isaacs-Kidd midwater trawls (IKMT) (1.8 and 3 m varieties). All of these gears can be accommodated on the *Sette* and will be rigged for monitoring depth and temperature in real-time during operations.

For "larger" dual warp stern trawls, considered were the "Stauffer" modified Cobb trawl and the OSU 100 m^2 rope trawl. Russian scientists generally use large commercial pelagic trawls equipped with a small mesh codend liner, but shipping such a large net out of Russia may be problematic. It was decided that inquiries will be made about the availability of a net with similar specifications in the United States for possible use. *Sette*'s Netmind mensuration system will be used for monitoring the stern trawl nets performances in the water.

A number of sampling protocols were addressed. Some of the highlights follow:

- to minimize some of the biases associated with diel sampling time, the order of operations conducted would be rotated from night to night;
- net mesh sizes would be standardized to 1 cm for all gears codends;
- tows will be conducted in a horizontal fashion at a depth to be determined in the field;
- many of the gear are designed to perform optimal at specific towing speeds and will be deployed accordingly;
- tow durations will be determined in the field; concern was expressed over the effect of tow duration on animal damage *vs*. reduction of within tow variability of catch.

Assessment of micronekton resources during the surveys will also use acoustic technologies. Specifically, MIE-AP members conducting acoustic assessments employ the Simrad EK60 equipped with two frequencies (38 and 120 kHz). Other gear-types suggested for consideration included visual methods (*e.g.*, video plankton recorders or cameras to monitor net extrusion), prototype lift nets (*e.g.*, Ocean Friendly design), and concurrent neuston nets. Traditional bongo and ring nets while generally macroplankton nets were also considered for inclusion in the experiment.

An unsuccessful attempt to obtain funding to support the experiment was made to the North Pacific Research Board (NPRB) at last year's request for proposals (RFP). A revised proposal will again be submitted to the current $3 million RFP by December 5, 2003.

Action items were identified for MIE-AP members in the weeks to come including the determination of the number of participants from each country for the cruises (particularly for inclusion in the NPRB proposal), consideration of specimen disposition and preservation requirements, and consideration to sample set replication for ensuring statistical analysis.

It was also recommended that a 1-day workshop be convened at PICES XIII, immediately after the *Sette* cruise, to review preliminary data and findings from the cruise, and discuss the goals, objectives, and status of the inter-calibration experiment and the future field program.

MIE-AP Endnote 1

Participation list

Members:

Richard D. Brodeur (U.S.A.)
Kazushi Miyashita (Japan)
Vadim F. Savinykh (Russia)
Michael P. Seki (Co-Chairman, U.S.A.)
Won Duk Yoon (Korea)

Observers:

Koh Kawaguchi (Japan)
Vladimir I. Radchenko (Russia)
Orio Yamamura (Japan)

MIE-AP Endnote 2

Workshop Agenda

1. Welcome and introductions
2. Status and review of the WG 14 final report
3. Background and Terms of Reference for the Advisory Panel on *Micronekton sampling gear intercalibration experiment*
4. Discussion of experiment logistics, including proposed platform(s), cruise dates, location (region) of survey, participants sampling gears to be included, experiment logistics, protocols, and analysis
5. Status of financial support status including discussion of scenarios in the absence of funding
6. Summary wrap-up and report write-up

BIO Endnote 4

Progress report of Advisory Panel on *Marine birds and mammals*

The third meeting of the Advisory Panel on *Marine birds and mammals* was held from 09:00 - 12:00 hours on October 12, 2003. The Co-Chairman, Dr. Hidehiro Kato, called the meeting to order and welcomed the participants (*MBM-AP Endnote 1*). The Panel reviewed the Terms of Reference (*MBM-AP Endnote 2*), the recommendations from the 2002 Panel meeting, and the draft agenda that was adopted (*MBM-AP Endnote 3*).

Nomination of new Co-Chairman (Agenda Item 3)

Dr. Douglas F. Bertram has stepped down as the MBM-AP Co-Chairman. Although he was not present, Panel members thanked Dr. Bertram for his service. It was noted that his leadership was exemplary and he will be missed. Dr. Kato introduced the circumstances of the previous Chairmanship nomination and suggested the necessity to maintain balance between west and east, and also between taxa. After some discussion, MBM-AP members agreed to nominate Dr. William J. Sydeman to replace Dr. Bertram as the Co-Chairman. Dr. Sydeman indicated that he would be happy to serve in this capacity if his nomination is approved.

Review of MBM-AP Workshop at PICES XII

The MBM-AP Workshop entitled "Combining datasets on distribution and diets of marine birds and mammals" was held October 10, 2003, and attended by 19 scientists. Six oral presentations were made, including 2 talks on marine birds, 3 talks on marine mammals, and a brief overview of how to investigate predator behavior in the marine environment. The summary of the workshop is included elsewhere in this Annual Report. Presentations and associated discussions reveled the following:

- Diet composition of birds and mammals varied between the Western and Eastern North Pacific;
- Diet composition of top predators has switched dramatically at decadal levels, probably related to regime shift;
- Marine birds and mammals can be used as ecosystem indicators;
- There is a "hot spot" at about 40ºN, 160ºE, supported by higher chlorophyll concentration and probably also by other oceanographic factors, where marine birds and mammals are abundant.

Workshop and Topic Session proposals for PICES XIII (Agenda Item 5)

Reviewing the results of this year's MBM-AP Workshop, the participants recommend that a ½-day follow-up workshop on "Distribution and diets of marine birds and mammals: Phase II" (*MBM-AP Endnote 4*) and a 1-day Topic Session on "Hot spots and their use by migratory species and top predators in the North Pacific" (*MBM-AP Endnote 5*) be convened at PICES XIII.

Membership for MBM-AP (Agenda Item 6)

Participation of scientists from PICES member countries in MBM-AP activities was discussed.

It was recommended that recruitment of Panel members from all PICES nations should be given high priority and that member countries should be requested to provide travel support for marine bird and mammal scientists to attend PICES Annual Meetings.

Cooperation with International Whaling Commission (Agenda Item 7)

Relations with the International Whaling Commission (IWC) were discussed and Dr. Hidehiro Kato was recommended as the PICES observer to the IWC.

Other business (Agenda Item 8)

The participants discussed the draft North Pacific Ecosystem Status Report (NPESR). It was recommended that Panel members and observers with expertise in particular regions of the North Pacific Ocean review the draft report and provide comments to the MBM-AP Co-Chairmen, which will then be synthesized and forwarded to the NPESR Working Group.

MBM-AP Endnote 1

Participation List

Members

Hidehiro Kato (Japan)
Zung G. Kim (Korea)
Thomas R. Loughlin (U.S.A.)
William J. Sydeman (U.S.A.)
Yutaka Watanuki (Japan)

Observers

George L. Hunt (U.S.A.)
Rolf Ream (U.S.A.)
Tsutomu Tamura (Japan)
Julie Thayer (U.S.A.)

MBM-AP Endnote 2

Terms of Reference

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

MBM-AP Endnote 3

MBM-AP Meeting Agenda

1. Address of welcome
2. Adoption of agenda
3. Nomination of new Co-Chairman
4. Review of Workshop on "Combining data sets on distributions and diets of marine birds and mammals" at PICES XII
5. Workshop and Topic Session proposals for PICES XIII
6. Membership for MBM-AP
7. Cooperation with International Whaling Commission
8. Other business

MBM-AP Endnote 4

Proposal for a ½-day MBM-AP Workshop at PICES XIII on
"Distribution and diets of marine birds and mammals: Phase II"

The MBM-AP Workshop on "Combining data sets on distributions and diets of marine birds and mammals" at PICES XII led to enhanced knowledge of relations of marine birds and mammals and the environment. Continuation of this workshop would further our understanding of coupled climate-ecosystem fluctuations in the North Pacific Ocean. The PICES Advisory Panel on *Marine birds and mammals* identified four species (2 birds and 2 mammals) with extensive spatial and temporal datasets on food habits and prey characteristics, which are not reviewed at PICES XII and could be examined. Species of interest include: Dall's porpoise, northern fur seal, common murre and Cassin's auklet (a planktivorous seabird). Reports on other species that have appropriate time series are also welcome.

Recommended convenors: Hidehiro Kato (Japan) and William J. Sydeman (U.S.A.)

Travel support is requested for at least one scientist who will make the key presentation at the workshop.

MBM-AP Endnote 5

Proposal for a 1-day Topic Session at PICES XIII on
"Hot spots and their use by migratory species and top predators in the North Pacific"

Through discussion at the MBM-AP Workshop at PICES XII on "Combining data sets on distributions and diets of marine birds and mammals", some "hot spots" in which cetaceans, pinnipeds and sea birds are abundant were identified. Oceanographic, nutritional and topographical conditions might support such hot spots. It was envisioned that this Topic Session could take advantage of long-term fisheries oceanography programs where the dispersion of top predators has been surveyed, as well as the advances in satellite technology, which has resulted in extensive novel information on the use of oceanographic habitats by top predators. The session would open with a review of persistent oceanographic habitats that may be used by top predators.

Recommended conveners: Hidehiro Kato (Japan) and William J. Sydeman (USA). FIS and POC are to be approached to co-sponsor the session and nominate convenors.

If the proposal is not accepted for PICES XIII, we suggest convening this session at PICES XIV in 2005.

BIO Endnote 6

Proposal for a 1-day BIO Topic Session at PICES XIII on
"Mechanisms that regulate North Pacific ecosystems: Bottom up, top down, or something else?"

Within the PICES region, dramatic changes have been observed in the past 50 years in the structure and function of marine ecosystems. In an effort to understand what caused these changes, various hypotheses have been proposed as controlling mechanisms for entire ecosystems or for particular components of the ecosystems (*e.g.* fish stocks and apex predators). Each of the hypotheses (*e.g.* trophic cascade, oscillating control, nutritional stress, and regime shift) has at its core a fundamental assumption that control is the result of bottom-up, top-down, or a wasp waist trophic pyramid restriction. Is it really that simple? Are these hypotheses testable? Will they lead us to a predictive capability?

We propose a Topic Session to critically examine these hypotheses, as applied to

ecosystems and important marine populations from the western and eastern North Pacific Ocean. The goal is to review, based on observations and model results, the basic assumption (source of control), and to evaluate the strength and weaknesses of the individual hypothesis. The session will also discuss how the different control mechanisms might affect the ability of managers to maintain sustainable fisheries in the region. The possibility of publishing the results in a special issue of a leading international journal will be explored.

The sponsors of this proposal and possible convenors are: Andrew Trites (Canada), Michio J. Kishi (Japan), and George L. Hunt and Douglas DeMaster (U.S.A.). A fifth convener from Asia will be desirable.

Travel support is requested for two invited speakers, at least one of which will be outside the PICES region.

BIO Endnote 6

Proposal for a ½-day BIO Topic Session at PICES XIII on
"Role of gelatinous zooplankton in coastal and oceanic ecosystems"

Recent increases in gelatinous zooplankton in a number of ecosystems in the North Pacific and elsewhere have demonstrated the potential importance of these organisms in energy transfer in coastal and oceanic environments. Gelatinous zooplankton exhibit rapid individual and population growth rates and have been shown to be major consumers of phytoplankton, zooplankton and early life stages of fishes. They are competitors with adult fishes and serve as conduits of energy transfer to the deep ocean. Despite their importance to the ecosystem, there are substantial gaps in our knowledge of basic life history, ecology and environmental responses even for many of the dominant species. This session will bring together information on such diverse gelatinous taxa as cnidarians, ctenophores, siphonophores, salps, and appendicularians, and examine their role in marine ecosystems and their responses to variable environmental conditions.

Recommended conveners: Richard D. Brodeur (U.S.A.) and a Japanese scientist (TBD).

Travel support is requested for two invited speakers.

REPORT OF FISHERY SCIENCE COMMITTEE

The meeting of the Fishery Science Committee (FIS) was held from 14:30-18:45 hours on October 12, 2003. The Chairman, Dr. Yukimasa Ishida, called the meeting to order and welcomed the participants. The meeting was attended by 12 FIS members and 17 observers representing all PICES member countries (*FIS Endnote 1*), and Dr. Jacquelynne R. King kindly served as rapporteur.

The Chairman reviewed the original agenda (*FIS Endnote 2*) and noted several modifications as follows. Decisions on agenda item 6 (Report from Study Group on *PICES Strategic Issues*) and agenda item 7 (North Pacific Ecosystem Status Report) were deferred to allow Committee members to read and comment on these reports by the end of November. Also, agenda item 8 (Report from Study Group on *PICES Capacity Building*) was deferred to allow the members to read and comment on this report by October 16 during this Annual Meeting. Agenda item 9 (Steps towards next major PICES scientific programs) and agenda item 14 (PICES XIV theme) were not discussed in detail, but the information was provided for future consideration.

Implementation of PICES XI decisions (Agenda Item 3)

At PICES XII, FIS co-sponsored three scientific sessions: a 1-day MEQ/BIO/FIS Topic Session on "Ecosystem-based management in the North Pacific"; a ½-day FIS Topic Session (jointly with EASEC) on "Management of eel resources"; and a ½-day FIS Paper Session. Summaries of the sessions are included elsewhere in this Annual Report.

The FIS Topic Session on "The role of sharks in marine ecosystems of the North Pacific Ocean" was cancelled due to the low number of submitted papers. Instead, some shark papers were presented during the FIS Paper Session.

Progress report of WG 16 on *Climate change and fisheries management* (Agenda Item 4)

Working Group 16 met on October 11, 2003, and had a successful meeting (*FIS Endnote 3*). The Working Group heard reports from Canada, China, Japan and Russia. Documented reports will be received shortly and will provide a useful base for the final report. The Working Group Co-Chairmen, Drs. Richard J. Beamish and Akihiko Yatsu, will compile and distribute a draft WG 16 report by the end of February. If a consensus cannot be reached regarding the content, it will be noted in the report. A report has not yet been received from the United States; however if one is not received, there is existing literature that will allow WG 16 to integrate information into their final report. The final report will be presented at the PICES Thirteenth Annual Meeting with the expectation that the final report will be ready for publication by the end of 2004. The Working Group agreed that before the report is published, it will be sent to NPAFC for review and comment, because the report includes salmon. Working Group members also agreed to present the summary report at meetings of other organizations (*e.g.*, ICES). The report may serve as a template for organizations concerned with effect of climate change on shifts in fish production and fisheries management. Financial support is only required for publication of the final report, and funds will not be needed until the 2005 fiscal year.

Proposals for new Working Groups (Agenda Item 5)

Joint Working Group on *Ecosystem-based management*

Dr. Glen Jamieson presented a proposal for a joint MEQ/FIS Working Group on *Ecosystem-based management science and its application to the North Pacific* and provided tentative Terms of Reference. The proposed Working Group has a broader definition than simply

fisheries management applications. During discussion of this proposal, Canada asked whether there were any examples of ecosystem-based management recently in place in the Pacific. There are currently no such examples, but North American governments have mandates to develop this approach. The United States suggested that Objective 1 in the proposed deliverables should include the development of a definition of ecosystem-based management, or at least making comparisons among existing definitions. Japan noted that effluent (particularly BOD) from aquaculture and its effect on benthic invertebrates is an important problem posed by aquaculture, and they would like to see inclusion of such problems in ecosystem-based management approaches. The United States stated that ecosystem-based management does involve all processes, including anthropogenic influences, in the marine environment. Russia mentioned that production of lower trophic levels, such as zooplankton and myctophids, are often omitted from discussions of ecosystem-based management, and that maintenance of biodiversity and sustainable populations should include consideration of lower trophic levels. Korea supported the establishment of a Working Group. Japan noted that since the topic is very broad and complicated, FIS should focus this Working Group more on fisheries management related issues. Japan also suggested that in order to move away from single species stock assessment, the inclusion of predator-prey relationships into multi-species stock assessments is required, and this is the direction of interest to Japan on ecosystem-based management topics.

After a lengthy discussion, FIS decided that a joint Working Group should be established, and the first task should be to collect and review existing information on ecosystem-based management in PICES member countries, and use the review to refine and focus the Terms of Reference. The originally proposed Terms of Reference were further discussed and revised following the discussion at the MEQ/BIO/FIS Topic Session on "Ecosystem-based management science and its application to the North Pacific" (see *MEQ Endnote 5*).

Joint Working Group on A*quaculture*

At the interim Science Board meeting, MEQ and FIS were asked to lead a discussion on forming a Working Group on the scientific issues of aquaculture. An initial proposal for a Working Group on "Aquaculture in the North Pacific – ecological assessment of risks and benefits" were reviewed by the Committee.

Dr. Ishida asked Committee members to comment on the appropriateness of aquaculture as a topic of interest for FIS, noting that a session on "Aquaculture in the ocean ecosystem" at PICES XII was sponsored by MEQ and BIO. The US members reminded the Committee that the Working Group on aquaculture was initially proposed by MEQ, but it was suggested that FIS also be included. If aquaculture involves ocean ranching, then CCCC should also be added as a sponsor. It was suggested that on the western side of the Pacific, ocean ranching is extremely important, and it should be included in the definition of aquaculture.

Reviewing the proposal, FIS noted that the focus of the Working Group would be marine and estuarine waters only, and not freshwater aquaculture. The explicit statement of marine or estuarine is missing from the Terms of Reference. Canada suggested that the demand for marine production will continue to increase, so aquaculture is a topic in which FIS should be involved. Korea agreed that it is an important topic of their interest. Dr. Ishida mentioned that salmon ocean ranching is a topic of interest to NPAFC, and that potential overlap and duplication should be avoided, so as to use limited research resources efficiently. In Japan, there are recent collaborations between agencies on aquaculture and there are developing issues with regards to many types of aquaculture that are not evident at this time. More time to make a decision on a Working Group would be appropriate for Japan.

In the interim, Canada recommended that a smaller MEQ/FIS study group undertake the drafting of the Terms of Reference for consideration in the future by PICES. It was suggested that the Terms of Reference be

presented at the interim Science Board meeting, so that initiation of the Working Group would not be delayed for a full year. Canada further proposed, and it was accepted by the Committee, that the study group meet after the aquaculture session to be held on October 14, to develop Terms of Reference that can be circulated to FIS members before the end of this Annual Meeting. This small group must include Asian scientists, so presenters from the aquaculture session should be asked to attend. The Terms of Reference prepared following recommendations from the aquaculture session can be found in *MEQ Endnote 6*. Discussion at this session also identified scientific issues to be considered in carrying out the Terms of Reference. These scientific issues are included in the summary of the session that is presented elsewhere in this Annual Report.

FIS agreed to support the establishment of the joint MEQ/FIS Working Group on aquaculture.

PICES web site revisions – information for FIS web page (Agenda Item 10)

Ms. Julia Yazvenko (PICES Secretariat) demonstrated the new PICES web site. Each group will have a separate page on this new site, and information was requested from FIS to post on the Committee's web page. The FIS Chairman will work with the PICES Secretariat to provide information to fit the proposed template, and will seek assistance from other FIS members as needed by e-mail.

Proposals with financial implications (Agenda Item 11)

Inter-sessional meetings
No inter-sessional meetings are proposed between PICES XII and PICES XIII.

Requests for travel support
FIS expects that funds (~CDN $5,000) will be available for invited speakers of FIS-supported Topic Sessions at PICES XIII.

Publications
There are no publications proposed for 2004. It is expected that the final report of WG 16 will be completed by the end of 2004, and published in the PICES Scientific Report Series in 2005.

Co-sponsored meetings and relationships with other organizations (Agenda Item 12)

Discussion was focused on relations with the North Pacific Anadromous Fish Commission (NPAFC). FIS supported the recommendation that *(i)* PICES issue a "formal invitation" to NPAFC to present a report on the status of North Pacific salmon at each PICES Annual Meeting (the most appropriate venue within PICES for presentation of this report was left for discussion in PICES); and *(ii)* NPAFC consider an invitation to PICES to present the North Pacific Ecosystem Status Report at NPAFC Annual Meeting. In addition, there is a proposal for a joint PICES-NPAFC symposium with the working title "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems" to be convened in 2005, in conjunction with the NPAFC Annual Meeting. Dr. Ishida suggested that given the focus of the symposium is salmon, NPAFC should take a leading role for this meeting. FIS supported the intent of the proposed symposium.

Topic Session and workshop proposals for PICES XIII (Agenda Item 14)

Nine proposals were considered:

1) *Sardines in the North Pacific Ocean: What we know after a century of variability and where do we go from here?* (FIS/BIO; BASS/REX; GLOBEC)
   Canada questioned whether this topic has adequate new information to warrant a 1-day session and to draw sufficient interest. The BASS Task Team Co-Chairman noted that the Task Team also had similar concerns and as such pared down the proposal to incorporate it into a workshop on their interests. China and Korea agreed that a focus on one species is too narrow and that including other species would be more appropriate. The Committee did not support this topic as a FIS-sponsored session.

2) *Top-down versus bottom-up control of the Bering Sea: What really drives the*

ecosystem?
The Committee suggested that this theme requires integration with other committees and has a lower priority as a FIS Topic Session.

3) *Application of Global Observing Systems to physics, fisheries and ecosystems* (POC/FIS/CCCC)
The Committee concluded that it may be too early to be able to link Global Observing Systems to fisheries.

4) *CCCC, GLOBEC, and GLOBEC-like results: First steps toward a synthesis of the impacts of large-scale climate change on North Pacific marine ecosystems* (CCCC/FIS)
The Committee suggested that this topic is more appropriate for a Science Board Symposium.

5) *Scale interactions of climate and biochemical systems: what do we need to get right?* (PICES/CLIVAR Workshop)
The Committee agreed that this workshop should be endorsed by FIS, but is not appropriate as a FIS Topic Session.

6) *Use of the ocean environment by migratory species* (FIS/BIO)
It was concluded that this topic needs to be more focused, but is of interest to FIS.

7) *Oceanographic hot spots: Common themes for top marine predators* (BIO/FIS)
It was noted that this theme appears to be very similar to the proposed theme on migratory species. FIS recommended that these two topics be integrated in one Topic Session.

8) *Role of sharks in marine ecosystems of the North Pacific* (FIS)
The Committee suggested that this topic could be integrated into the session on migratory species and top marine predators.

9) FIS Open (Paper) Session

Following consideration of all the proposals, the Committee recommended that a ½-day FIS Open (Paper) Session, and a 1-day integrated Topic Session (jointly with BIO) on migratory species and top predators be convened at PICES XIII.

Other issues, including scientific items of interest – member report (Agenda Item 15)

Request for advice from the United States

PICES has received a request for scientific advice on the recent climate-ocean changes observed in the North Pacific in 1998-1999 and their implications for fisheries. This is the first request ever for PICES to provide scientific advice to a member nation. The Committee agreed that this is an extremely important request, and a healthy initiative for PICES to undertake. It was also noted, that while the request was specific to the eastern North Pacific, international expertise is required to provide this advice. As such, the initiative is appropriate for PICES. It was suggested that this topic is important for the Atlantic region as well, and if PICES is able to provide this advice, it will help to develop future collaboration with ICES.

Korea asked for clarification between the scientific advice requested and the task undertaken by Working Group 16. Dr. Beamish acknowledged that there is some overlap, however this request is very specific to examining an event in the late 1990s.

There are six specific questions outlined in the request. FIS felt that all six questions are appropriate. Most of the information that is required to respond to this request is available from PICES experts and from PICES reports. The difficult task will be reaching a consensus on the advice and delivering the report. The process for providing the advice will be determined by PICES and consensus on the advice will not be required, but contrasting opinions will be reflected in the final product.

The process proposed by Science Board is to hold a workshop in June 2004, with the preparation of a draft report following the workshop. The final report will be presented at

the PICES Thirteenth Annual Meeting in October 2004. FIS supported this process and suggested that, as most work will need to be completed before the June 2004 workshop, a Study Group be established by January 2004, with a clear outline of the work required, assigned tasks and timelines.

FIS Best Presentation Award and Poster Award Committee

Following practices of previous years, the convenors of the FIS-sponsored sessions were asked to make the selection. The 2003 FIS Best Presentation Award went to Yuki Minegishi (Ocean Research Institute, University of Tokyo, Japan) for her paper entitled "Definitive identification of all species of the genus *Angguilla* using the complete mitochondrial genome" (co-authored by J. Aoyama, J. Inoue, M. Miya, M. Nishida and K. Tsukamoto).

Dr. Elizabeth A. Logerwell served as a member on the Best Poster Award Committee.

FIS Endnote 1

Participation List

Members

Richard J. Beamish (Canada)
George W. Boehlert (U.S.A.)
Elena P. Dulepova (Russia)
Douglas E. Hay (Canada)
Elizabeth A. Logerwell (U.S.A.)
Yukimasa Ishida (Japan, Chairman)
Gordon H. Kruse (U.S.A.)
Takashi Minami (Japan)
Toshikuni Nakatani (Japan)
Laura Richards (Canada)
Xian-Shin Jin (China)
Chang-Ik Zhang (Korea)

Observers

Vera Alexander (PICES Chairman)
Kerim Aydin (U.S.A.)
Churchill Grimes (U.S.A.)
Glen Jamieson (Canada)
Masahide Kaeriyama (Japan)
Jacquelynne R. King (Canada, Rapporteur)
Richard J. Marasco (U.S.A.)
Gordon A. McFarlane (Canada)
Igor V. Melnikov (Russia)
Yeong Chull Park (Korea)
R. Ian Perry (Science Board Chairman)
Anatoly Semenchenko (Russia)
Michael Schirrippa (U.S.A.)
Akihiko Yatsu (Japan)
Inja Yeon (Korea)
Hak-Yoel You (Korea)
Thomas C. Wainwright (U.S.A.)

FIS Endnote 2

FIS Meeting Agenda

1. Welcome and introduction of new members
2. Approval of agenda
3. Review and discussion of the implementation of PICES XI decisions
4. Report of the WG 16 on *Climate change and fisheries* management
5. Proposals for new Working Groups
   a. Joint FIS/MEQ Working Group on *Ecosystem-based management*
   b. Joint FIS/MEQ Working Group on A*quaculture*
6. Discussion of report from Study Group on *PICES Strategic Issues*
7. Discussion of *North Pacific Ecosystem Status Report*
8. Discussion of report from Study Group on *PICES Capacity Building*
9. Discussion of steps towards next major PICES scientific program(s)

10. PICES web site revisions – information for FIS web page
11. Items with financial implications
    a. Proposed inter-sessional meetings (workshops, working groups, other)
    b. Travel support requests
    c. Proposed publications
12. Co-sponsored meetings and relations with other organizations
13. Topic session proposals for PICES XIII
14. PICES XIV theme
15. Other issues, including scientific items of interest - member reports
16. Draft of report and FIS recommendations to Science Board

FIS Endnote 3

Progress report of Working Group 16
on *Climate change, shifts in fish production, and fisheries management*

The Working Group 16 met from 14:30-18:00 hours on October 11, 2003. The meeting was well attended with 17 participants representing all PICES member countries.

The goal of the meeting was to hear brief reports from each nation and to receive an update on the progress they have made on their final reports. Japan, Russia, China and Canada gave 10-minute presentations updating their information on biology and dynamics of key species, climate variability and potential impacts of climate change over the next 50 to 100 years. Korea will have a draft of their report ready in early November. The United States has not prepared a report, however, other participants felt that if a report is not forthcoming, there are regional reports which can be used in preparing the WG 16 final report. Once final drafts of all reports are received, Dr. Richard Beamish will prepare a draft of the complete report. This report will be distributed to all participants in February 2004 for review. The North Pacific Anadromous Fish Commission will also be invited to review the report because it includes salmon. The final report will be completed and submitted to FIS at PICES XIII in October 2004.

Other discussion focused on how best to disseminate the information contained in the report. Suggestions included:

- publish as a PICES Scientific Report;
- hold a ½-day Topic Session at PICES XIV;
- present at annual meetings of other international organizations (NPAFC, ICES, GLOBEC, etc.).

WG 16 Endnote 1

Participation List

Members

Richard J. Beamish (Canada, Co-Chairman)
Elena P. Dulepova (Russia)
Xian-Shi Jin (China)
Jin Young Kim (Korea)
Suam Kim (Korea)
Jacquelynne R. King (Canada)
Muneharu Tokimura (Japan)
Chang-Ik Zhang (Korea)
Akihiko Yatsu (Japan, Co-Chairman)

Observers

Gordon A. McFarlane (Canada)
Jang-Uk Lee (Korea)
Igor V. Melinikov (Russia)
Svetlana Naydenko (Russia)
Anatoly Velikanov (Russia)
Konstantin Zgurousky (Russia)
David L. Fluharty (U.S.A.)
Karen Hyun (U.S.A.)

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

The meeting of the Marine Environmental Quality Committee (MEQ) was held from 14:30-18:30 hours on October 12, 2003. The Chairman, Dr. John E. Stein, called the meeting to order and welcomed the participants (*MEQ Endnote 1*). The Committee reviewed the draft agenda (*MEQ Endnote 2*), and it was adopted.

Business from last year's meeting (Agenda Item 3)

The special issue of *Marine Environmental Research* (Vol. 57, Nos. 1-2) was presented to members of the Committee. The issue includes 9 papers by authors from 6 PICES member countries, and this publication brings to closure a major project by MEQ to hold a practical workshop involving scientists from all PICES member countries working collaboratively on assessment of marine environmental quality. Although not present, the Committee thanked Dr. Richard F. Addison (Canada), past member and Chairman of MEQ, for his efforts in serving as Guest Editor for the special issue.

Membership and chairmanship of MEQ (Agenda item 4)

Dr. Stein informed the Committee that Dr. Joan Kean-Howie has replaced Mr. Steve Samis as a Canadian member to MEQ; unfortunately at the last minute she was not able to attend PICES XII.

The Committee expressed again its concern that there was no participation in MEQ from China this year, nor has there been for the last few years. There continues to be an overall issue of recruiting full participation in MEQ by all PICES member countries.

This was the third year of Dr. Stein's chairmanship of MEQ, and normally there would be a change in chairmanship. At present there is no candidate to assume chairmanship of MEQ. The Committee requested Dr. Stein to serve for an additional year, and he agreed to do so while the Committee identifies a candidate from the western Pacific. A potential candidate to be the next Chairman of MEQ is Dr. Hideaki Nakata (Japan).

Report from WG 15 on *Ecology of harmful algal blooms in the North Pacific* (Agenda Item 5)

The Acting Chairman of WG 15, Dr. Vera L. Trainer, presented a report of Working Group activities since PICES XI, including their workshop on "Harmful algal blooms – harmonization of data" held October 10-11, 2003, and their meeting on October 11, 2003 (see *MEQ Endnote 3* for details).

At the close of this Annual Meeting, WG 15 will have completed its Terms of Reference. At the request of Science Board, MEQ led an effort to develop a proposal for establishing a Section on *Harmful algal blooms* (see Agenda Item 7).

MEQ inter-sessional activities in 2003 (Agenda Item 6)

Dr. F.J.R. (Max) Taylor (WG 15 Co-Chairman) attended the annual meeting of the ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors* (SGBOSV), and Dr. Stein participated in the annual meeting of the ICES Working Group on *Introductions and transfers of marine organisms* (WGITMO). Both meetings were held in March 2003, in Vancouver, Canada. The purpose was to explore areas of cooperation between ICES and PICES on non-indigenous species. Drs. Taylor and Stein gave presentations on activities of Working Group 15 and the MEQ Committee, respectively. It was agreed that the following are options for initiating collaborative activities on introduced species between the two organizations. To foster exchange of information, members of WGITMO and SGBOSV could participate in scientific sessions

or workshops at PICES Annual Meetings, and representatives of MEQ and WG 15 could attend future meetings of ICES groups. The two organizations could also consider holding a joint workshop or scientific session and discuss whether it would be beneficial to establish a joint Working Group. Specifically, Dr. Stein requested PICES to extend an invitation for a representative of SGBOSV and WGITMO to present a scientific paper at PICES XII in Seoul, Korea. In addition, it was agreed to explore the possibility of developing a joint ICES/PICES session on harmful introductions of phytoplankton at PICES XIII in Honolulu, in 2004 (see *MEQ Endnote 7* below).

MEQ proposals for new subsidiary bodies (Agenda Item 7)

There are proposals for establishing a Section and two new Working Groups.

MEQ Section on *Harmful algal blooms*
The Science Board requested MEQ to develop a proposal describing the roles and responsibilities for a potential MEQ Section on HABs. Inter-sessionally, the Committee developed and reviewed a draft proposal and sought comments on the proposal from scientists involved with HAB activities in other international organizations. At PICES XII, the proposal was revised by Working Group 15 at their workshop. MEQ discussed and accepted the revised proposal (*MEQ Endnote 4*). The Committee strongly endorsed establishing a Section on HABs and requested Science Board to support the proposal.

MEQ/FIS Working Group on *Ecosystem-based management*
Last year, both MEQ and FIS reviewed a proposal for establishing a joint Working Group on ecosystem-based management (see *MEQ Endnote 4* in the 2002 PICES Annual Report, pp. 107-108). Inter-sessionally, the proposal was revised and submitted to both Committees for discussion. At PICES XII, FIS concluded that the current draft Terms of Reference should be less broad and focus more on fisheries management if FIS was to co-sponsor the Working Group. MEQ suggested that there should be further discussion and potential revisions of the Terms of Reference following the Topic Session on "Ecosystem-based management science and its application to the North Pacific" at PICES XII. MEQ recommended that a Working Group should be established, and that the first task should be to review existing information on the subject and use the review to refine and focus the Terms of Reference (*MEQ Endnote 5*).

MEQ/FIS Working Group on *Aquaculture*
At the 2003 interim Science Board/Governing Council meeting, MEQ and FIS were asked to lead a discussion on forming a Working Group on the scientific issues of aquaculture. An initial proposal was developed and discussed in both Committees at PICES XII (*MEQ Endnote 6*).

Proposed Topic Sessions and Workshops for PICES XIII (Agenda Item 8)

The Committee proposed two Topic Sessions and a workshop for PICES XIII:

- A 1-day Topic Session on "Natural and anthropogenic introduction of marine species" (*MEQ Endnote 7*); recommended convenors: William P. Cochlan (U.S.A.) Yasuwo Fukuyo (Japan) and Julia Parrish (U.S.A.). ICES is to be approached to co-sponsor the session.
- A ½-day Topic Session on "Marine Protected Areas" (*MEQ Endnote 8*); recommended convenors: Glen Jamieson (Canada) and a scientist from the western Pacific to be decided.
- A 1-day MEQ Workshop on "Developing a North Pacific HAB data resource II" (*MEQ Endnote 9*); recommended convenors: Vera L. Trainer (U.S.A.) and Hak-Gyoon Kim (Korea). IOC and ICES are to be approached to co-sponsor the workshop.

Theme for PICES XIV (Agenda Item 9)

The Committee suggested that the theme for PICES XIV be "Sustainable use of ocean resources and coastal ecosystems: Land – sea - ocean interactions". This theme seems particularly appropriate for an Annual Meeting in the Russian Far East.

The Committee also noted that at PICES XIV, it would be timely to re-visit the topic of "Ecological effects of oil and gas development". Other potential themes for the MEQ Session are: coastal eutrophication, sediment contamination, and loss and degradation of marine habitat.

MEQ Strategic Plan (Agenda Item 11)

The Committee briefly re-visited changes made to the MEQ Strategic Plan at PICES XI, and agreed that no further changes were needed, particularly since the PICES Strategic Plan was undergoing a major revision.

TCODE meta-database thesaurus (Agenda Item 12)

Committee members had no substantive comments on the list of keywords for the North Pacific Ecosystem Metadatabase assembled by TCODE, but continue to support the efforts to develop a metadatabase.

Report from Study Group on *PICES Strategic Issues* (Agenda Item 13)

The Committee commended the work of the Study Group in producing the draft PICES Strategic Plan (Vision Statement). While MEQ supported themes and goals outlined in the draft, it was concerned that if PICES cannot increase participation by all member countries and the level of funding, progress in implementing all aspects of the plan maybe slow. MEQ and other Committees have been requested to provide their comments by November 30, 2003.

Discussion of *North Pacific Ecosystem Status Report* (Agenda Item 14)

Committee members were requested to review the North Pacific Ecosystem Status Report (NPESR) with particular attention to the *Synthesis* chapter and send comments to the MEQ Chairman by mid-November. The Committee noted that there are many gaps related to MEQ issues, and that as a Committee we need to develop mechanisms to identify the high priority gaps and then find individuals to draft sections for inclusion in the NPSER.

Report from Study Group on *PICES Capacity Building* (Agenda Item 15)

The Committee agreed in general with the recommendations of the report, but was concerned that their effective implementation was dependent on finding additional financial resources. Comments to Science Board are requested by November 30, 2003.

Next major PICES scientific program(s) (Agenda Item 16)

The Committee suggested that the broader ecological issues of harmful algal blooms is a good candidate for being a major scientific program in PICES. HABs are a concern for all PICES countries, and each country has national scientific programs on HABs. There are other international scientific organizations initiating programs on HABs. Both coastal pollution and oceanographic features appear to influence the initiation and progression of HABs but the interaction between anthropogenic and natural factors are not well understood. Coordinated efforts to conduct comparative studies of the ecology and oceanography of HABs could be very useful in understanding processes and mechanisms regulating the initiation and progression of toxic phytoplankton blooms, which is needed to develop models to improve the ability and capacity to forecast HAB events. Ultimately, this would substantively improve the ability of PICES to provide scientific advice to member countries on the trends, prediction, and mitigation of HABs.

ICES Symposium on "Marine bioinvasions" (Agenda Item 17)

ICES has requested PICES to consider co-sponsoring a major 3-day symposium on "Marine bioinvasions" to be held in spring 2006, at a location to be decided on the east coast of the United States (*SB Endnote 9*). MEQ endorses PICES co-sponsorship of the symposium. Bioinvasions is a high priority ecological risk in the North Pacific that has received limited attention by PICES.

PICES web site revisions (Agenda Item 18)

Ms. Julia Yazvenko (PICES Secretariat) demonstrated the features of the new PICES web site. The Committee nominated Dr. Alexander Tkalin to be the point of contact on scientific content for the MEQ page.

Relations with other international organizations (Agenda Item 19)

MEQ requested Ms. Keiko Ide, Deputy Director of the UNEP Northwest Pacific Action Plan (NOWPAP) Special Monitoring and Coastal Environmental Assessment Regional Activity Center (CEARAC), to provide information on NOWPAP/CEARAC activities. She reviewed the structure and goals of NOWPAP and focused on the objectives of the Working Groups to develop assessment tools. Of particular interest was the CEARAC Working Group 3, which is focusing on developing a harmful algal bloom database. MEQ noted that cooperation with NOWPAP would be beneficial to the coordination of efforts to harmonize data on harmful algal blooms.

Items with financial implications (Agenda Item 20)

MEQ requests travel support from the PICES Trust Fund for 1 Russian and 1 Chinese scientist to attend the proposed MEQ Workshop on "Developing a North Pacific HAB data resource – II", and the normal allocation (CND$5,000) for invited speakers for MEQ Topic Sessions.

Best Presentation Award (Agenda Item 21)

Dr. Alexander Tkalin (Russia) agreed to assess the presentations and recommended that the MEQ Best Presentation Award be given to Sung Il Lee (Pukyong National University, Korea) for his paper (co-authored by C.-I. Zhang and J.-M. Kim) entitled "Ecosystem-based management of fisheries resources in the Tongyeong marine ranching area in Korea" at the MEQ/BIO/FIS Session on "Ecosystem-based management science and its application to the North Pacific".

Other items

Request for advice from the United States

This is the first request for scientific advice by a member country to PICES. This request is seeking review of the evidence for, and ecological consequences of, observed climate-ocean changes in the North Pacific in 1999. MEQ agreed that this is an appropriate request and suggested that PICES should provide scientific advice on issues that are of an intermediate temporal nature, such as climate-ocean changes, but should not accept requests for advice that address management issues that are of an annual nature. MEQ also agreed with the process proposed by Science Board to address the request. Although not explicitly stated, MEQ expects that developing the advice, seeking peer review, finalizing and approving the final advice, and publishing the resulting document will be solely the responsibility of Science Board. The Committee recommends Dr. Julia Parrish for the group that will address this issue.

MEQ Endnote 1

Participation List

Members

Tatyana Belan (Russia)
Glen Jamieson (Canada)
Hideaki Nakata (Japan)
Alexander Tkalin (Russia)
John E. Stein (U.S.A., Chairman)
C. Michael Watson (U.S.A.)
Dong-Beom Yang (Korea)

Observers

Vladimir Shulkin (Russia)
Elena Latkovsjaya (Russia)
Keiko Ida (Japan)
Sook Yang Kim (Korea)

MEQ Endnote 2

MEQ Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. Business from last year's meeting
4. Membership and chairmanship of MEQ
5. Report from WG 15 on *Ecology of harmful algal blooms in the North Pacific*
6. 2003 inter-sessional activities – Attendance at ICES Working Group meetings
7. Proposals for new subsidiary bodies
   a. Section on *Harmful algal blooms*
   b. Joint FIS/MEQ Working Group on *Ecosystem-based management*
   c. Joint MEQ/FIS Working Group on *Marine aquaculture*
8. Topic session proposals for PICES XIII
9. Theme for PICES XIV
10. Proposal for a joint PICES/ICES workshop on "harmful bio-invasions"
11. MEQ Strategic Plan
12. TCODE – Discussion of metadatabase thesaurus
13. Discussion of report from Study Group on *PICES Strategic Issues*
14. Discussion of *North Pacific Ecosystem Status Report*
15. Discussion of report from Study Group on *PICES Capacity Building*
16. Discussion of steps towards next major PICES scientific program(s)
17. Discussion of co-sponsoring with ICES a symposium on "Marine bioinvasions"
18. PICES web site revisions – MEQ content
19. Relation with other international organizations/programs
20. Items with financial implications
21. 2003 MEQ Best Presentation Award
22. Preparation of report and recommendations to Science Board

MEQ Endnote 3

Report of Working Group 15 on *Ecology of Harmful Algal Blooms (HABs) in the North Pacific*

The Working Group 15 met from 14:30-18:00 hours on October 11, 2003. The meeting was attended by 20 participants representing all PICES member countries (*WG 15 Endnote 1*). The agenda was approved as presented (*WG 15 Endnote 2*).

Dr. Vera Trainer reported on the successful joint PICES/IOC workshop on "Harmful algal blooms - harmonization of data", held on October 10-11, 2003, in conjunction with PICES XII. The main goal of the workshop was to determine how harmful algal bloom and red tide data could be shared among PICES member countries. The agenda included 11 presentations and an extensive discussion of the benefits and challenges of sharing HAB data. The summary of the workshop can be found elsewhere in this Annual Report. All PICES member countries unanimously decided to adopt the IOC/ICES HAB Metadatabase (HAE-DAT) for a 1-year trial period to further explore the strengths and limitations of this approach. It was agreed that:

- Each country will enter one year's HAB data in the database using a year of their choice;
- Each country will decide which data to enter, or in other words, will decide what constitutes a "problem" HAB in their country;
- Each country will define "regions" for their data entry that could include exact locations or more general areas (*e.g.* prefectures in Japan). This will allow issues of data sensitivity to be overcome;
- Each country will decide on a point person to oversee data entry into HAE-DAT during the next year (a point person was chosen for each country but Canada); and
- For the next PICES Annual Meeting (October 2004, Honolulu, U.S.A.), each country will complete a "report card" describing what worked within the database, types of data that were difficult to deliver (data access issues, etc.), and the overall usefulness of the database.

It was highly recommended that a 1-day follow-up workshop on "Developing a North Pacific HAB data resource - II" be convened at PICES XIII (see *MEQ Endnote 9* for description). IOC and ICES are to be approached to co-sponsor the workshop. The interaction with IOC looks essential to foster PICES/ICES coordination on HAB data harmonization, and Dr. Henrik Enevoldsen should be invited to speak again about improvements to HAE-DAT database at the next meeting. Travel funds are requested for 1 Russian and 1 Chinese scientist who might not otherwise be able to attend the workshop.

It was also recommended that MEQ sponsor a 1-day Topic Session at PICES XIII on "Natural and anthropogenic introduction of marine species" (*MEQ Endnote 7*). ICES is to be approached to co-sponsor the session through the ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors* (SGBOSV) and the ICES Working Group on *Introductions and transfers of marine organisms* (WGITMO). Travel funds are requested from PICES for 2 invited speakers, one to speak about natural introductions and another person to speak about anthropogenic introductions.

Participants discussed the lack of non-"Topic Sessions" at PICES. With the proliferation of topic sessions we may be discouraging the submission of excellent papers to PICES Annual Meetings only because they are outside the topic areas. Rather than having Paper Sessions sponsored by a Committee, it was suggested that a "Hot" Topics/Breakthrough Science" session be held at each annual meeting.

Members of WG 15 continue to strongly endorse the proposal to establish a Harmful Algal Blooms Section under MEQ. The proposal and draft terms of reference for the HAB Section were reviewed, revised and recommended to MEQ for acceptance (*MEQ Endnote 4*). Potential Co-Chairmen for the Section were suggested.

WG 15 Endnote 1

Participation List

Members

William P. Cochlan (U.S.A.)
Yasuwo Fukuyo (Japan)
Paul J. Harrison (Canada)
Ichiro Imai (Japan)
Hak-Gyoon Kim (Korea)
Tatiana Orlova (Russia, Co-Chairman))
Vera L. Trainer (U.S.A., Acting Co-Chairman)
Mark L. Wells (U.S.A.)

Observers

Robin Brown (Canada)
Ming-Yuan Zhu (China)
Henrik Enevoldsen (IOC)
Hee Dong Jeong (Korea)
Sung-Dae Kim (Korea)
Keiko Ide (Japan, NOWPAP/CEARAC)
Muneharu Tokimura (Japan)
Georgiy Meiseenko (Russia)
Igor Shevchenko (Russia)
Nicolaus G. Adams (U.S.A.)
Kimberly Bahl (U.S.A.)
John E. Stein (U.S.A.)

WG 15 Endnote 2

WG 15 Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. HAB scientific presentations:
   - Utilization of inorganic and organic nitrogen by harmful algae: A case study of *Heterosigma Akashiwo* blooms in San

Francisco Bay – by William P. Cochlan and Julian Herndon
- Iron limitation of natural phytoplankton assemblages associated with the Pacific Northwest ECOHAB *Pseudo-nitzschia* blooms – by Mark J. Wells, William P. Cochlan and Charles G. Trick

4. National reports on harmful algal blooms
5. Summary of the joint WG 15/TCODE workshop on "Harmful algal blooms - harmonization of data"
6. Discussion on the future of harmful algal bloom issues within PICES (stay with modified TOR? new WG under MEQ? become a HAB Section under MEQ?)
7. Interactions with other international organizations/programs (GEOHAB, ICES, IOC, NOWPAP, SCOR)
8. Specific funding requests for 2004-2005
9. Adoption of report and recommendations to MEQ Committee

MEQ Endnote 4

Proposal for a Section on *Harmful algal blooms and their impacts*

Background

Harmful algal blooms (HABs) are a global issue, believed to be increasing in magnitude, frequency, and duration. Presently, most coastal countries are influenced by HABs, many with multiple species affecting multiple fisheries and coastal resources. Both toxin-producing and non-toxic algae are known to have harmful effects in PICES member countries. The historical record of events, the discovery of new algal toxins, the transport of toxic phytoplankton to new areas, the apparent relationship of some blooms with human activities, and the increase in economic cost of HABs to coastal regions, all are strong indicators that these events are a systemic ecological phenomenon that may become more severe as coastal human population continues to increase.

Recently, several international efforts have been initiated, highlighting the interest of many nations in increasing their understanding of the ecology and oceanography of HABs and in mitigating the effects of serious events. PICES is the organization that should facilitate and coordinate international efforts on HABs in the North Pacific. In this regard, the Scientific Committee for Ocean Research (SCOR) and the Global Ecology and Oceanography of Harmful Algal Bloom (GEOHAB) programs have recently approved a project on "*HABs in upwelling systems*" and will have an open science meeting on the subject in Lisbon, Portugal, in November 2003. This is an example of the types of meetings that are now occurring, and where representation or co-sponsorship by PICES would be beneficial in facilitating cooperation among scientists of PICES member countries and interactions with these other international scientific programs.

The Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) and Monitoring and Event Response to Harmful Algal Blooms (MERHAB) programs are currently funding research and monitoring projects on the U.S. west coast. This critical mass of research activity in the northeastern Pacific as well as a recent strong interest in HAB programs in other Pacific nations (for example, CEOHAB in China and a Japanese project investigating the use of satellite remote sensing for detection and tracking of HABs in Asia, commonly called the "Red Tide Watcher" project) are motivations for coordinated research efforts in PICES member nations. Funding for international activities is becoming increasingly available. Therefore, one important activity for a proposed HAB Section is to position member nations for research collaborations that can take advantage of infra-structural funding that is developing in each country. PICES activities will be critical in positioning the Pacific HAB community for mainstream research support.

The ecology and oceanography of HABs is a topic where there is also strong mutual interest between PICES and ICES. Currently, ICES has a standing working group dealing with HAB issues, therefore, it would be advantageous to

have a similar group in PICES. Having a standing group in PICES would make collaboration between the two organizations more straightforward and more likely to be sustained and productive.

PICES Working Group 15 on *Ecology of harmful algal blooms in the North Pacific* has identified a number of areas where sustained efforts are needed:

- *The fostering of international collaboration to assist in investigating HABs in ecosystems with common features.* For example, there is a current effort through GEOHAB to support meetings on ecosystem-based subjects. PICES investigators could propose a GEOHAB core project that incorporates systems of interest to their member countries, leading to open science meetings and coordinated research activities within the region.

  SCOR and the GEOHAB Scientific Steering Committee have approved a project on "*HABs in upwelling systems*" (as well as other ecosystems) and are convening Open Science Meetings [OSM] on the subject. Terms of reference for this steering committee, as well as the final document have been developed. The purpose of the OSM will be to review our knowledge of HABs in upwelling systems and to plan a comparative study between the Californian, Iberian and Benguela systems. SCOR will fund the participation of 15 individuals at the OSM, 5 from each of the regions. Because the Californian system is part of the study, PICES could and should be represented at the OSM, and information collected at that meeting should be reported back to the HAB section members. In a similar manner, open science meetings are planned for two other GEOHAB core projects, "*HABs in fjords and enclosed embayments*" and "High biomass HABs in atrophic systems", each of which has great relevance to PICES member countries.

- *The development of interactions between ICES and PICES HAB working groups will take some time to become effective*. Examples of the beginnings of a strong collaboration are:

  Henrik Enevoldsen, from IOC (UNESCO) and ICES HAB working group, requested the PICES Scientific Report No. 23 for inclusion in ICES training courses. This demonstrates the level of maturity of the scientific collaboration in PICES on HABs, and demand for truly global perspectives in addressing the ecological effects, human health risks and prospects for mitigation of HABs.

  The building of a global database on HAB occurrences and impacts is challenging but an extremely important task that will allow a GIS-referenced comparison of HAB problems in similar ecological regions around the world. IOC and ICES are much more advanced in this direction, and their knowledge and experience is valuable to PICES. The workshop on "Harmonization of HAB Data", convened in conjunction with PICES XII, was declared a joint PICES and IOC meeting. Again, this demonstrates the expanding international and global nature of HAB research, and why PICES can serve as the coordinating entity for the North Pacific.

- *Collaboration is required to understand timely the urgent problems in the HAB field*.

  Max Taylor, Co-Chairman of WG 15, attended the annual meeting of the ICES/IOC/IMO Study Group on *Ballast waters and other ship vectors* (SGBOSV) held in March 2003, in Vancouver, Canada. Although PICES has not yet focused on the ballast water question, it is an important and pressing issue that should be a future activity in PICES. Again this is not an issue that can be addressed in the short time frame of a PICES working group; it will require a sustained effort of synthesis and coordination among PICES member countries and with other international organizations. A particularly attractive suggestion was for a joint PICES/ICES

workshop/session on the problem of HAB introductions (*e.g.* ballast water), to be held in conjunction with the next PICES Annual Meeting in Honolulu in 2004. An invitation was extended to the Chairman of the ICES/IOC/IMO Study Group, Stefan Gollasch, to participate as a convenor and/or an invited speaker. This was in accordance with several recommendations by ICES and PICES Executives to encourage interaction between appropriate groups from each organization. WG 15 had also expressed a desire for more interaction in its annual reports.

- *Data harmonization is a long-term problem that cannot be resolved in 1-3 years*.

  There is a strong interest among PICES and ICES member countries to join databases that will help investigators study HAB trends and commonalities among nations. This effort was begun at the WG 15 workshop in October 2001, in Vancouver, Canada. The next step was the workshop on "Harmful algal blooms - harmonization of data", held in October 2003, in Seoul, Korea, in conjunction with PICES XII. The energy and interest in this subject should be supported through continued efforts in the future to harmonize HAB data. Because each country records data in a different way, this problem will take many years to resolve and establish effective data sharing protocols. Without this we will be limited in our ability to discern common elements of HAB event initiation, propagation, and to what extent human activities and climate variability are altering the dynamics of HABs.

- *Funding for international collaboration could be leveraged through PICES support.*

  There are examples of international collaborations in HAB research that are currently being funded. For example, the ECOHAB program is funding Canadian collaborators through the US program in the Pacific Northwest. These Canadian scientists are recognized as specialists in their field who are required for the completion of a comprehensive US research project that affects both member countries, and is most effectively studied in such a collaborative effort.

  A US-EU request for HAB proposals will be released at the end of 2003, jointly by the United States and European Union. This is an exciting opportunity that will fund (through the EU and US National Science Foundation) scientists on the respective sides of the Atlantic to collaborate with scientists researching similar problems. The realization of similar funding for international study across the Pacific could become possible through PICES support.

  Mexico has shown a strong interest in joining PICES in order to collaborate on a number of issues, including HABs. Their participation in a permanent HAB Section in PICES may facilitate their acquisition of internal funds for travel, etc.

In conclusion, WG 15 has made substantive progress in identifying the science needs related to HAB issues that are both common and unique to individual PICES member countries (see PICES Scientific Report No. 23). All PICES member countries and Mexico have significant HAB problems, and similar levels of scientific uncertainty in regard to HABs that are severely limiting the ability to forecast and mitigate HAB events. For these reasons there is keen interest in sharing information from active science and management programs in each PICES member country. In addition, some nations may be able to expand or re-define their research and management programs as a direct result of PICES support and interest. This is the critical time for PICES to begin active participation in the international collaborations that are currently underway. To name a few, IOC, SCOR, ICES and GEOHAB are sponsoring open science forums or workshops on HAB related topics. An international effort through APEC is currently underway to harmonize seafood safety regulations. A proposed MEQ Section on *Harmful algal blooms and their impacts* could effectively join these efforts by co-sponsoring

workshops and conferences on specific topics and by helping to support research collaboration among PICES member countries. This level of coordination and collaboration would be very difficult to achieve and maintain through short-lived working groups. PICES needs a more "visible" and interactive long-term HAB program, and that vehicle is a HAB Section.

Proposed Terms of Reference

1. To develop and implement annual bloom reporting procedures that can be consistent with ICES procedures, and therefore incorporated into HAE-DAT and used to update the North Pacific Ecosystem Status Report. This will be important in assessing impacts of HAB events and as a research tool to understand patterns that will eventually lead to an increased prediction capability.
2. To exchange national reports of HAB incidents and development in order to inform PICES of new toxins, new developments, and new approaches. Both toxin producing and non-toxic (but harmful) algal species should be included.
3. To focus on specific needs for scientific advice among PICES member countries by identifying topics of interest, and providing syntheses of the available scientific information on those selected topics. Example topics for discussion and syntheses might include:
   a. Mitigation practices to reduce the impact of HABs;
   b. Numerical model development of harmful algal bloom initiation and transport for predictions and forecasts;
   c. Relationship between oceanographic processes and HAB formation (*e.g.*, how the physics of nutrients, trace metals tie into bloom formation);
   d. Organism identification using molecular biological techniques;
   e. Discussion of possible changes to certain monitoring techniques (for example, cell numbers vs. toxin levels);
   f. Species introductions including issues of anthropogenic sources (e.g. ballast water) or natural systems (e.g. species range extension).
4. Together with TCODE, to develop a meta-database that describes HAB monitoring and research efforts in each PICES member country.
5. Support the harmonization of methods for identifying HAB species. This could include inter-calibration workshops co-sponsored by PICES and ICES.
6. Development of early warning systems for the detection of HABs. This could include discussion of ocean observing systems and techniques.
7. To educate the community (managers, students) about biology and ecology of HAB organisms. For example, an in-depth study and documentation of selected HAB species ("top ten") could include information about physiology, taxonomy, etc. of each of the species.

Recommended Co-Chairmen: Hak-Gyoon Kim (Korea) and Vera L. Trainer (U.S.A.)

MEQ Endnote 5

Proposal for an MEQ/FIS Working Group on
Ecosystem-based management science and its application to the North Pacific

Proposal: Working Group under MEQ and FIS
Title: Ecosystem-based management science and its application to the North Pacific

Background

Under the overarching objective of conservation of species and habitat, ecosystem-based management (EBM) is the implementation of defined objectives related to maintaining and monitoring the ecosystem features of biodiversity, productivity, and the physical and chemical properties of an ecosystem. EBM is now timely and necessary because *(i)* in many environments, individual ecosystem components

are presently being utilized, harvested or impacted with limited attention to the maintenance of the integrity of the overall ecosystem, and *(ii)* the scale of these impacts is now such that there is real possibility of overall negative ecosystem change to the detriment of human society. This Working Group will develop a synthesis of how PICES member countries are currently addressing the issue of EBM, and make recommendations on how PICES could improve the state of the science that provides the framework for EBM initiatives in PICES countries. This goal for the Working Group is consistent with the actions being currently undertaken by other national and international agencies.

The term 'marine environmental quality' generally refers to an assessment of the state of the marine environment, including conditions resulting from human activities. Both biotic and abiotic environmental impacts thus need to be considered in the context of natural variation in the ecosystem, and where appropriate, management objectives need to be proposed that address defined biological, social and economic EBM objectives. To date within PICES, the Marine Environmental Quality Committee has largely focused on contaminant issues. This proposal would address more completely MEQ's existing mandate, to promote and co-ordinate marine environmental quality and interdisciplinary research in the North Pacific. However, since fishing activities are one of the major human activities occurring in marine ecosystems, co-sponsorship of this Working Group by the FIS Committee would be appropriate and desirable.

In 2001, a Working Group on *Ecosystem considerations in fisheries management* was proposed by FIS (but not established). This Working Group was to incorporate new information on decadal scale shifts in ocean condition, and re-examine interpretations of fishing effects in light of this information. Developing an understanding of both natural variability and the changes arising from fishing on ecosystem characteristics would be part of the proposed Working Group's task, but the task would be broader. The Working Group would focus on how such variability and impacts could be monitored, and would also consider impacts arising from activities other than fishing. Consideration of how biological community organization is being, and can be, effectively and relevantly measured and monitored, is a necessary prerequisite to the meaningful assessment of how organization of a community might be altered by any proposed human activity.

It is suggested that MEQ and FIS are the appropriate leads of the proposed Working Group because of their mandates to investigate marine environmental quality and fisheries issues, respectively. The suggested approach to evaluate EBM will require coordination with a proposed MEQ/FIS Working Group on *Marine aquaculture*, if formed, with potential benefits from close interaction because of the significant scale of aquaculture and its impacts on coastal waters, notably in Asian countries.

<u>Proposed Terms of Reference</u>

1. Provide a summary of EBM definitions and national initiatives to implement or address EBM, and progress that has been achieved in pilot initiatives to date. Describe how each nation is working towards integrating environmental management and fisheries management from a policy/legislative point of view.
2. Briefly summarize EBM initiatives being undertaken elsewhere in the world, and in particular in the North Atlantic and around Australia and the Antarctic. Evaluate the indicators from the 2004 Symposium on "Quantative ecosystem indicators for fisheries management" for usefulness and application to the North Pacific.
3. Describe the ecological boundaries ("eco-regions", "large marine ecosystems") recognized by each PICES member country in which EBM is being, or could be, implemented, including a description of the relationship between these ecological boundaries, existing PICES regions, and national and international management jurisdiction boundaries. Identification of the major impacts and/or threats in each eco-region should be done in order to provide a

basis for the selection of appropriate indicators.

4. Provide recommendations on the science needed to enable EBM initiatives to be more fully implemented by PICES member countries. Recommendations might address, for example, the scientific merits of a common case study site for pilot EBM study; opportunities on how adjacent countries might explore common initiatives in trans-boundary; commonly-defined, eco-region areas; and the organization of topic sessions or workshops to broaden discussion around this complex overall topic.

The Terms of Reference listed above were prepared following a discussion at the MEQ/FIS/BIO Topic Session at PICES XII on "Ecosystem-based management science and its application to the North Pacific". The summary of the session is presented elsewhere in this Annual Report.

Recommended Co-Chairmen: Drs. Glen Jamison (Canada) and Chang-Ik Zhang (Korea).

MEQ Endnote 6

Proposal for an MEQ/FIS Working Group on
Mariculture in the 21st century – The intersection between ecology, socio-economics and production

Proposal: Working Group under MEQ and FIS
Title: Mariculture in the 21st century – The Intersection between ecology, socio-economics and production

Background

Globally the demand for seafood is increasing with projections that aquaculture in the marine environment will provide a steadily increasing proportion of the supply of seafood for human consumption. With this likely growth, aquaculture operations, including ocean ranching, are predicted to expand to additional coastal areas and most probably into the exclusive economic zones (EEZ) of several countries. Scientific progress has been made in: 1) developing standards for conduct of aquaculture operations (environmentally sound aquaculture); 2) exploratory research on the feasibility of offshore mariculture operations; and 3) evaluating the ecological risk and economic benefits from aquaculture in coastal areas and the EEZ. Less attention has been devoted to evaluating aquaculture from an ecosystem perspective. From an ecosystem perspective the questions might be – How should captive and capture fisheries be simultaneously evaluated in the context of fisheries management? What is the energy mass-balance in growth of piscivorous fish in captivity or in the wild? What are the risks and benefits of aquaculture in different marine systems (*e.g.*, coastal zone or EEZ)? What are emerging species for captive culture and what issues do they potentially represent? Another area of interest is the science underpinning harmonization/integration of aquaculture activities with other human activities that occur in the coastal zone under the concept of integrated coastal zone management. For example – What are appropriate analytical approaches to evaluate the siting of aquaculture operations related to other coastal zone management objectives?

Recent publications have called into question the merits of aquaculture, suggesting that there may be ecological or environmental trade-offs. Aquaculture itself is facing some serious problems, such as declining productivity and product quality, as well as ecosystem changes. It is time for PICES to pro-actively review the status and future of aquaculture, bring together what is known, and provide an opportunity for expert opinion on achieving sustainability in this increasingly important segment of world fisheries. The scientific activities in PICES should be on the environmental and ecosystem function, sustainability of production (e.g., carrying capacity of ecosystems), and socio-economics, and not on the technology of aquaculture or specific aspects of nutrition of cultured species. Coordination with the World Aquaculture Society is one avenue to gain

access to that expertise. Coordination with other relevant organizations (*e.g.*, NPAFC) and programs and participation in relevant meetings should be considered as appropriate to avoid duplication.

The suggested approach to evaluate the scientific issues of aquaculture from an ecosystem perspective will require interactions from all standing Scientific Committees in PICES. It is suggested, however, that MEQ and FIS are the appropriate leads of this proposed Working Group with input and advice, and participation by members, if warranted, of BIO and POC.

Additionally, because of the importance of aquaculture to China, Japan and Korea, and the level of scientific research on aquaculture in these countries, PICES scientists from these countries should have a substantive role in the proposed Working Group.

Proposed Terms of Reference

1. Develop an overview of current status and projected trends in aquaculture in marine and estuarine regions of PICES and non-PICES Pacific Rim countries (*e.g.*, India) that substantively contribute to world aquaculture.
2. Compile a list of current and emerging issues with respect to environmental and ecosystem function, sustainability of production (*e.g.*, carrying capacity of ecosystems), and socio-economics.
3. Explore coordination with the World Aquaculture Society and other relevant organizations and programs and participation in relevant meetings as appropriate.
4. Produce an outline for a volume on "Scientific issues for sustainable aquaculture in the PICES region".
5. Convene a workshop, perhaps jointly with the World Aquaculture Society, to explore these issues in detail.
6. Complete report of the results of the workshop as a PICES Scientific Report or "special issue" in a scientific journal or other accepted publication venue.

The Terms of Reference listed above were prepared following recommendations from the MEQ/BIO Topic Session at PICES XII on "Aquaculture in the ocean ecosystem". Discussion at this session also identified scientific issues to be considered in carrying out the Terms of Reference. These scientific issues are included in the summary of the session that is presented elsewhere in this Annual Report.

Recommended Co-Chairmen: Drs. Ik Kyo Chung (Korea), Carolyn Friedman (U.S.A.) and a Chinese scientist (TBD).

MEQ Endnote 7

Proposal for a ½-day MEQ Topic Session at PICES XIII on "Natural and anthropogenic introductions of marine species"

Justification

The Hawaiian Island chain ranks among the richest in flora and fauna, and among the most highly invaded of any archipelago in the world. Because PICES is meeting in Hawaii in 2004, it is appropriate to sponsor a session on species introductions in the marine environment. Further, ICES has recognized the potential serious consequences of species introductions in the marine environment, and has established two Working Groups to address both intentional and unintentional introductions, and is very interested in coordination with PICES. We propose a broad-based session, ranging from phytoplankton to fish, from the tropics to polar systems, and from the estuarine environment to the open ocean. Presentations will include broad overviews, as well as case studies from PICES countries.

Session description

Species introductions are among the most prevalent of human activities affecting natural ecosystems. In the marine environment, introductions, including most aquaculture initiatives, have resulted in both positive and

negative effects. The transport of invasive species such as phytoplankton, is thought to stem from range extensions associated with fluctuating oceanographic conditions (*e.g.*, El Niño), severe storm events (*e.g.*, typhoons), and human activities (*e.g.*, ballast water). The impact of transport processes on species distributional changes in North Pacific waters is not fully understood. Relative to the terrestrial environment, the study of introductions, and the potential for new species to become invasive, is in its infancy in marine systems. Emerging work includes introduction vectors, life history characteristics of invasive species, ocean conditions responsible for invasions, ecosystem resistance to invasion, and potential for eradication or mitigation of introductions once established. This session will seek to answer three fundamental questions: 1) What is known about different transport mechanisms? 2) What is the magnitude of ecological and economic effects arising from the transport of species? and 3) What steps can be taken to minimize real or potential effects of existent and future invasive species ?

Recommended convenors: William P. Cochlan (U.S.A.) Yasuwo Fukuyo (Japan) and Julia Parrish (U.S.A.).

Recommended co-sponsoring organization: ICES

Potential topics for presentations:

- Unintended consequences of aquaculture introductions
- When introductions become invasions: Case studies of aquatic vegetation (Spartina, Caulerpa)
- Re-introduction for restoration – helpful or harmful?
- The introduction of disease
- Influence of ocean conditions and environmental stress on the establishment of introduced species
- Atlantic salmon in Canada: Economic benefit or ecological disaster?
- Life history characteristics of invasive invertebrates

MEQ Endnote 8

Proposal for a ½-day MEQ Topic Session at PICES XIII on "Marine Protected Areas"

Justification

Many marine-focused organizations are considering the implications of marine protected areas (MPAs), and it would seem appropriate that PICES initiate a program that brings together relevant studies in PICES member countries. Hawaii, the site of the next PICES Annual Meeting, has a relatively extensive area protected through MPAs, and a session on MPAs there could be expected to encourage extensive participation by many academic and non-government organizations not presently involved with PICES.

Session description

Marine protected areas (MPAs) are increasingly being recognized as both a fishery management tool and as means to re-establish reference areas of relatively undisturbed biodiversity and productivity. There are proposals to declare substantial (20-30%) portions of all habitats as fully protected as is possible, and some studies suggest that this action may enhance local fisheries. The goals of this session are: *(i)* to review the nature and characteristics of existing and proposed MPAs in PICES countries; *(ii)* to review scientific data as to the utility of MPAs in improving our understanding of marine ecosystems and in fishery enhancement; and *(iii)* to compare experiences with MPAs in both tropical and temperate waters.

Potential convenors: Glen Jamieson (Canada) and a scientist from the western Pacific (TBD)

MEQ Endnote 9

Proposal for a 1-day MEQ Workshop on PICES XIII on "Developing a North Pacific HAB data resource – II"

Harmful Algal Blooms (HABs) are comprised of rapidly growing toxic and non-toxic species, and affect the marine ecology and economy of coastal nations. Monitoring and research activities aimed towards achieving effective predictive and mitigative strategies are underway in each PICES member nation, in many cases dealing with similar organisms or problems. These efforts will benefit from building a common data resource among PICES nations that allow inter-comparison of HAB species composition and the magnitude of environmental and economic impacts. At the joint PICES/IOC Workshop on "Harmful algal blooms – Harmonization of data" (October 2003, Seoul, Korea), representatives from PICES member countries accepted an offer from IOC/ICES to utilize their successful harmful algal event meta-database (HAE-DAT) format on a trial basis. The goal of this workshop is to provide an interim "report card" on the use of this database. The central tasks are: *(i)* to ascertain how well the database process worked; *(ii)* to identify any difficulties in data delivery from member nations; *(iii)* to assess the effectiveness of the interactive web-based window to the developing resource; and *(iv)* to determine if further modifications are needed to encompass unique aspects of Pacific Rim marine resources.

Recommended co-sponsoring organizations: IOC and ICES

Recommended convenors: Hak-Gyoon Kim (Korea) and Vera Trainer (U.S.A.)

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting of the Physical Oceanography and Climate Committee was held from 14:30-18:00 hours on October 12, 2003. The Chairman, Dr. Kuh Kim, called the meeting to order and welcomed members and observers (*POC Endnote 1*). Dr. Michael G. Foreman served as rapporteur. The Committee reviewed and adopted the proposed agenda (*POC Endnote 2*).

Business arising from PICES XI (Agenda Item 3)

- The final report of WG13 on *CO_2 in the North Pacific* was published as PICES Report No. 24. Dr. Andrew G. Dickson gave a brief summary of the report. The Committee thanked Dr. Richard A. Feely for compiling and editing the report and Dr. Yukihiro Nojiri for hosting the several inter-sessional activities.
- Dr. Stewart (Skip) M. McKinnell informed the Committee that 13 manuscripts were accepted for publication in the special issue of *Progress in Oceanography* on "Recent progress in studies of the Japan/East Sea ecosystem" (Guest editors: S. McKinnell, K.-R. Kim, M. Terazaki and A. Bychkov). This volume resulted from the PICES/CREAMS workshop in August 2002, and will be published before PICES XIII.
- Dr. Vyacheslav B. Lobanov reported on the 3rd PICES Workshop on "Okhotsk Sea and adjacent areas", which was co-sponsored by TINRO-Center and Census of Marine Life, and held June 4-6, 2003, in Vladivostok, Russia. There were 5 sessions, and 91 extended abstracts are under consideration for publication as a separate volume in the PICES Scientific Report Series in 2004.
- Dr. Kuh Kim informed the Committee that due to the outbreak of SARS, the 12th PAMS/JECSS workshop was postponed until November 2004.

Progress report of WG 17 on *Biogeochemical data integration and synthesis* (Agenda Item 4a)

The Co-Chairman of WG 17, Dr. Dickson, presented an extensive report of this Working Group activities since PICES XI, including their last meeting on October 10, 2003, and future plans (see *POC Endnote 3* for details).

Progress report of North Pacific Data Buoy Advisory Panel (Agenda Item 4b)

The Technical Coordinator, Mr. Ron McLaren, reviewed the current activities of the Panel (see *POC Endnote* 4 for details).

Science Board issues (Agenda Items 5-7)

Dr. McKinnell gave a summary of the progress of the North Pacific Ecosystem Status Report. This activity is strongly supported by POC. Comments and feedback to Science Board were requested by November 30, 2003.

The Chairman of Science Board, Dr. Ian Perry, informed POC that the PICES Review Committee finished its report and the recommendations were being implemented.

Dr. Perry reviewed the activities of the Study Group on *PICES Strategic Issues* headed by the Chairman of PICES, Dr. Vera Alexander. The first draft report was completed, and POC and other committees were requested to provide their comments to Science Board by November 30, 2003.

POC Strategic Plan (Agenda Item 8)

No further comments were given to the POC Strategic Plan stated earlier and reviewed at last year's Annual Meeting.

Report from Study Group on *PICES Capacity Building* (Agenda Item 9)

The Committee supported the recommendations of the Study Group on *PICES Capacity Building*, but noted that their implementation strongly depends on finding additional financial resources. Comments to Science Board are due to November 30, 2003.

Next major PICES scientific program(s) (Agenda Item 10)

Dr. Lobanov gave a presentation on the need for a third phase of the *Circulation Research in the East Asian Marginal Seas* project, CREAMS-III. CREAMS-I and CREAMS-II comprised mostly of physics and chemistry of the Japan/East Sea, while CREAMS-III will be broader and include biology and fisheries in the region. Scientists from several PICES member countries (Japan, Korea, Russia and U.S.A.) are involved in this research. The Committee suggests that CREAMS-III is an appropriate candidate as a scientific program under PICES.

Dr. Lobanov also proposed a pilot project on implementing a real-time observing system in the western marginal seas, and input was requested from BIO, FIS and MONITOR.

Workshops and Topic Sessions at PICES XIII (Agenda Item 11)

A workshop and two Topic Sessions were proposed for PICES XIII:

- A 2-day PICES/CLIVAR workshop on "Scale interactions of climate and marine ecosystems"; recommended conveners: Kelvin Richards (CLIVAR), Richard J. Beamish (Canada), Kuh Kim (Korea) and a scientist from Japan to be decided (*POC Endnote 5*).
- A 1-day Topic Session on "Application of Global Observing Systems to physics, fisheries and ecosystems"; recommended POC conveners: Michael G. Foreman (Canada) and Vyacheslav B. Lobanov (Russia). BIO, FIS, MEQ and CCCC are to be approached to co-sponsor the session (*POC Endnote 6*).
- A 1-day joint POC/BIO Topic Session on "Impacts of climate change on the carbon cycle in the North Pacific" (*POC Endnote 7*); recommended conveners: Christopher L. Sabine (U.S.A.), Kitack Lee (Korea) and Paul J. Harrison (Canada).

PICES XIV theme (Agenda Item 12)

POC recommends that the theme for PICES XIV be "Mechanism of climate impacts on fisheries and ecosystems for marginal seas".

Relations with international organizations and programs (Agenda Item 13)

- The North-East Asian Regional Global Ocean Observing System (NEAR-GOOS) has been operational since 1996, and involves four PICES member countries (Japan, People's Republic of China, Republic of Korea, and Russian Federation). PICES should actively communicate with scientists in NEAR-GOOS and participate in their meetings, with the idea of broadening the program to an ecosystem-based effort. POC recommends PICES involvement in the NEAR-GOOS Coordinating Committee Meeting to be held in December 2003, in Beijing, and NEAR-GOOS activities at the 6th WESTPAC Symposium to be held in April 2004, in Hangzhou, People's Republic of China.
- NOAA's proposal for a Pacific Coastal Observing System (PaCOS) encompassing the California Current System needs an international collaboration with PICES as the facilitator, as this observing system extends from the northern Vancouver Island to Baja California and involves three countries (Canada, the United States and Mexico). POC strongly supports PICES activities in this direction including a joint PICES/PaCOS/AOOS (Alaskan Ocean Observing System, former Coastal Alaskan Observing System or CAOS) Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" to be held November 17-19, 2003, in Victoria, Canada.

Proposals with financial implications (Agenda Item 14)

Publications

- A special issue on "Recent progress in studies of the Japan/East Sea ecosystem", resulting from the CREAMS/PICES workshop in August 2002, be published in *Progress in Oceanography* in summer 2004;
- "Guide to best practices for oceanic CO_2 measurements and data reporting", prepared by the Working Group 17, be published in 2004 in the PICES Scientific Report Series, with partial financial support from the IOC-SCOR Advisory Panel on *Ocean CO_2*.

Inter-sessional meetings

- Co-sponsor jointly with several Japanese institutes and IOCCP (International Ocean Carbon Coordinated Project) a 4-day workshop on "Ocean surface $p(CO_2)$ database and data integration", to be held January 14-17, 2004, in Tsukuba, Japan (postponed from October 2003) (*POC Endnote 3*);
- Co-sponsor jointly with NOAA and GCP (Global Carbon Project) a 3-day workshop on "Understanding North Pacific carbon cycle change: Data synthesis and modeling", to be held in June 2004, in Seattle, U.S.A. (*POC Endnote 3*);
- Co-sponsor a NEAR-GOOS meeting at the 6th WESTPAC Symposium, to be held April 19-23, 2004, in Hangzhou, People's Republic of China;
- Convene a 3-day CREAMS/PICES workshop on "Japan/East Sea circulation: What we know and how well can we forecast?", in the summer of 2005, near Vladivistok, Russia (*POC Endnote 8*).

Requests for travel funding

- 1-2 scientists to attend the PICES/CLIVAR Workshop on "Scale interactions of climate and marine ecosystems", to be held in October 2004, in conjunction with PICES XIII in Honolulu, U.S.A.;
- 2 invited speakers for PICES XIII: 1 for the Topic Session on "Application of Global Observing Systems to physics, fisheries and ecosystems", and 1 for the Topic Session on "Impacts of climate change on the carbon cycle in the North Pacific";
- 2 scientists to participate in the joint IOCCP/PICES workshop on "Ocean surface $p(CO_2)$ database and data integration" in January 2004;
- 1-2 scientists to participate in the joint NOAA/GCP/PICES workshop on "Understanding North Pacific carbon cycle change: Data synthesis and modeling" in June 2004;
- 1 scientist to attend the NEAR-GOOS meeting at the 6th WESTPAC Symposium in April 2004;
- 2 scientists to attend the CREAMS/PICES workshop on "Japan/East Sea circulation: What we know and how well can we forecast?" in the summer of 2005.

POC Best Presentation Award (Agenda Item 15)

Dr. Sung-Hyun Nam (Seoul National University, Korea) won the POC Best Presentation Award for his paper entitled "The corrections of the high-frequency (2-20 days) fluctuation effects on the TOPEX/POSEIDON altimeter data in the East (Japan) Sea", co-authored by S.-J. Lyu and K. Kim.

Other business (Agenda Item 16)

Request for advice from the United States

Dr. Kuh Kim read a letter from Dr. Richard Marasco, US national delegate to PICES, requesting scientific advice on the issue of recent regime-like changes in conditions in the North Pacific and their implications for fisheries. Dr. Perry suggested forming a Working Group with members from each committee to respond to the letter in a year. The Committee suggests that PICES accept this request. Dr. James Overland was recommended as a POC representative on the proposed Working Group.

PICES web site revisions

Ms. Julia Yazvenko (PICES Secretariat) demonstrated the features of the new PICES web site. The Committee nominated Dr. Foreman to be the point of contact on scientific content for the POC web page.

POC Endnote 1

Participation List

Members

Susan E. Allen (Canada)
Sang-Kyun Byun (Korea)
Michael G. Foreman (Canada, rapporteur)
Kuh Kim (Korea, Chairman)
Vyacheslav B. Lobanov (Russia)
Fan Wang (China)
Ichiro Yasuda (Japan)
Yury I. Zuenko (Russia)

Observers

Liqi Chen (China)
Andrew G. Dickson (U.S.A.)
Stewart M. McKinnell (PICES Secretariat)
Dmitry Kaplunenko (Russia)
Ron McLaren (Canada)
Yutaka Nagata (Japan)
R. Ian Perry (Science Board Chairman)
Kelvin Richards (U.S.A.)

POC Endnote 2

POC Meeting Agenda

1. Welcome and introductions
2. Approval of agenda
3. Completion of PICES XI decisions
4. Reports of existing subsidiary bodies and proposals for new subsidiary bodies
5. Discussion of *North Pacific Ecosystem Status Report*
6. PICES Review Committee Report
7. Discussion of report from Study Group on *PICES Strategic Issues*
8. Review of POC Strategic Plan
9. Discussion of report from Study Group on *PICES Capacity Building*
10. PICES scientific program(s)
11. Planning PICES XIII
12. PICES XIV theme
13. Relation with other international organizations/programs
14. Items with financial implications
15. 2003 POC Best Presentation Award
16. Other business
17. Adoption of POC report to Science Board

POC Endnote 3

Progress report of WG 17 on *Biogeochemical data integration and synthesis*

Meeting summary

The meeting of Working Group 17 was held from 09:00 – 18:30 hours on October 10, 2003. After a brief welcome by the Co-Chairman, Dr. Andrew G. Dickson (see *WG 17 Endnote 1* for attendance), the meeting continued with a series of status reports and technical presentations (*WG 17 Endnote 2*).

Measurement inter-comparisons

Dr. Dickson provided a brief description of an inter-comparison of underway and mooring/drifter-based $p(CO_2)$ measurement systems that had been organized by Dr. Yukihiro Nojiri earlier this year. The experiment, co-sponsored by several Japanese agencies, was held from March 10–14, 2003, at the National Research Institute of Fishery Engineering, Hazaki, Ibaraki, Japan. The participated institutions are shown below:

Underway equilibrator systems

Germany	Institut für Meereskunde, Kiel
Korea	Seoul National University
Japan	National Inst. for Environmental Studies (NIES)
	National Research Inst. for Fisheries Science
	AIST/Kanso Co.
New Zealand	NIWA

UK	University of East Anglia
U.S.A.	NOAA
	Monterey Bay Aquarium Research Institute (MBARI)

Mooring/drifter-based systems

France	CNRS/Univ. Paris (CARIOCA)
USA	MBARI
	Univ. Montana (SAMI)

The experiment was a great success due to the excellent organization provided by Dr. Nojiri and his group. The site was almost ideal, with sufficient water to supply all equilibrators and the capacity to change the $p(CO_2)$ in a reasonably controlled manner. Common calibration gases were provided to all participants so it was possible to identify problems with equilibrators during the exercise. Indeed two main problems were found: *(i)* a number of equilibrators had their signal contaminated by outside air that had been drawn in to replace air vented through the NDIR, or removed as bubbles in the seawater stream through the equilibrator; and *(ii)* some equilibrators were susceptible to fouling by the extreme microbial contamination that was present in the pool. This will lead to improved equilibrator designs in the future for this important measurement. A workshop will be held in January 2004 (see below) to discuss the results from this inter-comparison, and it is planned that a technical publication will be prepared describing the experiment.

There is also an ongoing inter-comparison of C-13 in dissolved inorganic carbon that was initiated by the PICES Working Group 13. The results are still coming in from this exercise, and it should be completed by the summer of 2004.

Status of Pacific CO_2 database and data inventory activities

The Working Group then heard a summary of recent activities in the preparation of databases of North Pacific measurements. The first presentation by Mr. Alex Kozyr of the Carbon Dioxide Information and Analysis Center (CDIAC) at Oak Ridge National Laboratory, outlined work that had been going on in the United States to synthesize the measurements made during the international WOCE/JGOFS survey in the 1990s. These data have been examined for consistency (both internally and on a basin-wide scale) and appropriate adjustments recommended. The adjusted data are now are now publicly available, as are a number of gridded products. There was a demonstration on how to access and display this data over the web using simple browser software to manipulate data that are available on a Live Access Server at CDIAC.

Dr. Toru Suzuki provided a brief overview of work that has been in progress at MIRC (Marine Information Research Center). Over 400 cruises in the North Pacific have been inventoried, and this inventory can be accessed at http://picnic.pices.jp. Work is now in progress to implement web access to metadata about these cruises (based on guidelines originally developed by the Working Group 13, and which are being refined for the Working Group 17 "Guide to best practices for CO_2 measurement and data reporting"), and it is hoped that ultimately there will be links to the actual data themselves, perhaps even using the same Live Access Server approach that has been implemented at CDIAC, which has now been installed at MIRC. The Working Group congratulated Drs. Suzuki and Sachiko Oguma on this work and expressed its appreciation of the efforts that were in progress, and look forward to the public release of much of this data in the coming years.

Topic Session at PICES XIII

The Working Group discussed plans for a Topic Session at PICES XIII to be held in Honolulu, U.S.A., in October 2004. The previously suggested topic "The impacts of climate change on the carbon cycle in the North Pacific" was adopted, convenors were identified and invited speakers proposed. A prospectus for this session is included as *POC Endnote 7*.

Inter-sessional meetings in 2004

The Working Group then heard details of two proposed inter-sessional activities for the

coming year that were seeking PICES co-sponsorship:

- A workshop on "Ocean surface $p(CO_2)$ database and data integration" will be held January 14-17, 2004, in Tsukuba, Japan. This workshop will have two themes: *(i)* discussion and finalization of the results from the March 2003 inter-comparison of underway and mooring/drifter-based $p(CO_2)$ measurement systems; and *(ii)* discussion of an international adoption of a proposal for the format of databases for underway $p(CO_2)$ measurements. Sponsorship for participation in this workshop has been obtained from the Japanese Government and SCOR/IOC (through the International Ocean Carbon Coordinated Project). The Working Group endorsed this activity that is organized by WG 17 members (Y. Nojiri, A. Dickson, A. Kozyr are serving as co-convenors for the workshop) as well as an IOCCP representative (M. Hood), and requested PICES to support participation of 2 observers from Western Pacific PICES member countries (Korea and Russia).
- A workshop on "Understanding North Pacific carbon-cycle change: Data synthesis and modeling" is planned for June 2004, in the Seattle area (U.S.A.). This workshop will be a Global Carbon Project (GCP) and PICES joint activity to encourage international participation in such a synthesis effort, and is timed to take advantage of the release of a multi-year data collection effort by the Japanese Oceanographic Data Center (JODC), in cooperation with the National Committee for JGOFS under the Japan Science Council and with the Working Group 17. The workshop (and prior data handling efforts) are supported with funds from the US Government (NOAA) and will be organized by WG 17 member Dr. Christopher Sabine. The Working Group emphasized the importance of such a workshop, offered its support and hoped that PICES would encourage the timely release of the North Pacific data by the JODC (planned for spring 2004). PICES is requested to support 1-2 WG 17 members who might not otherwise be able to attend the workshop.

Written "Guide to best practices for oceanic CO_2 measurements and data reporting"

Dr. Dickson provided a brief status report on the preparation of the proposed PICES "Guide to best practices for CO_2 measurement and data reporting". The IOCCP had endorsed this activity and offered funds to PICES to assist with publication costs. A first draft of many of the sections is now complete, and these will be made available for international comment from a website by the end of October 2003. Additional discussion of the sections involving $p(CO_2)$ are expected to take place at the January 2004 workshop, and the final version will be presented for publication as a report in PICES Scientific Report Series in April 2004.

National reports and plans for future national activities

There were then brief presentations from WG 17 members on the current activities in their countries that are related to the goals of the Working Group. Dr. Dickson presented a summary of current US activities including a funded repeat hydrographic survey as well as in increase in $p(CO_2)$ work on ships-of-opportunity. The strategy is global in nature, but the North Pacific is an integral part of this whole.

Dr. Dickson also gave a brief overview of cruise plans of the JAMSTEC Ocean Observation and Research Department for the coming year (provided by Dr. Shuichi Watanabe who was unable to attend the meeting due to his participation in the scientific cruise). Dr. Tongsup Lee presented an overview of Korean plans, and Mr. Frank Whitney gave a brief statement of Canadian plans for the coming year.

Recommendations/requests to PICES for 2004 and 2005

PICES is requested to:

- Co-sponsor a 4-day IOCCP/PICES workshop on "Ocean surface $p(CO_2)$ database and data integration", to be held January 14-17, 2004, in Tsukuba, Japan, and

provide travel support for 2 participants from Western Pacific countries (Korea and Russia) to attend the meeting;
- Co-sponsor a 3-day NOAA/GCP/PICES workshop on "Understanding North Pacific carbon cycle change: Data synthesis and modeling", in June 2004, in Seattle, U.S.A., provide travel costs for 1-2 participants, and encourage the JGOFS North Pacific Synthesis Group to ensure that the data is made available in a timely fashion;
- Approve a 1-day joint POC/BIO Topic Session on "The impacts of climate change on the carbon cycle in the North Pacific", to be held at PICES XIII in Honolulu, U.S.A., in October 2004, and provide full support for 1 invited speaker;
- Publish the Working Group 17 "Guide to best practices for oceanic CO_2 measurements and data reporting" in the PICES Scientific Report Series. (IOC has provided additional funds for this activity to ensure a large print run.)
- Support (~$15,000) a regional (Western Pacific) training workshop for CO_2 measurements planned for 2005. This activity will be arranged jointly with IOCCP and WESTPAC (IOC).

WG 17 Endnote 1

Participation List

Members

Robin M. Brown (Canada)
Andrew Dickson (U.S.A., Co-Chairman)
Alexander Kozyr (U.S.A.)
Tongsup Lee (Korea)
Toru Suzuki (Japan)

Observers

Alexander Bychkov (PICES)
Dong-Jing Kang (Korea)
Kitack Lee (Korea)
Sachiko Oguma (Japan)
Shigero Toyashima (Japan)
Frank Whitney (Canada)

WG 17 Endnote 3

WG 17 Meeting Agenda

1. Welcome and introductions
2. Discussion of agenda
3. Report on international inter-comparison on "Underway and drifting/mooring based $p(CO_2)$ measurement systems"
4. Status of database and data inventory activities
5. Planning of the Topic Session on "The impacts of climate change on the carbon cycle in the North Pacific" at PICES XIII
6. Planning for inter-sessional meetings in 2004
   a. Workshop on "Ocean surface pCO_2 database and data integration"
   b. Workshop on "Understanding North Pacific carbon-cycle change: Data synthesis and modeling"
7. Discussion of draft of proposed "Guide to best practices for oceanic CO_2 measurements and data reporting"
8. Members' reports and plans for future national activities
9. Specific funding requests for 2004–2005
10. Summary and plans for future

POC Endnote 4

Progress report of *North Pacific Data Buoy* Advisory Panel

The meeting of the *North Pacific Data Buoy* Advisory Panel (NPDBAP) was scheduled from 14:30–18:30 hours on October 11, 2003. Unfortunately, there was not sufficient

attendance by Panel members to have a meeting, and an information session was held instead to review the NPDBAP Annual Report presented by the NPDBAP Technical Coordinator, Mr. Ron McLaren. The complete Annual Report is available on the NPDBAP web site (http://npdbap.noaa.gov). A brief summary is given below.

Background

The formation of the *North Pacific Data Buoy* Advisory Panel, reporting to the PICES Physical Oceanography and Climate Committee (POC) and the Data Buoy Co-operation Panel (DBCP), was approved by the Governing Council at PICES X (October 2001, Victoria, Canada). The DBCP officially accepted the NPDBAP as an entity at its 18th Annual Meeting held October 14-18, 2002, in Martinique.

Meetings and Workplan action items

The first meeting of the Panel was held June 5-7, 2002, in Victoria (Canada). During the meeting, the Terms of Reference, consistent with DBCP and PICES objectives, were finalized and a set of Operating Principles was agreed to. Workplan items were identified as being actions the Panel should complete over the next year.

An "ad hoc" meeting of the Panel was held during the 18th DBCP Annual Meeting. The action items from the June 2002 meeting were discussed, including buoy deployment opportunities. Representatives from Canada and the United States (NDBC, US Naval Oceanographic Office and the Global Drifter Program) were in attendance.

To include all the PICES member countries in the work of the Panel, Mr. Brian O'Donnell (North American NPDBAP Co-Chairman) and Ron McLaren attended the PICES Eleventh Annual Meeting held October 18 - 26, 2002, in Qingdao, People's Republic of China. Unfortunately, there was not sufficient attendance by NPDBAP members to have a Panel meeting there. Two presentations were made during the meeting:

- An electronic poster explaining the objectives of the NPDBAP and the progress to date was prepared (with assistance of Ms. Estelle Couture (MEDS) and Regional MSC computer support) and displayed at the Electronic Poster Session. There was general interest, however, there were few attendees involved in the deployment of drifting buoys, so the presentation was more of academic interest than a recruitment tool.
- A presentation describing the work of the NPDBAP, the DBCP, and providing a technical overview of drifting buoy hardware and communication processes was made by Mr. McLaren at the MONITOR Workshop on "Monitoring from moored and drifting buoys". This paper was included in the proceedings published in 2003 as PICES Scientific Report No. 27.

Some NPDBAP members met on October 21, 2003, during the 19th DBCP Annual Meeting in Angra dos Reis (Brazil). DBCP representatives from Canada, United States, Korea, Japan and the WMO were in attendance. The minutes of this meeting are available on the NPDBAP website. It was unanimously agreed to hold the next meeting of the NPDBAP just prior to the 20th DBCP Annual Meeting, which would be held October 18-22, 2004 in Chennai, India. This would permit maximum attendance of active Panel members while minimizing travel costs to attend a meeting in a different location.

Buoy deployments

During the period August 2002 to August 2003 an average of 57 drifting buoys deployed in the North Pacific Ocean (30ºN to 65ºN and 110ºE to 110ºW), reported via the Global Communications System (GTS) to the Marine Environmental Data Service (MEDS). As of August 2003, 71 buoys were reporting, 44 with barometric pressure. The total number of messages received increased from 19,165 in August 2002, to 29,841 in August 2003, the latest month for which statistics are available. Hopefully, this increase is in part, due to the efforts of the participating members of the NPDBAP. Information on all deployments is available on the NPDBAP web site.

Plans for 2003 - 2004 include:

- deployment of 21 SVP-B drifters in the East China Sea/Yellow Sea area by NAVO (U.S.A.);
- deployment of 24 buoys (surface drifting buoys, profiling floats and moorings TRITON) in the seas surrounding Japan and the western North Pacific Ocean by various Japanese agencies;
- deployment of 6 to 12 SVP-B drifting buoys in the North Pacific by Canada;
- barometer upgrades to 40 SVP-B drifting buoys (NDBC, U.S.A.) and up to 10 SVP-B drifting buoys (Canada) that will be deployed for the Global Drifter Program (GDP) in the North Pacific.

NPDBAP web site

The NPDBAP web site was completed due to the efforts of Ron McLaren, Estelle Couture and Cara Schock (Marine Environmental Data Service, DFO, Canada), and Cheryl Demers and Steve Collins (National Data Buoy Center, NOAA, U.S.A.). Dr. Paul Moersdorf offered to host the NPDBAP web site at the NDBC facilities at Stennis Space Centre, and can be found at: http://npdbap.noaa.gov. The web site explains the goals of the NDDBAP, Operating Principles and membership, and provides access to MEDS for buoy data. It is also linked to the NDBC web site (http://www.ndbc.noaa.gov) that displays NPDBAP drifting buoy data for the Eastern North Pacific in real time. Minor changes will be made over the next few months to include references to various meteorological and oceanographic web sites of the member countries and link the NPDBAP web site with the new PICES web site.

Panel Chairmanship

This issue is becoming of great importance as an Asian NPDBAP Co-Chairman has not yet been selected and the current North American Co-Chairman, Brian O'Donnell, has been assigned to a position with Climate Change and the Earth Observation System project. His future involvement with the NPDBAP will be decided over the next few months.

POC Endnote 5

Proposal for a 2-day PICES/CLIVAR Workshop at PICES XIII on "Scale interactions of climate and marine ecosystems"

The physical climate system varies on a wide range of scales: changing storminess and severe weather, recognised modes of variability (such as NAO, PDO and ENSO), and changes to mean global characteristics. Likewise the marine ecosystem has many interacting scales: small-scale patchiness *vs* global, shelf *vs* deep-sea populations, and individuals *vs* communities. To date, most studies considering the impact of the complexities of climate variability on the equally complex marine ecosystem have used correlation statistics of a given population and physical climate indices. We need to go beyond simple correlations to tease out the relationships between the changing physical and biological systems if we are to understand what controls what. How do the various scales of climate variability project onto the variability of the population of a given species or the ecosystem as a whole? How does the changing climate impact on the scale interactions of the biogeochemical system? Are the time-series we have long enough to draw meaningful conclusions? What do we need to get right in models used to predict the impact of climate change on the marine ecosystem and fisheries?

The workshop will bring together experts in the physical oceanography of the Pacific, climate dynamics and variability, marine ecosystems and biogeochemistry, and fisheries. The workshop will be charged to produce statements on our present understanding of, or lack thereof, the impact of climate variability on the marine eco- and biogeochemical system, what we can hope to extract from combining extant datasets, and strategies for numerical experimentation, observational networks and data assimilation,

that will improve our knowledge and predictive capabilities. Sufficient enthusiasm by the participants will result in the publication of a special issue of a leading international journal.

Recommended Convenors: Kelvin Richards (U.S.A.), Richard J. Beamish (Canada), Kuh Kim (Korea) and a Japanese scientist (TBD).

POC Endnote 6

Proposal for a 1-day POC Topic Session at PICES XIII on
"Application of Global Observing Systems to physics, fisheries, and ecosystems"

Problems such as global climate change, carbon cycling, ocean circulation forecasting, and variability in biomass and fish abundance have necessitated a great increase in the variety and quantity of ocean measurements. In response to these growing demands, the last two decades have seen a proliferation of new technologies for remotely sensing the physical and chemical properties of oceans and the biological characteristics of organisms living in them. Noteworthy examples include the TOPEX/Poseidon/Jason and ERS/Envisat satellites for sea surface heights, SeaWiFS and MODIS for ocean colour, and Argo profiling floats for deep ocean velocities, temperatures and salinities. Technologies such as these allow interdisciplinary, near-realtime sampling of the global ocean with unprecedented resolution in time and space. In this session we welcome papers on the application of global observing systems to the description and better understanding of important physical, fishery, and ecosystem processes in the North Pacific Ocean.

Recommended POC Convenors: Michael G. Foreman (Canada) and Vyacheslav B. Lobanov (Russia). BIO, FIS, MEQ and CCCC are to be approached to co-sponsor the session and nominate convenors.

POC Endnote 7

Proposal for a 1-day POC/BIO Topic Session at PICES XIII on
"The impacts of climate change on the carbon cycle in the North Pacific

Background

Many recent studies have investigated carbon cycle variability in the Central and North Pacific. A significant number of these studies were related to the effects of El Niño-Southern Oscillation (ENSO) on upwelling regions of the Equatorial Pacific. Recently, there have been several studies indicating significant variability over other regions of the North Pacific and potential linkages to the Pacific Decadal Oscillation (PDO). Most of these studies covered a relatively short time frame, examined only a relatively small portion of the North Pacific, or considered only a limited number of parameters. What is often lacking is an overall picture of North Pacific carbon cycle that draws together all of these individual lines of investigation and looks for coherent patterns that may help us understand the regional significance of variability and the possible mechanisms controlling the observed spatial and temporal patterns. A session at PICES XIII will provide a forum for presentation of new insights into links between climate change and the carbon cycle as are manifest in the North Pacific, and it will showcase, in part, results from a synthesis and modeling workshop (co-sponsored jointly by NOAA, Global Carbon Project and PICES) planned for June 2004.

Proposed session description

An important area of contemporary carbon cycle research is in its linkages and responses to climate change. This session will bring together scientists focusing on such phenomena in the North Pacific region. We encourage contributed papers and posters that present recent research into the carbon cycle of the North Pacific with particular emphasis on the following: climate induced inter-annual and decadal variability in

air-sea CO_2 exchange; the role of the North Pacific in taking up anthropogenic carbon; changes in phytoplankton community structure and its consequences for the carbon cycle; and recent modeling and synthesis activities that aim to understand such linkages.

Recommended convenors: Christopher Sabine (U.S.A.), Kitack Lee (Korea) and Paul Harrison (Canada). BIO is to be approached to co-sponsor the session.

Recommended co-sponsoring organization: International Ocean Carbon Coordination Project (IOCCP).

Recommended invited speakers:
David Karl (U.S.A.) - *Changing ecosystems and the N. Pacific carbon cycle*
Nicholas Gruber (U.S.A.) - *North Pacific carbon cycle synthesis results* (full support by PICES)
Douglas Wallace (Germany) - *Global carbon cycle and its links to climate change* (full support by IOCCP).

POC Endnote 8

Proposal for an inter-sessional workshop on
"Japan/East Sea circulation: What do we know and how good can we forecast?"

Ocean circulation dynamics is an essential factor for physical processes, ecosystem dynamics and human activity. Recognizing the importance of operational oceanographic information, including forecasts (*e.g.*, in relation to the development of regional coastal components of GOOS, like NEAR-GOOS, PICES activity on the North Pacific Ecosystem Status Report and possible PICES Pilot Projects, CREAMS program development etc.), it is timely to ask "What do we know, how valid are our numerical models, and how can we make reliable forecasts of the circulation in the Japan/East Sea?". Intensive field observations over recent years brought new knowledge on circulation dynamics in this region. At the same time there have been vigorous developments in numerical modeling. How do these correspond with each other? What are the achievements and gaps? What should be our approach to create reliable, regional models, for research and operational oceanography?

We would like to propose that a 3-day workshop on "Japan/East Sea circulation: What we know and how well can we forecast?" be convened in summer 2005, near Vladivostok, Russia. The workshop goals are: *(i)* to produce assessment and synthesis of available circulation models, possibly for publication in a special issue of *Dynamics of Atmosphere and Oceans* (DAO) or a journal of equivalent status; and *(ii)* to exchange experience and provide training for young scientists with the models. The workshop will bring together modelers and data collectors in a relaxed environment. Preparation for the workshop will include assigned home tasks for observationalists - to assemble data sets for use in model testing, and for modelers - to run standard numerical simulation cases.

Recommended convenors: Christopher N.K. Mooers (U.S.A.), Vyacheslav B. Lobanov (Russia), Kuh Kim (Korea).

Potential co-sponsors: PICES, CREAMS, IOC/WESTPAC, ONR-Asia, Russian Academy of Sciences.

Travel support is requested for two scientists to attend the workshop.

REPORT OF TECHNICAL COMMITTEE ON DATA EXCHANGE

The meeting of the Technical Committee on Data Exchange was held from 14:30 - 18:30 hours on October 12, 2003. The Chairman, Dr. Igor I. Shevchenko, called the meeting to order and welcomed the participants (see *TCODE Endnote 1* for attendance). The Committee reviewed the draft agenda and it was adopted with modifications (*TCODE Endnote 2*).

Progress on items in the 2002/2003 TCODE Workplan (Agenda Item 3)

Joint WG 15/TCODE Workshop at PICES XII (WP item 10)

Several TCODE members reported on the successful joint WG 15/TCODE workshop on "Harmful algal blooms - harmonization of data" convened by Drs. Hee-Dong Jeong (Korea) and Vera Trainer (U.S.A.). There was an extensive discussion of the challenges of sharing HAB data in various PICES member countries. The group agreed to work together to adopt the IOC/ICES HAB Metadatabase (HAE-DAT) for a 1-year trial period to further explore the strengths and limitations of this approach.

TCODE-GLOBEC co-operation on data management (WP items 1-3)

No progress made on this item. Changes in staff in the GLOBEC International Programme Office (Plymouth, UK) have stalled this activity.

Expansion of the Bering Sea Metadatabase to cover the North Pacific (WP item 4)

Dr. Bernard A. Megrey and Mr. Allen Macklin reported on the transformation of the Bering Sea Metadatabase to the North Pacific Ecosystem Metadatabase (NPEM), and demonstrated the search capabilities of this database (http://www.pmel.noaa.gov/np/mdb/index.html). There was extensive discussion on how best to maintain the data inventory records and how to encourage both usage and additional contributions. The developers also described the potential of 'federated search' capabilities, which would allow one to search metadata records from separate databases from a single application (*e.g.*, NPEM). They will be attempting this with assistance from the Korean Oceanographic Data Center (KODC) as a demonstration, and requested names of key contacts in other PICES data management centers to expand this capability.

List of keywords for North Pacific Ecosystem Metadatabase (WP item 5)

Dr. Megrey and Mr. Macklin reported on their effort to assemble a suitable list of keywords for the North Pacific Ecosystem Metadatabase based on the extensive list from the Global Change Master Directory. Very little feedback was received from PICES members on the proposed list. The lack of a 'hierarchy' to the keyword list made it difficult for prospective users to comment on the list. The Committee recommended that the keyword list (as circulated) be implemented, recognizing that additional keyword could be added with little effort, if required.

E-Poster Session at PICES XII (WP item 6)

Dr. Megrey reported on the number and themes of the presentations at the E-Poster Session on "GIS/Geographic-based applications to marine sciences". A summary of the session is included elsewhere in this Annual Report and posted on the TCODE web site (http://tcode.tinro.ru).

Updating inventory of long-term data sources for the North Pacific (WP item 7)

Dr. Shevchenko and Mr. Robin M. Brown reported on the limited progress made on this item (http://tcode.tinro.ru/invent.html).

Updating TCODE web site (WP item 8)

Drs. Shevchenko and Thomas C. Royer reported that only limited progress was made on updating the TCODE web site for data management resources such as *(i)* links to real-time and quasi-real time data for the North Pacific; *(ii)* data visualization and analysis tools; and *(iii)* description of inter- and intra-data exchange

policies in PICES member countries. Dr. Shevchenko noted that much of this information could be extracted from annual reports from TCODE members, using the content model that he provided.

Review of TCODE Strategic Plan (WP item 9)
Mr. Brown and Dr. Shevchenko, the former and the current TCODE Chairmen, briefly reviewed the draft TCODE Strategic Plan. This draft was posted at the TCODE web site (http://tcode.tinro.ru/sp.html), and Committee members were asked to provide comments and feedback to the Chairman by the end of 2003.

Updates on data management activities in PICES member countries (Agenda Item 4)

Several presentations were made on activities in PICES nations.

Canada
Mr. Brown presented a short report outlining agencies and data centres with holdings of oceanographic, fisheries and meteorological data. He also described new initiatives in cabled ocean observatories (VENUS and NEPTUNE) that will require advanced data management and archival systems.

Japan
Dr. Muneharu Tokimura reported on the restructuring of the Japanese Fisheries Research Agency and implications of this process for data management and archival. Several initiatives in the assembly of fisheries and biological data, with plans for creating open databases with Internet access were reviewed.

Korea
Mr. Hae Seok Kang reported on the activities and responsibilities of KODC.

Russia
Dr. Shevchenko reported on data management activities and agencies in Russia.

U.S.A.
Dr. Royer reported on activities of the EVOS/GEM and the North Pacific Research Board in establishing ocean observing systems.

All reports will be posted on the TCODE web site.

Discussion of *North Pacific Ecosystem Status Report* (Agenda Item 5)

Dr. R. Ian Perry, Science Board Chairman, summarized the progress of the North Pacific Ecosystem Status Report. The Committee had a short discussion on this issue and reiterated its strong support for this project. Comments and feedback to Science Board are due on November 30, 2003.

Discussions of report from Study Group on *PICES Strategic Issues* (Agenda Item 6)

The Committee had a short discussion on this issue. Comments and feedback to Science Board are due on November 30, 2003.

Discussions of report from Study Group on *PICES Capacity Building (*Agenda Item 7)

The Committee had a short discussion on this issue. Comments to Science Board are due on November 30, 2003.

Discussion of steps towards next major PICES scientific program(s) (Agenda Item 8)

Dr. Perry provided a background for this topic. The Committee had a short discussion but no particular proposals were made.

Topic Session proposals for PICES XIII (Agenda Item 9)

In keeping with the PICES XIII theme of open ocean processes, TCODE proposes to conduct an electronic poster session entitled "Data visualization of open ocean processes in the North Pacific". This session will provide an opportunity to present techniques that animate remotely sensed data such as TOPEX/Poseidon/Jason altimetry, SeaWiFS and MODIS ocean color, and sea surface temperature measurements. Techniques of data retrieval and archiving are also welcome. Integration of remotely sensed physical, biological and/or chemical data are solicited,

especially with regard to oceanic "hot spots" of biological activity. Recommended co-convenors: Dr. Thomas C. Royer (U.S.A.) and a local Hawaiian representative (to be identified).

PICES XIV theme (Agenda Item 10)

This item was discussed but there were no recommendations forwarded to Science Board.

Items with financial implications (Agenda Item 11)

TCODE requests travel funds for a PICES Data Management expert (Dr. Georgiy Moiseenko, VNIRO) to attend a meeting of the ICES-IOC Study Group on *Development of marine data exchange systems using XML*, to be held in Brussels, Belgium. ICES is considering XML as a standard for data exchange, and Dr. Moiseenko will report back to TCODE on the findings of this Study Group.

New business - items added at the meeting (Agenda Item 12)

New PICES web page

Ms. Julia Yazvenko (PICES Secretariat) presented an outline of the new PICES web site and invited comments. The Committee nominated Dr. Shevchenko to be responsible for linking the TCODE web site and the PICES web site.

WG 17 activities

Mr. Brown reported on activities of the PICES Working Group 17 on *Biogeochemical data integration and synthesis*. This group has their own web site (http://wg17.pices.jp) with links to the PICNIC (**PI**CES **C**arbon Dioxide Related Data Integratio**n** for the North Pacif**ic**) inventory (http://picnic.pices.jp) developed by the Marine Information Research Center (MIRC, Japan) in association with WG 17 and TCODE.

Joint WG 15/TCODE Workshop on HAB

Dr. Vera Trainer summarized the results from the joint WG 15/TCODE workshop on "Harmful algal blooms - harmonization of data" at PICES XII, and outlined plans for a follow-up workshop on "Developing a North Pacific HAB data resource" to be held at PICES XIII (October 2004, Honolulu, U.S.A.).

MONITOR Task Team activities

Dr. Sei-ichi Saitoh presented a brief report on activities of the MONITOR Task Team. This group identified important datasets on high seas distributions of fish and plankton that are held by Hokkaido University. These datasets will be digitized and produced on CD-ROM. TCODE assistance is sought to aid in the distribution of these data and to ensure that they are listed in the appropriate data inventories. MONITOR agreed to assist in the identification of important long-term datasets for the TCODE inventory.

Best Presentation Award

Ms. Kimberly Bahl (U.S.A.) won the Best Presentation Award for her E-Poster entitled "North Pacific Ecosystem Theme Page and Metadatabase: A collaborative research tool for fisheries-oceanography and ecosystem investigations", co-authored by B. Megrey and A. Macklin.

TCODE Workplan for 2003/2004 (Agenda Item 13)

- TCODE members to work with WG 15 (MEQ HAB Section) members to complete entries for harmful algal bloom events in PICES member countries into the ICES-IOC HAB Metadatabase (HAE-DAT) for a single year. In addition, TCODE will add entries to the TCODE Inventory that describe HAB data sources in PICES member countries and ensure that appropriate HAB data sources are identified in the North Pacific Ecosystem Metadatabase. [Action - Shevchenko and Brown]
- TCODE Chairman to contact new Data Manager at the GLOBEC International Project Office and re-establish plans for creating an inventory of PICES-GLOBEC data. [Action - Shevchenko]
- North Pacific Ecosystem Metadatabase
  a. Prepare an article for PICES Press [Action - Megrey and Macklin]
  b. Implement metadata keyword list [Action - Megrey and Macklin]

c. Link NPEM web site and TCODE web site [Action - Shevchenko]
d. Update existing records and add new records [Action - all TCODE members with assistance of the MONITOR Task Team]
e. Identify key contacts for 'federated search' [Action - all TCODE members]

- Update TCODE web site by adding real-time data sources, data visualization and analysis tools and data exchange policies of PICES member countries. [Action - Shevchenko to update web site; all TCODE members to provide input]
- Organize E-Poster Session at PICES XIII (October 2004, Honolulu). [Action - Royer]
- Work with the PICES Secretariat to link TCODE web site to the new PICES web site [Action - Shevchenko and Yazvenko].

TCODE Endnote 1

Participation List

Members

Robin M. Brown (Canada)
Hae-Seok Kang (Korea)
Bernard A. Megrey (U.S.A.)
Georgiy Moiseenko (Russia)
Thomas C. Royer (U.S.A.)
Igor I. Shevchenko (Russia, Chairman)
Muneharu Tokimura (Japan)

Observers

Hee-Dong Jeong (Korea)
Sung-Dae Kim (Korea)
Allen Macklin (U.S.A.)
Yutaka Nagata (Japan)
R. Ian Perry (PICES)
Toru Suzuki (Japan)

TCODE Endnote 2

TCODE Meeting Agenda

1. Welcome and introduction of members
2. Adoption of agenda
3. Review progress on items in the 2002/2003 Workplan (WP)
   a. WG 15/TCODE workshop on *Harmful algal blooms - harmonization of data*
   b. TCODE-GLOBEC cooperation on data management
   c. Expansion of the Bering Sea Metadata base to cover the North Pacific
   d. Metadata keywords list
   e. Electronic Poster Session for PICES XII
   f. Updating inventory of real-time data sources for the North Pacific
   g. Updating TCODE web site
   h. TCODE Strategic Plan
4. Updates on data management activities in PICES member countries
5. Discussion of *North Pacific Ecosystem Status Report*
6. Discussion of report from Study Group on *PICES Strategic Issues*
7. Discussion of report from Study Group on *PICES Capacity Building*
8. Discussion of steps towards next major PICES scientific program(s)
9. Topic session proposals for PICES XIII
10. PICES XIV theme
11. Items with financial implications
12. New business (items added at the meeting)
13. Discussion and adoption of the TCODE Workplan for 2003/2004.

REPORT OF THE IMPLEMENTATION PANEL ON THE CCCC PROGRAM

The Executive Committee of the Climate Change and Carrying Capacity Program Implementation Panel (CCCC-IP/EC) met from 18:30-21:00 hours on October 12 and from 13:20-14:30 on October 14, 2003, in Seoul, Korea. The meeting was chaired by Drs. Harold P. Batchelder and Makoto Kashiwai. Dr. Batchelder thanked Dr. Kashiwai for his service as CCCC-IP Co-Chairman, during which he effectively pushed the CCCC Program toward the implementation and synthesis phase. Dr. Batchelder also noted that one of the agenda items that would be addressed during this meeting was the election of a new CCCC-IP Co-Chairman to replace Dr. Kashiwai. He welcomed attendees, and after brief introductions of those present (*CCCC-IP Endnote 1*), reviewed the agenda. The agenda was adopted with slight modifications (*CCCC-IP Endnote 2*).

Review of procedures for Best Presentation Awards and Closing Ceremony

Dr. Batchelder reported on the results of the discussion of this item at the first Science Board session. The procedure of nomination/selection for the CCCC Best Presentation Award by a young scientist was determined. It was difficult to know which papers were eligible for this award, since no information on the age of the presenter was available from the submitted abstracts. It was recommended that Science Board request the PICES Secretariat to ask authors submitting abstracts in future years to indicate whether they are eligible for consideration of Best Presentation Awards by including a checkbox on the abstract submission form for scientists who are less than 35 years old.

Dr. Rolf Ream (National Marine Mammal Laboratory, Alaska Fisheries Science Center, U.S.A.) won the CCCC Best Presentation Award for his paper entitled "Oceanographic influences on northern fur seal migratory movements" (co-authored by J. Sterling and T. Loughlin).

Documentation of PICES XII Sessions (Agenda Item 4)

CCCC-IP/EC discussed responsibilities for documenting CCCC-sponsored scientific sessions at PICES XII. It was agreed that convenors of the REX (Dr. William T. Peterson) and MODEL (Dr. Bernard A. Megrey) Topic Sessions and BASS Workshop (Dr. Gordon A. MacFarlane) would provide session summaries by the end of Thursday, October 16, to Dr. Batchelder, who will direct those summaries to the PICES Secretariat.

Progress reports of Task Team activities (Agenda Item 5)

CCCC-IP/EC received overviews of CCCC Task Team activities from the BASS, REX, MONITOR and MODEL Task Team Co-Chairmen. On October 16, all Task Teams provided final reports that included a summary on progress in 2003 and recommendations and planned activities for 2004, and even some for 2005. These reports appear elsewhere in this Annual Report.

Changes in CCCC-IP/EC membership (Agenda Items 6 and 7)

The Executive Committee recommends that:

- Dr. Kashiwai (Japan), who has completed his term of office as CCCC-IP Co-Chairman, be heartily thanked for his efforts on behalf of the CCCC Program;
- Dr. Suam Kim (Korea) be appointed as new Asian Co-Chairman of CCCC-IP for a term extending from October 2003 to October 2006 (conclusion of PICES XV).

CCCC-IP/EC approves:

- BASS' request to replace Dr. Gordon A. McFarlane (Canada) by Dr. Kerim Aydin (U.S.A.) as BASS Co-Chairman;
- MONITOR's request to replace Dr. David L. Mackas (Canada) by Dr. Phillip R. Mundy (U.S.A.) as MONITOR Co-Chairman;
- REX's request to replace Dr. William T. Peterson (U.S.A.) with Dr. Douglas E. Hay (Canada) as REX Co-Chairman.

Due to the changes in Task Team Chairmen above, CCCC-IP/EC requests that the new Co-Chairmen be added to, and that vacating Co-Chairmen be removed from, the Executive Committee.

Proposals for new subsidiary bodies (Agenda Item 8)

The Executive committee did not receive any proposals for new subsidiary bodies.

Topic Session and Workshop proposals for PICES XIII (Agenda Item 9)

The following Topic Sessions and Workshops are proposed to be convened:

- a ½-day MODEL Topic Session on "Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans" (*MODEL Endnote 3*);
- a 1.5-day CCCC Topic Session on "CCCC, GLOBEC, and GLOBEC-like results: First steps toward a synthesis of the impacts of large-scale climate change on North Pacific marine ecosystems" (*CCCC Endnote 3*);
- a 2-day BASS/REX/MODEL Workshop on "Linking open ocean and coastal systems II" (*BASS Endnote 4*);
- a 1-day MODEL Workshop to prepare a strategy and products for the future NEMURO and NEMURO.FISH training sessions;
- a 1-day REX Workshop on "The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim" (*REX Endnote 3*);
- a 1-day MONITOR/POC Workshop on "North Pacific GOOS: Needs and activities".

MODEL has a proposal titled "International workshop on climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food webs and implications for marine fish production in the North Pacific Ocean and marginal seas" pending with the Asian Pacific Network (APN). If successful (should be known in April 2004), a 4-day workshop for about 15 participants is proposed for the week preceding PICES XIII. In the event that this proposal is successful, it is anticipated that this workshop will be held prior to the BASS/REX/MODEL Workshop and will incorporate the MODEL Workshop on preparing training sessions. PICES has committed funding for two Canadian scientists to attend the APN workshop.

Theme proposals for future Annual Meetings (Agenda Item 10)

CCCC-IP/EC suggests that the theme for the PICES XIV Science Board Symposium (October 2005, Vladivostok, Russia) be related to "Progress in prediction" (*e.g.*, "Progress in prediction: What can we predict, what do we think we can predict, and what isn't predictable?").

CCCC-IP/EC also suggests that the theme for the PICES XV Science Board Symposium (October 2006, Japan) be related to the North Pacific Ecosystem Status Report. This Symposium would be the opportunity to obtain feedback on the NPESR (about 2.5 years after initial publication; and perhaps 6 months prior to publication of the "2nd Edition"). Also, this theme would provide for an evaluation of the usefulness, value, and impact of the NPESR within the North Pacific, as well as an evaluation of its impacts more globally.

Discussion of CCCC integration and NEXT report (Agenda Item 11)

There was only limited discussion of the report produced by the **N**emuro **Ex**perimental **P**lanning

Team (NEXT) at the various Task Team meetings because of a lack of time. CCCC-IP/EC members were asked to communicate additional comments (if any) on the NEXT report to Dr. Batchelder by November 20, 2003. The final report is included as *CCCC Endnote 4*.

Specific discussion occurred within the CCCC Task Team business meetings or in the EC meeting on four issues that relate to the NEXT report. These are:

- merging BASS and REX into a new Task Team that will better achieve the synthesis of CCCC objectives;
- having an inter-sessional scientific symposium (proposed for April 2006) to provide an international forum for the presentation of CCCC synthesis findings from national programs, and to foster multinational synthesis;
- model-data comparisons that are a high priority for evaluating the CCCC products, and will be crucial to CCCC synthesis; and
- substantial capacity building that is required before model-data comparisons can be accomplished.

Some of these discussions produced specific recommendations that are listed below (Agenda Item 19).

CCCC activities and travel support requests (Agenda Item 12)

The following meetings are to be convened inter-sessionally (between October 2003 and October 2004):

- MONITOR will hold a 3-day workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" (November 20-22, 2003, in Victoria, Canada) to consider PICES' role in coordinated monitoring efforts in the Northeast Pacific. Funding for the workshop is provided by the Pacific Coastal Observing System (PaCOS) and the Gulf Ecosystem Monitoring Program (EVOS-GEM).
- MODEL will hold a workshop in December 2003 in Yokohama, Japan, to further manuscript development for a special issue of *Ecological Modeling* devoted to NEMURO and NEMURO.FISH. This workshop is funded by the Fisheries Research Agency of Japan, and no funding is requested from PICES.
- MODEL will hold a small (4-6 attendees) workshop in August 2004, in Seattle, U.S.A., to 1) document and disseminate various NEMURO model codes, and 2) conduct editorial functions for the *Ecological Modelling* manuscripts. A major product of the MODEL Task Team is the NEMURO code and its various successors NEMURO.FISH, etc. However, to date this code has been developed (and implemented) by a rather small core team. In order to broaden the availability and value of this model development, two actions must occur. The first is that the scientific contribution and value of these codes must be demonstrated and documented by publications in the peer-reviewed literature. MODEL has developed a plan for this. The second step that is needed is to better document and disseminate the NEMURO and NEMURO.FISH codes. This will involve substantial time to improve the legibility/structuring of the code, and a concerted effort in capacity building. The NEXT report (see *CCCC Endnote 4*) recommends holding training sessions, which would bring together modelers and observationists to provide the needed expertise to accomplish basin-wide comparisons of model output with existing datasets. The proposed workshop will address these two crucial actions. Financial support is requested for travel of 2 scientists; it is currently anticipated that one scientist will be from Japan, and the second from the US east coast. It is possible that APN funds may be awarded to this pending project to support one of these travelers, but that is not yet known (should be known by April 2004).

CCCC-IP requests support for the following travel:

- 1 CCCC scientist to attend the PICES co-sponsored international symposium on "Quantitative ecosystems indicators in

fisheries management" in April 2004, in Paris, France;
- 1 CCCC scientist to attend the ICES symposium on "The influence of climate change on North Atlantic fish stocks" in May 2004, in Bergen, Norway;
- CCCC Co-Chairmen to participate in the 2004 interim Science Board Meeting;
- 2 invited speakers to attend the CCCC Topic Session on "The impacts of large-scale climate change on North Pacific marine ecosystems" at PICES XIII;
- 2 invited speakers to attend the joint BASS/REX/MODEL workshop on "Linking open ocean and coastal ecosystems II" at PICES XIII; one scientist will be an expert on sardines (perhaps from the Atlantic) and the second scientist will represent individual-based modeling approaches to fish growth;
- 1 invited speaker for the MODEL Topic Session on "Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans" at PICES XIII;
- 2 scientists to attend an inter-sessional MODEL Workshop to be held in August 2004, in Seattle, U.S.A.;
- 2 invited speakers to attend the REX workshop on "The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim" at PICES XIII;
- 2 invited scientists to attend the MONITOR workshop on "North Pacific GOOS: Needs and activities" at PICES XIII;
- 1 MONITOR representative to attend the ICES-IOC Steering Group on GOOS meeting to be held in April 2004, in Spain;
- 1 MONITOR representative to participate in NEAR-GOOS activities in conjunction with the 6th WESTPAC Symposium in April 2004, in Hangzhou, People's Republic of China.

Discussion of the North Pacific Ecosystem Status Report (Agenda Item 13)

On October 10-11, 2003, just prior to the PICES Twelfth Annual Meeting, the MONITOR Task Team held a 2-day workshop to "Examine and critique a North Pacific Ecosystem Status Report". The workshop included invited presentations, synopsis of the draft NPESR, regional summaries and discussions of the approaches and hypotheses. Extensive plenary discussion occurred on how to produce future editions of the NPESR, ensure quality control, peer review of the document, and mechanisms of outreach and feedback. A brief summary of the workshop is included elsewhere in this Annual Report. Specific recommendations will be forthcoming in the MONITOR Scientific Report of the workshop. Additional comments from CCCC-IP/EC members on the NPESR should be communicated to Drs. Skip McKinnell and Ian Perry by November 20, 2003.

CCCC-IP/EC would like to applaud the efforts of the authors of the individual regional summaries and all the other contributors to the NPESR, and Drs. McKinnell and Perry for accomplishing this important task of PICES.

Discussion of report from Study Group on *PICES Capacity Building* (Agenda Item 14)

Most, if not all, CCCC Task Teams discussed the report produced by the Study Group on *PICES Capacity Building*. All recognized that there exist among the PICES nations disparate levels of scientific expertise in important aspects, such as modeling, data management, analysis skills, etc., which are of concern to CCCC-IP. All Task Teams acknowledged that effective capacity building will require a sustained effort, and will have associated real costs - and probably not insignificant costs. It was the opinion of some within CCCC-IP that Science Board and Governing Council need to evaluate the priority of capacity building, in relation to resources available. CCCC-IP/EC suggests that Science Board forward a request to Governing Council for increased annual dues by the contracting parties, with the increased dues earmarked for PICES capacity building.

The Executive Committee is pleased with the comments of the capacity building report that scientific participation in PICES needs to be broadened. There is a perception that PICES is of greater interest to government-supported

scientists and that academic scientists frequently must find their own travel funds to be able to attend PICES meetings and workshops. It is important that efforts be made to encourage broader participation in PICES activities by junior scientists, senior scientists (who often have connections to national funding bases), and program managers from relevant research funding organizations.

In addition to the excellent capacity building mechanisms suggested for training and education in the Study Group report, it is proposed that training and education could be implemented effectively through (1) extended visits to host countries by scientists bringing expertise in specialized areas of research, and (2) regular yearly "summer courses" (perhaps 1 month in duration every summer) on focus-topics that would provide immersion of graduate students, post-docs, and young scientists. Funding for these approaches would need to be identified by PICES. Possibilities are additional funds from PICES member countries as well as government agencies and private foundations. An example of an extramural funding effort that includes both scientific advancement and capacity building is being pursued by the CCCC MODEL Task Team. MODEL members, Drs. Megrey and Werner, have a proposal pending with the Asia Pacific Network (APN), which includes an education and capacity building component for the training of two visiting scholars (one each from China and Russia).

Additional comments on the report should be communicated before November 20, 2003, to Dr. Batchelder, who then will forward these comments to the Science Board Chairman.

Discussion of report from Study Group on *PICES Strategic Issues* (Agenda Item 15)

The PICES Strategic Plan (Vision Statement) was discussed in each CCCC Task Team's business meeting - more so in some than in others. It was also discussed in the CCCC-IP/EC meeting. Generally, in the CCCC-IP/EC meeting there was a consensus that this Statement was a good start, especially in that it presents a framework for PICES to eventually provide scientific leadership and guidance for wise use of the resources of the North Pacific, and thus putting relevance to PICES role in North Pacific marine science. It was also recognized that the PICES Vision Statement was likely to be revised as needed over the next year or so, and that the future Strategic Plan should again be evaluated by the scientific committees and programs of PICES.

Specific comments by CCCC-IP EC members should be communicated by November 20, 2003, to Dr. Batchelder, who will then direct these comments on to the Science Board Chairman.

Relations with other organizations and programs/projects (Agenda Item 16)

CCCC-IP identified linkages with ICES, GLOBEC, NPRB and the EVOS Gulf Ecosystem Monitoring (GEM) initiatives as high priorities for the coming year. Also, there are several regional coastal observing programs in the Northeast Pacific (PaCOS, PNW-IOOS, AOOS), as well as numerous programs in the Northwest Pacific (CREAMS, NEAR-GOOS, others), that CCCC-IP should maintain close relations with. The continued development of closer links with GOOS and the Sloan Foundation's Census of Marine Life initiative are also viewed as promising areas to support. Finally, CCCC-IP must interact closely with NPAFC to address salmon issues of interest to the CCCC Program in the North Pacific.

Request for scientific advice from the United States (Agenda Item 18)

CCCC-IP/EC discussed the request from the United States for PICES' scientific advice on 1998-1999 regime changes in conditions in the North Pacific and their implications for fisheries, and potential PICES response. Consensus is that an active and positive response by PICES is both an obligation and an important opportunity.

The US request is a clear recognition of PICES' expertise and scientific leadership on the topic of ecosystem regime shifts. Collectively, PICES scientists can provide a comprehensive and up-

to-date assessment of what is known. Equally important, we can provide a realistic assessment of what is "unknown" or (at least for now) "unknowable", and the best strategies for reducing or working around these areas of uncertainty.

The request for advice is also a clear evidence that governments are open to strong (and independent) scientific input regarding ecosystem variability, and the development of robust management strategies. Effective response by PICES will help build our case for continuing and expanding support from member nations.

Recommendations to Science Board (Agenda Item 19)

- CCCC-IP ***recommends*** that Science Board support the request of interest and participation of PICES for the proposed 2005 workshop to conduct global comparisons and identify global synchrony in fluctuations of zooplankton populations (*SB Endnote 11*). It is anticipated that this workshop will be supported also by other organizations, including ICES and GLOBEC International.
- CCCC-IP ***recommends*** that PICES serve as prime sponsor of a 2-3-day symposium on CCCC synthesis in April 2006 (probably in Honolulu).
- CCCC-IP ***recommends*** the approval of changes in CCCC-IP/EC membership requested under Agenda Items 6 & 7 above. However, see also next recommendation regarding the future status of BASS and REX.
- BASS and REX believe that the goals of the CCCC Program during the synthesis phase will be best achieved by merging these two Task Teams. The division of effort between the deep ocean (BASS) and coastal regions (REX) is artificial (and often blurred), and understanding large-scale forcing effects on important coastal marine resources and ecosystems requires the larger scale view that a merged Task Team will provide. Thus, CCCC-IP supports the BASS and REX proposal, and ***recommends*** that the BASS and REX Task Teams be dissolved, and that a new CCCC Task Team, titled **CFAME** for **C**limate **F**orcing and **M**arine **E**cosystem Response be created. Terms of Reference, suggested Co-Chairmen (several names have been nominated already), and membership of CFAME will be developed in the next several months by an interim committee that includes the existing members of both REX and BASS, with leadership by the current REX and BASS Co-Chairmen, and will be recommended to Science Board at the interim Science Board meeting in spring 2004.
- MONITOR considered its future role within PICES. The function of MONITOR needs to extend beyond the duration of the CCCC Program. MONITOR has assumed the primary responsibility for the evaluation (and perhaps future versions) of the NPESR, as well as providing guidance for present and future monitoring programs in the North Pacific. Since these goals go far beyond those originally anticipated as part of the CCCC Program, CCCC-IP ***recommends*** to Science Board that the existing MONITOR Task Team be moved outside of CCCC—*e.g.*, MONITOR should become a Technical Committee, much like TCODE. Should this recommendation be approved it is suggested that each Scientific Committee, each Technical Committee and each scientific program designate one official representative to the new MONITOR Technical Committee. This change would suggest also that the Chairman of MONITOR be added as a member of Science Board.
- CCCC-IP ***recommends*** that the membership for each CCCC Task Team be reviewed, in order to evaluate participation, and to ensure that each country is represented by active members to the greatest extent possible. As in prior years, participation by some nations in particular Task Team workshops and/or business meetings was lacking. This is a recurring problem that is best addressed by ensuring that 1) activities of the CCCC Task Teams are of relevance to all member nations, and 2) the most appropriate and

interested scientists from each nation are on the Task Teams.

- CCCC-IP ***recommends*** that PICES accept the task of providing guidance/advice regarding the nature and duration of the recent regime shift and its impact on the coastal ocean and marine fisheries, which was recently requested by the United States.

Other business (Agenda Item 20)

Request for CCCC information from GLOBEC
At the request of the Executive Director of GLOBEC International, CCCC-IP Co-Chairmen will provide information for a 1-page flyer on GLOBEC regional programs.

Request for CCCC endorsement
The formal request for PICES to support an invitation to participate in a proposal for a workshop to "Identify global synchrony in fluctuations of zooplankton populations" (*SB Endnote 11*) is being made through the BIO Committee, but CCCC-IP wanted Science Board to know that CCCC-IP is very interested in seeing the goals of this effort achieved.

CCCC Endnote 1

Participation List

Members

Harold P. Batchelder (CCCC-IP Co-Chairman)
Shin-ichi Ito (MODEL Co-Chairman)
Makoto Kashiwai (CCCC-IP Co-Chairman)
Gordon A. MacFarlane (BASS Co-Chairman)
David L. Mackas (MONITOR Co-Chairman)
William T. Peterson (REX Co-Chairman)
Sei-ichi Saitoh (MONITOR Co-Chairman)
Francisco E. Werner (MODEL Co-Chairman)
Akihiko Yatsu (BASS Co-Chairman)

Observers

Kerim Aydin (U.S.A.)
Suam Kim (Korea, in-coming CCCC-IP Co-Chairman))
Stewart M. McKinnell (Deputy Exec. Secretary)
R. Ian Perry (Science Board Chairman)
Chang-Ik Zhang (Korea)

CCCC Endnote 2

CCCC-IP/EC Meeting Agenda

1. Welcome and opening remarks
2. Adoption of agenda
3. Business from last year's meeting
4. Review of responsibilities for documenting CCCC scientific sessions
5. Progress reports of Task Teams activities from past year and plans for next two years
6. Review of current CCCC-IP membership; election of new CCCC-IP/EC Co-Chairman
7. Replacements for Task Team Chairmen
8. Proposals for new CCCC subsidiary bodies
9. Topic Session and Workshop proposals for PICES XIII
10. Themes for future PICES Annual Meetings
11. Discussion of CCCC integration and the NEXT report and recommendations
12. Review of planned CCCC activities and travel support requests
13. Discussion of North Pacific Ecosystem Status Report
14. Discussion of report from Study Group on *PICES Capacity Building*
15. Discussion of report from Study Group on *PICES Strategic Issues*
16. Relations with other international programs
17. PICES web site revisions
18. Request for scientific advice from the United States
19. CCCC report and recommendations to Science Board
20. Other business

CCCC Endnote 3

Proposal for a 1.5-day CCCC Topic Session at PICES XIII on "CCCC, GLOBEC, and GLOBEC-like results: First steps toward a synthesis of the impacts of large-scale climate change on North Pacific marine ecosystems"

Session description

Although it is widely known from the fossil record of deep-sea cores that climate changes on the glacial-interglacial scale generate significant impacts on marine ecosystem productivity and structure, it is only in the last ten to fifteen years that marine scientists have begun to document evidence that basin- or large-scale climate changes might be significant forcing for decadal to millennium-scale changes in marine ecosystems. Tidbits of information led to the development of the Global Ocean Ecosystems Dynamics projects of many individual nations, and to several regional scale programs examining the influence of climate change. In 1994, PICES initiated the Climate Change and Carrying Capacity (CCCC) Program to provide an organizational framework for examining climate impacts on marine ecosystems in the North Pacific. During the past decade, the North Pacific experienced the strong 1997 El Niño and 1998 La Niña, as well, as perhaps, a regime shift in the late 1990s. The purpose of this session is to begin a general synthesis of these studies linking climate change to ecosystem productivity and structure in the North Pacific Ocean.

Session rationale

Many national programs examining climate–ecosystem linkages on a regional scale are nearing conclusion and will benefit by the grander scale, basin-wide, synthesis that will be initiated in this session. We believe that this session will bring together scientists from different regions of the Pacific to share their results, and will encourage collaborations for the broader synthesis that will be the topic of an inter-sessional symposium recommended by the **N**emuro **Ex**perimental Planning **T**eam (NEXT).

Session format

We propose a 1.5-day oral scientific session with additional abstract submissions being posters. The huge interest in this scientific topic, with the culmination or near conclusion of many national GLOBEC programs around the Pacific basin suggests to us that this session will be very heavily subscribed. We propose additionally that 1.5 hours of time be reserved at the beginning of the oral session for six 15-minute presentations that will provide summaries on national GLOBEC efforts by each PICES member nation. We tentatively suggest that these speakers would be: David L. Mackas (Canada), Yoshioki Oozeki (Japan), Qisheng Tang (People's Republic of China), Suam Kim (Republic of Korea), Vladimir I. Radchenko (Russia) and Harold P. Batchelder (U.S.A.).

Recommended convenors: Harold P. Batchelder (U.S.A.), Suam Kim (Korea) and several others (to be named)

CCCC Endnote 4

NEXT - Nemuro EXperimental Planning Team
Strategy for accomplishing PICES CCCC Program synthesis

Introduction

The PICES Climate Change and Carrying Capacity (CCCC) Program was recently summarized in a report by Perry *et al*. (2002). Most of the details, including the history of the CCCC Program, can be found there, and are not repeated here. But, it is worthwhile to re-visit the conceptual foundation of the CCCC Program, before examining how to go about accomplishing the integration and synthesis of PICES member nation activities in the Pacific that contribute to the Program. The overall goal of the CCCC Program is **"to forecast the consequences of climate variability on the ecosystems of the subarctic Pacific"**. More

specifically, the CCCC Program was formed to investigate **"how do inter-annual and decadal variation in ocean conditions affect the species dominance, biomass, and productivity of the key zooplankton and fish species in the ecosystems of the PICES area"**.

The CCCC Program is a core regional program of the IGBP GLOBEC program. Consistent with other regional and national GLOBEC programs, CCCC adopted a diverse strategy that included retrospective analysis, model development, process studies, sustained observational systems and data management, to address the aforementioned goal and question. The CCCC Science Plan identified eight specific scientific questions that mapped onto four core scientific issues, which relate to: 1) Physical Forcing of North Pacific Ecosystems and the responses of 2) Lower Trophic Levels (primary producers and primary consumers), and 3) Higher Trophic Levels (secondary and higher consumers) to that forcing, and 4) Ecosystem Interactions (especially top-down *vs.* bottom-up forcing). Some or all of these issues have been addressed at one or more regional or local sites by each of the PICES member nations (Canada, China, Japan, Korea, Russia and the United States).

The CCCC Program created four Task Teams to assist in implementing coherent and cooperative marine research. These are REX, MODEL, BASS and MONITOR. REX, or the Regional EXperiment Task Team had the responsibility of developing inter-comparisons among regional national (primarily coastal) studies. The MODEL Task Team was charged with developing conceptual and theoretical models of physical circulation, biological populations and the coupling of physics and biology in the North Pacific. BASS, or the BASin Scale Task Team, was charged to develop a basin scale research program in the North Pacific. The MONITOR Task Team was charged to design and assist in the implementation of a monitoring program for detecting climate variability and its impacts on North Pacific ecosystems. Some of these Task Teams have Advisory Panels to provide direction to specific Task Team initiatives, *e.g.*, the *Iron Fertilization Experiment* Advisory Panel of BASS, and the *Continuous Plankton Recorder* Advisory Panel of MONITOR.

To date, each of these CCCC Task Teams has held workshops, sessions at PICES Annual Meetings, and produced useful reports and products, with relatively little input or interaction with the other Task Teams. In recent years this has changed as both REX and BASS have worked closely with MODEL to implement specific models that apply to their specific needs and interests. It is clear that the CCCC Program, with its diverse Task Teams and implemented national programs, has reached the point where it must move forward with integration and synthesis of these diverse activities. It was with this background that the **N**emuro **Ex**perimental Planning **T**eam (NEXT) was formed. Terms of Reference for NEXT and the membership of NEXT are included in *Appendix A* and *Appendix B*, respectively. These Terms of Reference are rather specifically oriented around the use of the NEMURO model developed by MODEL for future synthesis. **NEMURO** is the **N**orth Pacific **E**cosystem **M**odel for **U**nderstanding **R**egional **O**ceanography. The recommendations below provide some generic guidance for synthesis using NEMURO and its successors, *e.g.*, NEMURO.FISH, NEMURO_SAURY and NEMURO_HERRING, which include links to higher trophic levels. More generally however, the recommendations below provide a "roadmap" for achieving a basin-scale synthesis of the regional and local datasets generated by CCCC projects in the member nations.

Recommendations

1. A major inter-sessional (2-3 days) PICES sponsored symposium should be held in around April 2006, to present CCCC synthesis findings from national programs, and to foster multinational synthesis (a grander understanding) of the connections between climate variability and ecosystem structure and functioning in the North Pacific. A suggested venue for this symposium is Honolulu, Hawaii, U.S.A., because of the desire to enable broad national participation of scientists from PICES member nations from both sides of

the Pacific. We would hope that the papers from this symposium would be published in a special journal issue (*e.g.*, *Progress in Oceanography*).

2. The CCCC Program should conduct detailed model-data comparisons/validation of the NEMURO lower trophic levels model using data from many different coastal regions. (See recommendations 3 and 4 below and *Appendix C*).

3. A two-tiered approach should be used for further development of ecosystem and coupled physical-ecosystem models in the North Pacific. The first tier, which will continue to be led by the MODEL Task Team, will be to further theory and implementation of the basic model frameworks needed to advance our understanding of climate, physics and biology in the PICES region. An example of this would be future incorporation of the role of iron limitation on population dynamics, diversity and ecosystem structure. This might be accomplished through future dedicated workshops, or via "virtual workshops" in which several key investigators work to accomplish a specific model implementation and series of simulations. The second tier, which will require extensive involvement of scientists with time-series or spatially-explicit data sets, will be careful and detailed comparisons of model predictions using NEMURO to field observations of the various state variables in the NEMURO code. To accomplish this latter goal will require substantial capacity building (influx of funds directed toward training workshops).

4. Members of the MODEL and BASS Task Teams discussed how various models developed within the CCCC Program could be used to test specific scientific hypotheses related to ecosystem structure in the North Pacific, and how the ecosystem has, or might, respond to climate change and variability. Most of the hypotheses relate to mechanisms that might be responsible for controlling productivity at multiple levels of the ecosystem. The ECOSIM model is most powerful in assessing the effects of large-scale changes in predation and trophic levels (specifically, through top-down processes) as they have, or may, respond to climate variability. Conversely, NEMURO-like models emphasize physical-forcing acting on lowermost trophic levels and impacting higher trophic levels through bottom-up processes. Thus, combined hypothesis testing using both ECOSIM and NEMURO models provides a powerful framework for examining ecosystem changes, and for deciphering the mechanisms that are responsible for those changes. The list of scientific hypotheses for future model experiments is listed in *Appendix D*.

5. Better mechanisms are needed to bring together the expertise of modelers with marine scientists making observations, or to train the observationists to implement and use the models to provide simulations that can be compared to their data sets. This lack of connection between modelers and data collectors has been a severe impediment to the wider application of NEMURO. Two specific suggestions to accomplish this are:

    a. To hold one or more 2-3 day **practical workshop(s)** during which potential users of the NEMURO model code and its derivatives (*e.g.*, NEMURO.FISH, etc.) receive instructions and hands-on training with the model. The goal of this workshop is to encourage the use of the NEMURO model code of LTL, and perhaps HTL, in regional programs, and importantly, to compare the model output with data from several coastal regions. Ideally, attendees from PICES member nations at the first workshop would be able to subsequently transfer their accumulated knowledge to other scientists and research groups in their nation. Regions where extensive and sufficient data sets exist for doing such model-data comparisons are now many, largely as a result of many nationally funded regional observation programs

that have occurred within the CCCC Program for the past 5-10 years, and in some places funded by other sources for much longer times (*e.g.*, CalCOFI). Examples are listed in *Appendix C*. If the first workshop, to be held just prior to the April 2006 CCCC synthesis symposium, is successful, similar workshops could be held in later years to broaden the connections between modelers and data observers even more.

b. **To assure better web page support** by the PICES Secretariat in order to provide better access to code and documentation for the NEMURO model and its successors. At the present time, this support is provided on an *ad hoc* basis by key members of the MODEL Task Team, but this role should be assumed by the PICES Secretariat. It is recommended that an intern position be established that will oversee this, as well as all of the other PICES web based activities (except meeting registrations). A plan for addressing this issue was presented to most CCCC Task Teams at PICES XII by Ms. Julia Yazvenko of the PICES Secretariat.

References

Perry, R. I., A. B. Hollowed, and T. Sugimoto. 2002. The PICES Climate Change and Carrying Capacity Program: Why, how, and what next? PICES Scientific Report, 22, 87-100.

PICES 2000. MODEL Task Team report of the international workshop to develop a prototype lower trophic level ecosystem model for comparison of different marine ecosystems in the North Pacific. PICES Scientific Report, 15, 1-77

Yamanaka, Y. 2001. NEMURO model follow-up. PICES Scientific Report, 17, 37-43.

NEXT Appendix A

NEXT Terms of Reference

1. To help guide and prioritize requests for modifications, future advancements, extensions, validations, and calibrations of the NEMURO model and its successors.
2. To develop a scientific strategy, based on requirements of ecosystem models to be developed, for a series of workshops for testing hypotheses on the following topics of CCCC Integration:
   a. Comparison of coastal ecosystems around the North Pacific Rim (and North Atlantic), using zooplankton and small fish as focal species;
   b. Latitudinal comparison of North Pacific ecosystems, using multiple focal species;
   c. Link basin-scale ecosystem models to coastal ecosystem models in the North Pacific, using salmon and associated species linked trophically to salmon as focal species.
3. To direct the development of advances in NEMURO by considering the scientific importance of the suggestion, the time and resources required to complete the task, and proposed suggestion's relevance to the goals of PICES and the CCCC Program.
4. To develop an outline of hypotheses testing model experiments during the early half of 2003, mainly through "virtual meetings" such as e-mail and other forms of long distance communication, and report to CCCC-IP/EC for consideration.

NEXT Appendix B

NEXT membership

Harold P. Batchelder (Chairman)
Gordon A. McFarlane (BASS)
Akihiko Yatsu (BASS)
Shin-ichi Ito (MODEL)
Bernard A. Megrey (MODEL)
Thomas C. Wainwright (MODEL)
Douglas E. Hay (REX)
William T. Peterson (REX)
Yoshiro Watanabe (REX)
Yukimasa Ishida (FIS)

NEXT Appendix C

Possible locations for future NEMURO model-data comparisons/validation

To date, the NEMURO LTL model has been configured to simulate biological processes and state variables for three regions: Station Papa in the Eastern Subarctic Pacific; Station A7 in the Western Subarctic Pacific; and an Eastern Bering Sea Station (PICES 2000; Yamanaka, 2001). At recent MODEL workshops, it was decided to move forward with publishing some of these simulations and others in a special issue of *Ecological Modelling*. This is a significant milestone in the dissemination of NEMURO to the scientific community.

Model-data comparisons should be done for other regions within the North Pacific that have sufficient data sets for (1) forcing (local wind intensity, solar radiation, mixed layer depth, etc.) future region-specific models and (2) biological data (phytoplankton and zooplankton biomass and size composition) for comparing to the resulting simulations. Ideally, sufficient data would be available from a prospective **model-data** comparison to permit comparison of seasonal averages and higher frequency fluctuations. There are only a few locations where the biological (*e.g.*, plankton) data are sufficiently well sampled temporally (minimum of quarterly sampling) to conduct detailed comparisons with model output. These are:

- Newport, OR Line (Peterson)
- Vancouver Island Shelf Stations (Mackas)
- CalCOFI (Bograd/Ohman)
- Coastal Gulf of Alaska off Seward, AK (Coyle, Whitledge) and maybe Prince William Sound, AK (Cooney)
- Jiaozhou Bay, China (Qiao)
- Yellow Sea (Qiao; sampled at *ca*. 70 stations on 6 cruises between spring 1996 and fall 1997)
- Toyama Bay in the Japan/East Sea (Ikeda & colleagues)
- PM line in the Japan/East Sea (Chiba)
- Yellow and Japan/East Sea waters off the Korean Peninsula (Kang)

These, plus the Station P, Station A7 and Station in the Bering Sea, are the key locations for future **model-data** comparisons.

NEXT Appendix D

Hypotheses and scientific questions for future model testing experiments

The two models that have received the most attention within the CCCC Program are the ECOPATH (and ECOPATH with ECOSIM; hereafter referred to as ECOSIM) and the NEMURO model and its various enhancements. NEMURO models are fundamentally bottom-up, physically-forced process models with detailed functional linkages among and between trophic levels for vital rates (consumption, growth, mortality, and reproduction). Conversely, ECOSIM models are often built "middle-out" starting with commercially harvested fish species (*e.g.*, flatfish, pollock, cod, salmon), and with lower trophic levels (phytoplankton, mesozooplankton) and higher trophic levels (predatory fish, birds, mammals)

calibrated from observations of trophic level abundances and consumption pathways. ECOSIM models can be used to address connections between food web components that are not modelled by detailed bottom-up process models like NEMURO. The combined use of bottom-up and top-down forced models is valuable for cross-calibration and for evaluating how climate variability impacts marine ecosystems, and how those impacts are propagated through the food web. It also allows explicit evaluation of the influence of other human (*e.g.*, fisheries) impacts on marine ecosystem structure.

Hypothesis list:

$H1_o$: The role of top predators (large fish, birds and marine mammals) in North Pacific marine food webs has varied over time (*e.g.*, due to climate changes, whaling, fisheries, natural fluctuations).

$H2_o$: North Pacific wide changes in predatory fish populations (flatfish, pollock, cod) reflect common climate forcing as well as local fishing patterns (this hypothesis attempts to understand the role of basin wide, presumably climate variability versus more local, harvest related forcing).

$H3_o$: Climate variability, as quantified by the temporal and spatial pattern of the Pacific Decadal Oscillation (PDO) brings simultaneous changes in both western- and eastern-side populations of small pelagics (sardine and anchovy), but through different mechanisms on opposite sides of the ocean basin (this hypothesis is directed at understanding how populations of small pelagics on opposite sides of the North Pacific appear to be coherently responding to large-scale forcing, when ocean conditions (SST pattern as measured by the PDO) are opposite (colder in east, when warmer in west).

$H4_o$: Sardine and anchovy population fluctuations are controlled by lower trophic level productivity (bottom-up processes) during both the increases and declines in their populations.

$H5_o$: Small but concurrent changes in combined predator population (*e.g.*, fish and birds which feed on a common resource [*e.g.*, euphausiids]) can be used as an indicator for detecting shifts in key unsampled prey populations.

$H6_o$: Overall marine productivity (defined at the broadest level), esp. its magnitude, form (*e.g.*, crustacean *vs* gelatinous zooplankton; or size structure), and seasonality is important in determining survival of commercially important North Pacific species.

- $H6A_o$: The timing and availability of marine production in coastal regions of the North Pacific, and its availability in a proper form for juvenile salmon is key in determining early ocean survival of salmon, and may be particularly impacted by changing climate.
- $H6B_o$: Differences in the vulnerability and timing of production cycles of the zooplankton populations used by sardine, anchovy and saury in the recirculation region of the Kuroshio Extension is responsible for the alternation of dominant species in the western Pacific.

Although not phrased in hypothesis form, another question that is of interest is to determine what upper trophic level biological flows are key in connecting open ocean ecosystems and continental shelf ecosystems in the North Pacific.

REPORT OF BASS TASK TEAM

The Basin Scale Studies (BASS) Task Team met in the morning of October 12, 2003, to review the past year's activities and plan activities for 2004. The Co-Chairmen, Drs. Gordon A. McFarlane and Akihiko Yatsu, welcomed participants (*BASS Endnote 1*) and outlined the objectives of the meeting. The agenda was approved as presented (*BASS Endnote 2*).

Activities and accomplishments in 2003 (Agenda Item 2)

BASS/MODEL Scientific Report

The results from the BASS/MODEL workshop series were published as PICES Scientific Report No. 25. This is the major product of the successful east-west comparison of ecosystem structure and responses to turbulences such as climate variations, primary production variations and removals of key elements (fishery) using ECOPATH and ECOSIM.

2003 BASS Workshop at PICES XII

A 1-day BASS Workshop on "Linkages between open and coastal systems" was convened on October 15, 2003, in Seoul, Korea, during the PICES Twelfth Annual Meeting. A total of 15 talks and 5 posters covering all trophic levels from both gyres and coastal areas were presented. Invited speakers from North America and Asia provided current information on physics, plankton, fish, birds and mammals, and speculated on mechanisms for energy transfer between areas. This information will be useful for future modeling. The summary of the workshop is included elsewhere in this Annual Report. It is expected that selected papers from the workshop will be published in a special issue of *Deep-Sea Research II*.

Report of IFEP Advisory Panel

The report of past and future activities of the Advisory Panel on *Iron Fertilization Experiment* (IFEP) was presented by Dr. Paul J. Harrison (*BASS Endnote 3)*. Discussions centered on:

- east-west differences in primary production variability;
- the relative importance of three iron supply sources - dust/fog, upwelling and transport from coastal areas;
- the possibility of input of iron supply from dust/fog into numerical modeling (this was thought too complicated to input at this stage).

Proposed activities at PICES XIII (Agenda Item 3a) and NEXT report (Agenda Item 4)

With the successful completion of the gyre modeling work, participants discussed linking open ocean and coastal ecosystems from the viewpoint of CCCC synthesis, including focusing on key species, examining modeling approaches and re-structuring CCCC Task Teams. The discussion resulted in:

- a proposal of a 2-day BASS/REX/MODEL Workshop at PICES XIII entitled "Linking open ocean and coastal systems II" (*BASS Endnote 4*); and
- a recommendation of the unification of BASS and REX as one new Task Team (*BASS Endnote 5*).

The proposed workshop will further examine the oceanographic and biological linkages between open ocean and coastal systems in the North Pacific Ocean for the subsequent ecosystem modeling, and should provide a new center of focus for the proposed merged Task Team.

Joint NPAFC/PICES symposium (Agenda Item 3b)

A 2-day joint BASS/NPAFC workshop on the role of salmon and associated species in linking open ocean and coastal systems was originally proposed for immediately prior to PICES XIII (Honolulu, U.S.A.). The new suggestion, developed by the Chairmen of the NPAFC CSRS and PICES Science Board, is to postpone

this workshop, and instead hold a major joint-symposium in 2005, with the working title "State of Pacific salmon and their role as indicators of the health of North Pacific ecosystems". Development of the symposium (if approved) objectives and key questions to be addressed will take place in early 2004, and the final organization will occur at NPAFC and PICES' Annual Meetings in 2004. BASS supported this proposal and recommended Drs. Richard J. Beamish (Canada) and Yukimasa Ishida (Japan) as PICES' convenors.

North Pacific Ecosystem Status Report (Agenda Item 5)

BASS endorsed the progress of NPESR preparation. BASS will examine the draft report to ensure that information on the gyres is reflected. In addition, BASS members suggested the need of addressing some omissions (*e.g.*, 1989 regime shift) and standardizing terminology (*i.e.*, 3 types of regimes?). BASS members will address these specific concerns and provide comments to the NPESR Working Group.

Reports on PICES capacity building and Strategic Plan (Agenda Items 6 and 7)

BASS endorsed the approach presented for capacity building and the PICES Strategic Plan (Vision Statement), particularly that of advising on the sustainability of living marine resources and protection of the marine environment.

Requests for travel (Agenda Item 8)

BASS requests support for 2 scientists to attend the Workshop on "Linking open ocean and coastal ecosystems II" at PICES XIII.

Election of Co-Chairman (Agenda Item 10)

BASS requests to replace Dr. McFarlane (Canada) by Dr. Kerim Aydin (U.S.A.) as the BASS Co-Chairman. It was noted that Dr. Aydin has not yet been nominated by the United States as a member of BASS even though he has actively participated in BASS activities during the last four years. The nomination is pending CCCC and Science Board approval of the BASS/REX unification into a new Task Team.

BASS Endnote 1

Participation List

Members

Masahide Kaeriyama (Japan)
Suam Kim (Korea)
Andrei S. Krovnin (Russia)
Gordon A. McFarlane (Canada, Co-Chairman)
Vadim F. Savinykh (Russia)
Akihiko Yatsu (Japan, Co-Chairman)

Observers

Kerim Y. Aydin (U.S.A.)
Richard J. Beamish (Canada)
Michael J. Dagg (U.S.A.)
Paul J. Harrison (Canada)
Yukimasa Ishida (Japan)
Makoto Kashiwai (Japan)
Jacquelynne R. King (Canada)

BASS Endnote 2

BASS Meeting Agenda

1. Welcome and introductions
2. Review accomplishments in 2003
   a. BASS/MODEL Scientific Report No. 25
   b. BASS Workshop on "Linkages between open and coastal systems" at PICES XII
   c. Report of *IFEP* Advisory Panel
3. Planning for 2004
   a. Workshop "Linking open ocean and coastal system II" at PICES XIII (follow-up from 2003 BASS Workshop)
   b. Joint symposium with NPAFC

c. Discuss role of BASS in proposed CCCC inter-sessional symposium
4. Discussion of report from NEMURO EXperimental Planning Team (NEXT)
5. Discussion of North Pacific Ecosystem Status Report
6. Discussion of report from Study Group on *PICES Capacity Building*
7. Discussion of report from Study Group on *PICES Strategic Issues*
8. Specific funding requests for 2004 and 2005
9. Other business
10. Election of new BASS Co-Chairman

BASS Endnote 3

Report of *Iron Fertilization Experiment* Advisory Panel

Activities in 2003

SERIES Workshop

A 4-day SERIES (**S**ubarctic **E**cosystem **R**esponse to **I**ron **E**nrichment **S**tudy) Workshop was held March 9-12, 2003, at the Institute of Ocean Sciences, Sidney, Canada. Observed results from the experiment conducted in July-August 2002, in the Eastern Subarctic Pacific by three research vessels, CSS *John P. Tully* (Canada), M/V *El Puma* (Mexico) and M/V *Kayio-Maru* (Japan) were synthesized. Data exchange, publications, timeline for the next 12 months, etc. were discussed.

SEEDS planning meeting

A planning meeting for the 2004 SEEDS (**S**ubarctic Pacific Iron **E**xperiment for **E**cosystem **D**ynamics **S**tudy) experiment in the Western Subarctic Pacific was held April 18, 2003, at the Ocean Research Institute, University of Tokyo, Japan. Objectives of the research projects were presented by both US and Japanese scientists. The ship schedule for US and Japanese research vessels and parameters that will be measured on each vessel were discussed.

Activities in 2004

PICES IFEP Workshop

A 3-day PICES IFEP Workshop on "*In situ* iron enrichment experiments in the Eastern and Western Subarctic Pacific" will be held February 11-13, 2004, at the Institute of Ocean Sciences in Sidney, British Columbia, Canada. (The schedule was changed from December 2003 to February 2004.)

Specific objectives of the workshop are:

- to synthesize results from two recent *in situ* iron enrichment experiments in the Subarctic Pacific (SEEDS-2001 and SERIES-2002);
- to discuss responses in lower and higher trophic levels, carbon cycles, trace-gas production and ocean-atmosphere flux, and models;
- to determine similarity and differences in biogeochemical and ecosystem responses to iron addition between Eastern and Western Subarctic Pacific; and
- to identify specific scientific questions for the longer-term experiment in the Western Subarctic Pacific (SEEDS-2004).

The results of this IFEP workshop will be published as a PICES Scientific Report in 2004.

Travel support from PICES is requested (and approved in 2003) for one scientist from New Zealand to attend the workshop.

Topic Session at ASLO/TOS Conference

A 1.5-day special session on "Response of the upper ocean to mesoscale iron enrichment" will be convened February 17-18, 2004, at the ASLO/TOS Ocean Research Conference in Honolulu, U.S.A. The Session represents a combined effort of the Canadian SOLAS and the PICES IFEP.

SEEDS-2004

The second *in situ* iron enrichment experiment in the Western Subarctic Pacific (SEEDS-2004) will take place in July-August 2004. A Japanese ship will release iron on July 17, 2004, stay at

the iron-enriched patch for 10 days, and come back to the site from Day 23 to Day 34. A US research vessel will be at the site from Day 6 to Day 26, which allows us 4-5 days' overlapping at the beginning and the end of the experiment.

Publications

Selected papers from the SEEDS-2002 experiment as well as the experimental design of SEEDS-2004 will be published as a special issue of *Progress in Oceanography*.

BASS Endnote 4

Proposal for a 2-day BASS/REX/MODEL Workshop at PICES XIII on "Linking open ocean and coastal ecosystems II"

Following the successful completion of the BASS/MODEL workshop series on data synthesis and trophic modeling of the subarctic Pacific basin ecosystems (PICES Scientific Report No. 25), and a 1-day BASS Workshop on "Linkages between open and coastal systems" at the 2003 PICES Annual Meeting and the MODEL/REX workshops to develop NEMURO.FISH, we propose a 2-day BASS/MODEL/REX workshop prior to PICES XIII, in order to explore specific food web modeling approaches for linking climate with coastal and oceanic biological production, as a recommended continuation of these Pacific-wide collaborative research efforts. Specifically, climate events may propagate through trophic levels with variable effects at each level, such that coherent patterns that exist may not be detectable across all regions without further modeling synthesis. To date, models of lower trophic levels (NEMURO), forage species (NEMURO.FISH) and upper trophic levels (ECOPATH/ECOSIM) have been constructed of multiple regions of the North Pacific to examine coastal and oceanic regions with a common set of modeling tools. The next step is to compare and evaluate these and complementary methods (such as Individual Based Models) in a Pacific-wide synthesis.

The workshop shall consist of three components:

1. A critical evaluation of regional and basin-wide trophic models with a focus on the recent results of BASS, MODEL and REX Task Teams. The development of complementary and comparable approaches to *(a)* modeling connections between climate and ecosystems, lower and upper trophic levels, and coastal and oceanic regions; and *(b)* incorporating seasonal dynamics. Discussion shall include the identification of key data requirements for North Pacific scale production modeling and forecasts.

2. As a specific example, the examination of climate driven processes underlying changes in the distribution (expansion and contraction) of Pacific sardines, especially with respect to transitions between coastal and oceanic (gyre) ecosystems. What are the future expectations of sardine productivity and distribution under various climate change scenarios?

3. Synthesis of PICES activities to date that are applicable to BASS/REX studies, particularly Pacific-wide climate influence on ecosystems and marine resource productivity. Identification of the major issues and gaps in knowledge relating to the understanding of changes in ecosystems under a changing environment. Recommend solutions, particularly identifying fieldwork required to fill in the gaps in knowledge and to improve predictive ability.

Recommended conveners: Gordon A. McFarlane (Canada), Akihiko Yatsu (Japan), Kerim Aydin (U.S.A). REX and MODEL are to be approached to co-sponsor the workshop and nominate convenors.

Travel support is requested for two scientists to attend the workshop.

BASS Endnote 5

Rationale for integrating the BASS and REX Task Teams

The BASS Task Team requests that the CCCC-IP Executive Committee consider combining the BASS and REX Task Teams into one new Task Team, and identifying new Co-Chairmen. We believe that this will ensure fuller participation from all member countries, and ensure coverage of both open ocean and coastal regions appropriately. The following rationale was discussed and agreed upon by participants:

1. It is consistent with recent activities of each of these two Task Teams that have examined linkages between coastal and open ocean systems.
2. The original intent of PICES was to have a single Task Team, but these two Task Teams were created so that baseline studies could be undertaken. After 12 meetings, many of these baseline activities have been completed.
3. An integrated Task Team could provide the scientific body for hypothesis testing of model experiments as recommended by NEXT in their Strategy for accomplishing PICES CCCC Program synthesis.
4. MODEL Task Team has been collaborating separately with each of BASS and REX. An integrated Task Team would be a more effective approach for collaborating with MODEL.
5. One Task Team will also ensure better participation and a clearer focus for examining climate change impacts on ecosystems. This will be advantageous for fiscal efficiency.

REPORT OF MODEL TASK TEAM

The meeting of the MODEL Task Team was held from 09:00-13:00 hours on October 12, 2002. The Co-Chairmen, Drs. Shin-ichi Ito and Francisco E. Werner called the meeting to order and welcomed the participants (*MODEL Endnote 1*). The Task Team reviewed the draft agenda and adopted it (*MODEL Endnote 2*).

Discussion of reports from Study Group on *PICES Capacity Building* and NEXT (Agenda Item 2)

Dr. Harold P. Batchelder (CCCC-IP Co-Chairman) presented recommendations from the Study Group on *PICES Capacity Building* and the NEMURO Experimental Planning Team (NEXT).

- On capacity building, the discussion focused on how best to accomplish the important goals listed in the report and how to secure funds for this effort. Ideas included: *(i)* short 2-3 day workshops, *(ii)* extended visits to host countries by scientists bringing expertise in specialized areas of research, and *(iii)* regular yearly "summer courses" on focus-topics allowing immersion for graduate students, post-docs and young scientists. Funding opportunities would need to be identified by PICES, and could include funds from PICES member countries as well as government agencies and private foundations.
- The lack of connection between modelers and data collectors has been a severe impediment to a wider application of NEMURO. Among other recommendations, NEXT proposed NEMURO Training Sessions to enable the broader PICES community to implement the NEMURO model regionally. During these sessions, potential users of the NEMURO model code and its derivatives *(e.g.*, NEMURO.FISH, *etc*.) will receive instruction and hands-on training with the model. This issue is discussed further in sections below.

New PICES web site (Agenda Item 3)

Ms. Julia Yazvenko (PICES Secretariat) presented the new web site structure and format targeted for late 2003 or early 2004. Each group will have a separate page on this new site. MODEL will provide information to fit the proposed template including tasks, reports and membership. Dr. Bernard A. Megrey was nominated as the contact person on scientific content for the MODEL web page and links with the existing MODEL web site. MODEL requested that the PICES web site include list-serve capabilities to the Task Team members.

Report from Study Group on *PICES Strategic Issues* (Agenda Item 4)

The PICES Strategic Plan (Vision Statement) was announced and certain aspects were discussed. In particular, mention was made of the new role that PICES may be asked to play in providing scientific advice to member countries.

North Pacific Ecosystem Status Report (Agenda Item 5)

The draft North Pacific Ecosystem Status Report (NPESR) was discussed and Task Team members were asked to consider if MODEL should contribute to future NPESRs. One example was to report on the performance of models of the North Pacific basin in capturing certain physical signals (*e.g.*, stratification, transport, mixed layer depth) that could not be fully captured by observations. This would require interaction with the PICES Physical Oceanography and Climate Committee as well as other scientific programs such as GODAE (Global Ocean Data Assimilation Experiment). Contribution to the NPESR could include the models' performance in capturing past signals as well as predictive aspects where possible.

MODEL accomplishments in 2003 (Agenda Item 6)

A successful workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model" (co-sponsored in part by the Nakajima Foundation) was held March 3-6, 2003, at the Frontier Research System for Global Change, in Yokohama, Japan. The main results of the workshop were: *(i)* the development of a computer simulation model of fish bioenergetics and growth for Pacific herring and Pacific saury including feedback from the fish model to lower trophic model; *(ii)* the formulation of a Lagrangian model of NEMURO.FISH including fish migration; and *(iii)* the adaptation of the Lagrangian model to saury in the western North Pacific. The workshop results will be published in PICES Scientific Report No. 26.

A ½-day MODEL Topic Session on "Comparison of modeling approaches to describe ecological food webs, marine ecosystem processes, and ecosystem response to climate variability" was convened at PICES XII. The program of the session that consists of 10 oral presentations and 5 posters was reviewed. A summary of the session is included elsewhere in this Annual Report.

MODEL Workplan for 2004 (Agenda Item 7)

Inter-sessional meetings

- Convene an inter-sessional workshop in December 2003, in Yokohama, Japan, to work on NEMURO and NEMURO.FISH manuscripts for a special issue of *Ecological Modeling*. This workshop is funded by the Fisheries Research Agency of Japan (FRA) in a grant to Dr. Shin-ichi Ito for a project entitled "Development of model on coupled response of lower and higher trophic level ecosystems for climate variability in the North Pacific". No PICES funds are requested for this activity.
- Meet in August 2004, in Seattle, U.S.A., for *(i)* an inter-sessional workshop to "Document and disseminate NEMURO and NEMURO.FISH" in preparation for a 2005 inter-sessional Training Session, and *(ii)* editing the manuscripts for publication in *Ecological Modelling*. Partial support will be available from FRA, and PICES support is requested for two scientists to attend.

PICES XIII

- Plan and convene a ½-day CCCC/MODEL Topic Session on "Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans" (*MODEL Endnote 3*). PICES support is requested for one invited speaker.
- Conduct a joint BASS/REX/MODEL planning workshop to link NEMURO and NEMURO.FISH to ECOPATH and ECOSIM for the study of sardine and anchovies (*BASS Endnote 4*).
- Convene a 1-day CCCC/MODEL Workshop to prepare a strategy and products for future NEMURO and NEMURO.FISH Training Sessions.

Publications

- Submit papers on NEMURO and NEMURO.FISH models and their applications for review and publication as a special issue of *Ecological Modeling* (Guest Editors: Shin-ichi Ito, Michio J. Kishi, Bernard A. Megrey and Francisco E. Werner).

Pending APN Workshop proposal

Drs. Werner and Megrey submitted a proposal to APN (Asia Pacific Network) for US$86,000, for an "International Workshop on Climate interactions and marine ecosystems: Effects of climate on the structure and function of marine food-webs and implications for marine fish production in the North Pacific Ocean and marginal seas". The objective is to use a common marine food-web and fisheries bioenergetics modeling approach based on NEMURO and NEMURO.FISH, along with long-term area-specific oceanographic and fisheries data sets, *(i)* to understand the propagation of climate change effects up the marine food-web; *(ii)* to quantify its effects on energy cycling and fish growth and production (Pacific herring is the target) in distinct geographic regions in the North Pacific and its marginal seas; *(iii)* to initiate a discussion of how these results can be integrated into the

decision making process by fisheries/resource managers and policy makers; *(iv)* to hold a workshop to integrate the work; and *(v)* to publish two papers in peer-reviewed journals.

If funded, the proposal will bring a Chinese and a Russian young scientist for four months to the United States to work on data mining and model implementation. It will also fund a workshop with 15 participants in October 2004, in Honolulu, the week before PICES XIII. Funding decision will be announced in April 2004. Since Canada is not an APN member, PICES funds were requested for two Canadian scientists to attend the workshop.

Membership of MODEL Task Team (Agenda Item 8)

No new members were introduced but MODEL recommended that the current membership be reviewed to make sure the Task Team was composed of the appropriate mix of disciplinary points and views, and has proper international representation.

MODEL Task Team recommendations (Agenda Item 9)

1. Convene a MODEL workshop in December 2003, in Yokohama, Japan (hosted by FRA), to prepare manuscripts on NEMURO and NEMURO.FISH for submission to a special issue of *Ecological Modelling*.

2. Convene an inter-sessional workshop in August 2004, in Seattle, U.S.A., (i) to edit the manuscripts for publication in *Ecological Modelling*, and (ii) to document and disseminate "clean versions" of NEMURO and NEMURO.FISH. Travel funds are requested for two scientists.

3. At PICES XIII:
   - Convene a ½-day CCCC/MODEL Topic Session on "Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans". If alternate funding for the inter-sessional meeting is found (*e.g.*, from APN), we request funding for one invited speaker.
   - Conduct a joint BASS/REX/MODEL workshop to discuss coupling NEMURO and NEMURO.FISH with ECOPATH and ECOSIM to study sardine and anchovy fluctuations.
   - Building on the dissemination of NEMURO and NEMURO.FISH, and in preparation for a CCCC Integration Symposium in 2006, convene a 1-day CCCC/MODEL workshop to plan the NEMURO Training Session of April 2005.

MODEL Endnote 1

Participation List

Members

Shin-ichi Ito (Japan, Co-Chairman)
Gennady A. Kantakov (Russia)
Michio J. Kishi (Japan)
Bernard A. Megrey (U.S.A.)
Hiroaki Saito (Japan)
Thomas C. Wainright (U.S.A.)
David W. Welch (Canada)
Francisco E. Werner (U.S.A., Co-Chairman)
Sinjae Yoo (Korea)
Yury I. Zuenko (Russia)

Observers

Harold P. Batchelder (U.S.A.)
Michael J. Dagg (U.S.A)
George L. Hunt (U.S.A.)
Irina Ishmukova (Russia)
Maki Neguchi-Aita (Japan)
S. Lan Smith (Japan)
Fan Wang (China)
Yasuhiro Yamanaka (Japan)
Julia Yazvenko (PICES Secretariat)
Hak Yoel You (Korea)

MODEL Endnote 2

MODEL Task Team Meeting Agenda

1. Welcome and introduction of new members
2. Discussion of reports from Study Group on *PICES Capacity Building* and NEXT
3. Discussion of PICES web site
4. Discussion of report from Study Group on *PICES Strategic Issues*
5. North Pacific Ecosystem Status Report
6. Review of accomplishments in 2003
7. Planning for 2004
   a. Inter-sessional meetings
   b. PICES XIII
   c. Publications
   d. APN proposal
8. Rotation of membership
9. Recommendations to CCCC IP
10. Other business.

MODEL Endnote 3

Proposal for a ½-day CCCC/MODEL Topic Session at PICES XIII on "Modeling approaches that integrate multiple spatial scales and trophic levels between shelf and open oceans"

Marine ecosystems are characterized by complex trophic interactions that occur on disparate time and space scales. Modulation by physical and biogeochemical properties further complicates these interactions. To date, most studies of marine ecosystems consider shelf and open ocean regions separately. However, through active migration and/or advective processes, shelf and oceanic populations are coupled. In this session, we welcome modeling contributions that consider shelf, open ocean and coupled shelf-ocean domains that integrate across multiple spatial scales, temporal scales and trophic levels. From these studies we seek to develop a better understanding of how open ocean and shelf ecosystems are linked.

Recommended convenors: Shin-ichi Ito (Japan), Michio J. Kishi (Japan), Bernard A. Megrey (U.S.A) and Francisco E. Werner (U.S.A). Travel support is requested for one invited speaker.

REPORT OF MONITOR TASK TEAM

The MONITOR Task Team met from 9:30-13:00 hours on October 12, 2003, to review accomplishments of the preceding year and the status of various national and regional monitoring programs, and to make plans for the upcoming year. The participation list and meeting agenda are appended as *MONITOR Endnote 1* and *MONITOR Endnote 2*.

North Pacific Ecosystem Status Report - PICES XII MONITOR Workshop (Agenda Item 2)

Dr. David L. Mackas reviewed the outcome from the MONITOR Workshop to "Examine and critique a North Pacific Ecosystem Status Report" held October 10-11, 2003, at PICES XII. Summary of the workshop is included elsewhere in this Annual Report and will be published in January 2004, in PICES Press.

The workshop convened was a great success. Recommendations and scientific criticisms made by more than 40 participants will enable the PICES community to reach new heights in applied ecosystem monitoring and operational oceanography. Participants from across the globe brought insights from various ecosystems that greatly strengthened discussions and made for dynamic interactions.

The role of MONITOR in NPESR preparation and review was discussed. Task Team members agreed that this is an important present and future work for MONITOR. Potential actions and activities by MONITOR:

- contribute expertise to 'scientific peer review';
- initiate future NPESR editions (however, this role assumes a permanent mandate for MONITOR, probably extending beyond the duration of the CCCC Program);
- help future chapter authors find relevant data and specialist expertise; and
- contribute to 'outreach' communication.

Report on PICES CPR program (Agenda Item 3)

Dr. Sonia D. Batten provided a brief report on the status of the PICES North Pacific CPR (Continuous Plankton Recorder) Program. Funding (grant of US $185,000 from the North Pacific Research Board) for the east-west transect (from Vancouver to Yokohama) is in place through June 2005. For the north-south line, funding through 2006 (grant at a level of US $120,000 per year) is pending but not yet approved by the Gulf of Alaska Ecosystem Monitoring and Research Program of Exxon Valdez Oil Spill Trustee Council. Starting 2004, change in ship availability will cause a route change for the north-south line – Puget Sound to Anchorage *vs.* Los Angeles to Prince William Sound. The new, shorter, route will provide continued good coverage of Alaska Gyre but much less coverage of the California Current System. A detailed report on this activity will be published in January 2004, in PICES Press.

PICES should continue to endorse, and encourage further development of the very successful North Pacific CPR Program.

Other monitoring activities (Agenda Item 4)

- 3 'new' lines off Pacific coast of Japan crossing the Kuroshio and Oyashio current systems were initiated by the Japanese Fisheries Research Agency;
- A new 'ferry box' monitoring program in Alaskan coastal waters was launched in 2003 by the Gulf of Alaska Ecosystem Monitoring and Research Program.

Inter-sessional activities (Agenda Item 5)

Dr. Sei-ichi Saitoh will represent PICES at the Fifth Annual Meeting of POGO (Partnership for Observation of the Global Ocean). This meeting will be held November 18-20, 2003, in Yokohama, Japan, and focus on the

implementation of an ocean global observing system.

At last year's Annual Meeting, MONITOR recommended that PICES should endorse and sponsor two North Pacific "GOOS pilot projects" focused on the marginal seas and continental margin boundaries of the Northwest and Northeast Pacific. The Northwest Pacific pilot program was envisioned to be built around the expanding NEAR-GOOS program. The Northeast Pacific pilot program was envisioned as a coast-wide linkage of new and existing regional and national ocean monitoring programs in the California Current and Alaska Current systems. As a step toward building such a Northeast Pacific monitoring network and discussing the role of PICES in regional coordination, MONITOR will convene a 3-day (November 20-22, 2003) workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" in Victoria, Canada. Partial funding for the workshop is provided by the Pacific Coastal Observing System (PaCOS) and the Gulf Ecosystem Monitoring Program (EVOS-GEM). The meeting will be chaired by Drs. David Mackas (2001-2003 MONITOR Co-Chairman), Phillip R. Mundy (incoming MONITOR Co-Chairman and US GOOS Steering Committee member) and Skip McKinnell (PICES Deputy Executive Secretary). A report on this workshop will be published in January 2004, in PICES Press.

Session proposal for PICES XIII (Agenda Item 6)

A workshop and a Topic Session were proposed for PICES XIII:

- A 1-day workshop (joint with POC) on "North Pacific GOOS: Needs and activities"; recommended convenors: Vyacheslav B. Lobanov (Russia), Phillip R. Mundy (U.S.A.) and Sei-ichi Saitoh (Japan). This workshop could be combined with the proposed POC Topic Session on "Application of Global Observing Systems to physics, fisheries and ecosystems";
- A ½- or 1-day Topic Session on "MONITOR contributions to CCCC Program: New results from ongoing time series"; recommended convenors: Sonia D. Batten (U.K.), David L. Mackas (Canada) and Sei-Ichi Saitoh (Japan). Should this session be accepted, convenors will explore the possibility of publishing the results in the *Journal of Oceanography*. This could be part of a longer CCCC Topic Session on "CCCC, GLOBEC and GLOBEC-like results: First steps toward a synthesis of impacts of large-scale climate change on North Pacific marine ecosystem".

"Time series at risk" (Agenda Item 7)

The following time series were identified as "time series at risk":

- CalCOFI;
- US GLOBEC LTOP lines off Newport (Oregon) and Seward (Alaska);
- Bering Sea M2 mooring;
- JMA lines in the Japan/East Sea and oceanic western North Pacific (especially zooplankton analysis for the Japan/East Sea line).

This list may be incomplete as there were no Korean or Chinese representatives at the meeting during this agenda item.

Discussion of reports from NEXT and Study Groups on *PICES Capacity Building* and *PICES Strategic Issues* (Agenda Items 8-10)

Reports and recommendations from these groups were reviewed at a plenary session with other Task Teams, and the results of this discussion are reflected in the report of the Implementation Panel on the CCCC Program.

Interactions with TCODE (Agenda Item 11)

The Task Team discussed a proposal by Dr. Sei-ichi Saitoh for interaction between MONITOR and TCODE to promote data exchange and CD-ROM publication of long-term data sets, and recommends that MONITOR and TCODE jointly *(i)* identify and list available long-term monitoring data sets; and *(ii)* make these data sets more broadly available by 'publishing' them on CD-ROM, with priority set based on their value for current and future PICES activities.

Future role and status of MONITOR (Agenda Item 12)

It was generally agreed that the MONITOR Task Team should extend beyond the duration of the PICES CCCC Program. Key 'permanent' tasks for the Task Team include: *(i)* updates to the North Pacific Ecosystem Status Report; and *(ii)* implementation of the North Pacific GOOS. It was recommended that PICES recognize this role by forming a permanent MONITOR Committee.

Several alternative organizational structures were discussed. Most preferred by Task Team members was for MONITOR to become a Scientific Committee (like POC, BIO, MEQ and FIS). Second choice was to become a Technical Committee (like TCODE). A third option is for MONITOR to be merged with TCODE. However, group consensus was that MONITOR should maintain close contact with, but be separate from, TCODE because of differences in focus and expertise (collection and interpretation of time series *vs*. data archival and exchange). In practice, a combined committee would necessarily function as two sub-committees.

Specific funding requests (Agenda Item 13)

- 2 invited speakers for the Workshop on "North Pacific GOOS: Needs and activities" and 2 invited speakers for the Topic Session on "MONITOR contributions to CCCC Program: New results from ongoing time series" at PICES XIII;
- 1 MONITOR representative to attend the ICES-IOC Steering Group on GOOS (SGGOOS) meeting to be held in April 2004, in Spain;
- 1 MONITOR representative to participate in NEAR-GOOS activities in conjunction with the 6th WESTPAC Symposium in April 2004, in Hangzhou, People's Republic of China;
- Production of several copies of the "North Pacific Ecosystem Status Report Poster" to be carried to various scientific meetings by MONITOR members.

Election of new MONITOR Co-Chairman (Agenda Item 14)

Dr. Phillip R. Mundy (U.S.A.) was chosen (in a closed election with two other US scientists, Drs. Jeffrey M. Napp, and Steven J. Bograd) and recommended as the new MONITOR Co-Chairman to replace Dr. Mackas (Canada).

New PICES web site (Agenda Item 15)

Ms. Julia Yazvenko of the PICES Secretariat demonstrated the features of the new PICES web site. Each group will have a separate page on this new site. Using the proposed template, MONITOR will supply lists of 'key tasks', 'projects' and 'products' for the MONITOR web page.

MONITOR Endnote 1

Participation List

Members

Vyacheslav B. Lobanov (Russia)
David L. Mackas (Canada, Co-Chairman)
Phillip R. Mundy (U.S.A.)
Yutaka Nagata (Japan)
Jeffrey M. Napp (U.S.A.)
Thomas C. Royer (U.S.A.)
Sei-ichi Saitoh (Japan, Co-Chairman)
William J. Sydeman (U.S.A.)

Observers

Sonia D. Batten (U.K.)
Li-Qi Chen (China)
Kiyotaka Hidaka (Japan)
Elena Latkovskaya (Russia)
Stewart M. McKinnell (PICES Secretariat)
Kaoru Nakata (Japan)
Sachi Okhi (Japan)
Yasunori Sakurai (Japan)

MONITOR Endnote 2

MONITOR Task Team Meeting Agenda

1. Approval of agenda
2. North Pacific Ecosystem Status Report - discussion of draft report and of PICES XII MONITOR workshop on this topic
3. Report on North Pacific CPR program
4. Review other MONITOR activities in 2003
5. Description of upcoming inter-sessional activities:
   a. POGO-5 meeting
   b. Workshop on "Development of pilot coastal monitoring program(s) in the NE Pacific" and role of PICES in regional coordination
6. Plans/proposals for PICES XIII
7. Identification of "Time-series-at-risk"
8. Discussion of NEXT (NEMURO Experimental Planning Team) report and recommendations
9. Discussion of report from Study Group on *PICES Capacity Building*
10. Discussion of report from Study Group on *PICES Strategic Issues*
11. Interactions with TCODE (proposal for joint promotion of data exchange, CD-ROM press, development of marine GIS)
12. Role and status of MONITOR Task Team after end of CCCC Program
13. Specific funding requests for 2004 and 2005
14. Election of new MONITOR Co-Chairman
15. Other business.

REPORT OF REX TASK TEAM

On the morning of October 12, 2003, the four CCCC Task Teams first met in a plenary session to discuss the report from the Study Group on *PICES Capacity Building* and the NEXT (Nemuro EXperimental Planning Team) report. The group discussion was led by the CCCC Co-Chairman, Dr. Harold P. Batchelder.

Upon adjournment of the plenary, the REX (Regional EXperiment) Task Team Meeting was convened from 09:30-12:30 hours. The REX Co-Chairman, Dr. William T. Peterson, welcomed participants (*REX Endnote 1*) and outlined the objectives of the meeting. The agenda was reviewed and accepted (*REX Endnote 2*).

Review accomplishments in 2003 (Agenda Item 2)

REX Topic Session at PICES XII

The program for the REX Topic Session (S3) on "Influence of fishing and/or invasive species on ecosystem structure in coastal regions around the Pacific Rim" at PICES XII was discussed. It was noted that Task Team members are pleased with the response: 6 oral papers and 5 posters will be presented. Summary of the session is included elsewhere in this Annual Report.

March 2003 MODEL Workshop

Dr. Douglas E. Hay reported on his involvement with the MODEL Workshop to "Embed NEMURO and NEMURO.FISH into a 3-D circulation model" that was held March 3-6, 2003, in Yokohama, Japan. He felt that the workshop made advances in terms of adding fish to the NEMURO plankton model. Parameterization of growth of herring and saury was completed, thus producing a generic model of fish growth. The next steps are to apply NEMURO.FISH to study sardine and anchovy fluctuations and to develop an individual-based model.

Discuss plans for 2004 (Agenda Item 3)

REX Workshop at PICES XIII

Topics for a potential REX workshop in 2004 were considered. It was suggested and approved that REX organize a workshop that would discuss the seasonal cycle of plankton production in continental shelf waters at many sites around the Pacific Rim, with the long-term goal of linking such observations with the NEMURO model (*REX Endnote 3*).

Such an activity would contribute to the desire of the CCCC Program that various components of the Program work more closely together. REX felt that collaborations between modellers and observationalists would be further strengthened if at least one modeler and one observationalist working at the same laboratory could jointly carry out model verification studies of the NEMURO code. Model-data comparisons will require that NEMURO be adapted for a given region or site and this is best done by those working at each site.

REX Topic Session at PICES XIII

Dr. Richard D. Brodeur proposed that REX co-convene (with BIO) a 1-day Topic Session on "Sardine in the North Pacific: What we know after a century of variability and where do we go from here?". This proposal generated much discussion with the overall recommendation that the idea is interesting but the topic needed a more climate-related focus if REX were to endorse the proposal. It was also suggested that the session should consider sardines in the Humboldt and Benguela currents as well.

BASS/REX/MODEL Workshop at PICES XIII

A proposal from Drs. Kerim Aydin and Gordon A. McFarlane for a joint BASS/REX/MODEL Workshop on "Linking open ocean and coastal systems II" (*BASS Endnote 4*) was discussed. The idea met with approval although further

discussion between REX and BASS Co-Chairmen was recommended.

Inter-sessional symposium on CCCC synthesis
Discussion on REX involvement in the inter-sessional symposium on PICES CCCC Program synthesis was postponed until next year, as the meeting has been re-scheduled for April 2006 rather than April 2005.

North Pacific Ecosystem Status Report (Agenda Item 5)

REX members discussed the Synthesis chapter of the North Pacific Ecosystem Status Report. Overall everyone was impressed with the product. Dr. Peterson asked that any editorial and scientific comments be directed to Dr. Skip McKinnell at the PICES Secretariat.

Discussion of report from Study Group on *PICES Capacity Building* (Agenda Item 6)

This topic resulted in a spirited discussion of the need for more monetary support from member nations to support the travel of Task Team members. Apparently there exists a perception that PICES is of greater interest to government-supported scientists and that academic/university scientists frequently must find their own travel funds to be able to attend PICES meetings. Clearly, unless the level of national support is increased for travel expenses, it will be difficult for PICES to engage in capacity building.

Report from Study Group on *PICES Strategic Issues* (Agenda Item 7)

Due to lack of time this report received very little discussion.

Specific funding requests (Agenda Item 8)

REX requests support for two scientists to attend the workshop on "The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim" proposed for PICES XIII in Honolulu.

Election of a new REX Co-Chairman (Agenda Item 10)

Dr. Hay (Canada) was recommended, and he kindly agreed, to serve as the new Co-Chairman to replace Dr. Peterson (U.S.A.). It was noted that Dr. Hay has not yet been nominated by Canada as a member of REX even though he has actively participated in REX activities over many years.

It was also recognized that REX may merge with BASS in the coming year, thus such a merger may result in two others serving as Co-Chairmen of the BASS/REX Task Team. Discussion of chairmanship for the integrated Task Team is deferred until the CCCC Implementation Panel and Science Board reach a decision on the proposed merger.

REX Endnote 1

Participation List

Members

Kenji Asano (Japan)
Elena Dulepova (Russia)
George L. Hunt (U.S.A)
William T. Peterson (U.S.A., Co-Chairman)
Yukata Watanuki (Japan)
Chang-Ik Zhang (Korea)

Observers

Harold P. Batchelder (U.S.A.)
Richard D. Brodeur (U.S.A.)
Douglas E. Hay (Canada)
Makoto Kashiwai (Japan)

REX Endnote 2

REX Task Team Meeting Agenda

1. Welcome and introductions
2. Review accomplishments in 2003
   a. Topic Session on "Influence of fishing and/or invasive species on ecosystem structure in coastal regions around the Pacific Rim" at PICES XII
   b. REX involvement in March 2003 MODEL Workshop
   c. Progress towards linking data sets on seasonal cycles of plankton abundance with NEMURO model
3. Discuss plans for 2004
   a. Select topic(s) for REX Workshop(s) at PICES-XIII in 2004
   b. Discuss potential for joint workshop(s) with MODEL, MONITOR and BASS
   c. Discuss role of REX in CCCC-proposed inter-sessional symposium, April 2005
   d. Discuss REX involvement in NEXT and REX role in application of NEMURO to modeling selected coastal ecosystems around the Pacific Rim
4. Discuss role of REX in implementation of a better-integrated CCCC Program
5. Discussion of North Pacific Ecosystem Status Report
6. Discussion of report from Study Group on *PICES Capacity Building*
7. Discussion of report from Study Group on *PICES Strategic Issues*
8. Specific funding requests for 2004 and 2005
9. Other business
10. Election of new REX Co-Chairman.

REX Endnote 3

Proposal for a 1-day REX Workshop at PICES XIII on "The seasonal cycle of plankton production in continental shelf waters around the Pacific Rim"

The REX Task Team has the responsibility of developing inter-comparisons among regional coastal marine ecosystems. Given that the long-term goal of the PICES CCCC Program being the application of models to understanding the influence of climate variability on plankton and fish production in the North Pacific, near-term goals are: (a) to learn more about the influence of climate variability on plankton production cycles, and (b) to determine if we can model the seasonal cycle of plankton production with the NEMURO at many sites around the Pacific Rim.

At this workshop, we hope to locate as many site-specific studies as possible, each with several years of observations for as many boxes in the NEMURO lower tropic level model as is possible, in order to facilitate model verification studies that must be conducted in the future. Since NEMURO is an NPZ model, successful model<>data comparisons will require data sets on temporal changes in light, nutrients, phytoplankton and zooplankton over (ideally) several seasonal cycles. Although the long-term goal of the workshop is to facilitate model-comparisons at many sites around the Pacific Rim (including the Bering Sea), the proximate goal is to discuss linkages and time lags between primary and secondary production cycles; and where possible, the potential match-mismatch between phytoplankton and zooplankton biomass cycles and the spawning and growth of important fish species. If long time series are available, we ask "How do interannual and decadal scales differences in the timing of the spring bloom and other blooms affect zooplankton production and fish spawning?".

Recommended convenors: William T. Peterson (U.S.A.) and Yoshiro Watanabe (Japan).

Should this workshop be accepted, convenors will explore the possibility of publishing the results in the *Journal of Oceanography*.

Travel support is requested for two invited speakers.

DOCUMENTING SCIENTIFIC SESSIONS AT PICES XII

Session S1 (Science Board Symposium)
Human dimensions of ecosystem variability

Co-Convenors: R. Ian Perry (SB), Vladimir I. Radchenko (BIO), Yukimasa Ishida (FIS), John E. Stein (MEQ), Kuh Kim (POC), Igor I. Shevchenko (TCODE), and Harold P. Batchelder & Makoto Kashiwai (CCCC).

Background

Marine ecosystems are dynamic in terms of climate and physical features, and the species that inhabit them. Human relationships and interactions with the ocean have been long-lasting and changing in their nature and strength over the years. Even though natural variability in marine systems is thought to be large, separating natural climate variability from human-induced sources is an on-going challenge. This session examined how natural environmental processes and human activities interact to cause changes in marine environments and human societies. Various human activities have the effect either of removing, altering or adding nutrients or species to areas. The session considered how changes in nutrient composition and amounts, fishery removals or discards, habitat alteration, introduction of non-native species or pollutants, might change ecosystem structure and production. It also examined case studies of the effects of ecosystem change on human societies, including the implications of fisheries management decisions which affect the nature and functions of ecosystems. The session highlighted the many ways that humans interact with marine ecosystems and the scientific efforts to quantify and predict human impacts on such dynamic systems.

Summary of presentations

The session consisted of 11 oral presentations and several posters. Papers dealt with topics that range from the environmental and biological variability of marine systems and their consequences for human societies, to issues of human interventions in marine ecosystems and their impacts. Several of the presenters were from social science disciplines, who would not normally participate in PICES. They provided very interesting insights into the human impacts of marine ecosystem changes, including changes in populations, sex and age ratios, and changes in market demand and choice of marine products as economies improve. Most presentations showed variable effects of marine ecosystem changes on human societies: some effects and impacts in some locations were severe, whereas other effects or impacts in other locations were relatively mild (sometimes even positive). It was beyond the scope of this session to make cross-comparisons as to the reasons for these variable impacts, but differing degrees of resilience and vulnerability on the part of human societies and marine ecosystems appeared to be important factors. A leading question is what makes human societies resilient to marine ecosystem changes, and what makes marine ecosystems resilient to human impacts? Several presentations underlined the difficulties in distinguishing human from natural (climatic) environmental changes, and argued for more and careful observations of longer duration to disentangle these factors. There was also little evidence presented of how far down the trophic web the impacts of human interventions could be detected. The paper by Martell and Cox attempted to examine this problem in the central North Pacific, but only to the level of small tunas. Three very interesting presentations from China demonstrated the difficulties in predicting the effects that changes in human societies will have on marine ecosystems: as the economy of China continues to improve and more people enter the middle class, the demand for seafood has actually increased so that fishing of wild populations is unable to meet this demand. The

response has been a tremendous increase in aquaculture activities, which themselves make new demands and have different impacts on marine ecosystems.

List of papers

Oral presentations:

Lawrence C. Hamilton (Invited)
Ecosystem-society interactions in the Northern Atlantic: Human dimensions of fisheries collapse

Chris Frid, Odette Paramor, Leonie Robinson and Catherine Scott (Invited)
Long-term changes in the North Sea ecosystem: Disentangling fisheries, climate and eutrophication

David L. Fluharty (Invited)
Ecosystem variability and human response: An exploration of effect and affect (S1-970)

Jie-Hua Lu and Ping Lv
Effects of population changes and GDP growth on the marine ecosystem in coastal regions of Northeast Asia

Yu-Zhu Li
A macroeconomic approach to underlying driving forces of the depleting marine fisheries in PRC with economies in transition

Shang Chen, Zhao-Hui Zhang, Jing Wang and Wei-Jun Bian
Quantitative analysis of damage of Bohai sea ecosystem by risk assessment technique

Hidetada Kiyofuji, Sei-ichi Saitoh, Kazuhito Watanabe and Teisuke Mimura
Environmental impact assessment of squid fisheries in Japan using RS/GIS

Alexander Bogdanovsky, Igor E. Kochergin, Igor A. Arshinov, Sergey I. Rybalko, Valentina D. Budaeva, Vyacheslav G. Makarov, Pavel A. Fayman, Vasiliy F. Mishukov and Valeriy P. Tunegolovets
Results of oil spill modeling for the most potential spill sources in the Russia Far East Seas

Anatoly V. Smirnov and Artem Yu. Sheybak
Changes of East Sakhalin walleye pollock stock and offshore oil and gas development - whether is connection?

Steven J.D. Martell and Sean P. Cox
Assessment of the trophic impacts of fishing in the central Pacific Ocean

Douglas E. Hay
Coherence of stock fluctuations in Atlantic and Pacific herring: Evidence and explanations

Posters:

Tatyana A. Belan
Anthropogenic pollution and present status of benthos near Vladivostok (Peter the Great Bay, Sea of Japan)

Alexander Bogdanovsky, Igor E. Kochergin, M.V. Mischenko and Sergey I. Rybalko
Modeling of impact produced on marine environment by the construction activities within Sakhalin oil and gas projects

Galina Borisenko, Viktor V. Shcheglov and Olga S. Yurcheko
Influence of radioactive pollution on biological resources of the Far Eastern seas

Sergey A. Cherkashin, M.V. Nikiforov and V.A. Shelekhov
Estimation of influence of zinc, cadmium and lead on survival rate of prelarvae of some sea fishes

Nancy Davis and Kate Myers
Review of food habits methods used for NPAFC BASIS-related studies

Dmitry Galanin
Biological characteristics of *Paralithodes brevipes* in coastal waters of southeast Sakhalin

Eugeny N. Ilynskiy
Trends in the composition of demersal fish community on the shelf of western Kamchatka

Eung Kim and Young-Jae Ro
Production of monthly hydrographic OA Map of KODC datasets

Yuriy R. Kochnev
Traumatism of snow crab, *Chionoecetes opilio*, in the eastern Tatar Strait (S1-942)

Natalya V. Konovalova and Irina V. Motylkova
Phytoplankton on the northeast shelf of Sakhalin

Kitack Lee and Guen-Ha Park
Quantifying anthropogenic CO_2 in the ocean using the optimum multiparameter analysis

Olga N. Loukianova and Margarita D. Boyarova
Organochlorine compounds in the marine food net of Posyet Bay (Sea of Japan)

Olga N. Loukianova
Oxidative damage in marine mussels influenced by anthropogenic pollution

Ping Lv
An analysis on development condition of consumption structure of marine products and the contributing population factors

Igor V. Melnikov
Juvenile northern Atka mackerel *(Pleurogrammus Monopterygius)* in the epipelagial of deep-sea areas of the northern Pacific Ocean

Olga N. Moukhametova
Taxonomic composition and distribution of ichthyoplankton of inshore waters of northeastern Sakhalin

Galina V. Moyseychenko and Victor V. Scheglov
Drilling mud's impact on phytoplankton synthesis

Elena V. Oleynik, Tatyana A. Belan and Tatyana V. Konovalova
Use of computer method of ABC-curves (PRIMER) for estimation of benthic community state at the Sakhalin Island shelf in autumn 1999

Svetlana L. Ovsyannikova
Modern state of walleye pollock stock in the South Kuril region

Peng Liu
The NIE analysis of the marine fishery protection policy

Victor V. Scheglov, Alla A. Ogorodnikova and Ludmila V. Nigmatulina
Urgency of search of conjugation relations between intensity of pollution and response of biota in coastal sea areas

Vladimir M. Shulkin, Elena N. Chernova, Viktor Ya. Kavun and Svetlana I. Kozhenkova
Accumulation of metals by macrophytes and mollusks: Human influence versus natural variability

Mariya A. Smirnova
Microbial indication of ecological conditions along the Aniva Bay coast in winter 2002

Alexander Tkalin, Tatiana Lishavskaya and Alexander Moschenko
Bottom sediment contamination at the Sakhalin Island shelf

Alexander I. Varkentin and N.P. Sergeeva
Fishery as a principal factor of walleye pollock (*Theragra chalcogramma*) stock abundance decrease in the east part of the Okhotsk Sea for recent years

Session S2 (POC/BIO Topic Session)
Physical and biological responses of coastal ocean ecosystems and estuaries to inputs of freshwater

Co-Convenors: Michael J. Dagg (U.S.A.) and Yury I. Zuenko (Russia)

Background

Freshwater input affects physical and biological processes in many ways. Properties of the receiving waters are directly modified by fresh water and its constituents, but impacts also extend to include the entire water column and sea-bed. Time and space scales over which these modifications occur vary with factors such as scales of freshwater discharge, dissolved and particulate composition of materials in the freshwater discharge, latitude of discharge (which affects the magnitude of Coriolis acceleration, the light environment and the temperature regime, which in turn affect biological rates), wind and tides (which affect circulation and surface layer behavior) and bottom topography of the receiving basin. Meteorology and climatology also affect the linkages and pathways between freshwater inputs, physical responses, lower trophic level responses and higher trophic level responses. This session explored ways in which the inputs of freshwater and its dissolved and particulate constituents influence physical and biological processes, including higher trophic levels, in the receiving waters of estuarine and coastal ocean systems.

Summary of presentations

This topic session consisted of 12 oral presentations and 10 posters. The speakers represented five PICES countries: Canada, China, Korea, Russia, and the United States. Large rivers are generally considered to be important sources of freshwater for the coastal ocean and papers were presented on the Yangtze, Mississippi and Fraser Rivers. Processes associated with relatively small rivers of the Russian and Korean coasts were also discussed. In addition, the first speaker pointed out the significance of the broad band of coastal runoff from the mountainous regions along the coast of Alaska and Canada.

The session presented information on a wide range of responses of coastal ecosystems to terrestrial inputs of freshwater, including: coastal water circulation; spatial and vertical water structure; nutrient supply; suspended matter concentration and sedimentation; trophic interaction and processes; bottom sediments; primary production and bloom conditions; bacteria, phytoplankton and zooplankton abundance; distribution and species composition; macrozoobenthos communities; fish feeding; and fish migrations. In addition, statistical data on fish recruitment and catch were presented. The morning presentations focused mainly on physical and lower trophic level processes and the afternoon talks saw the theme extended further to include responses at the fish and higher trophic level.

It was clear that strong linkages exist between the inputs of freshwater, the associated physical and biochemical components, and biological production. However, there was no evidence of a direct influence of fresh or low salinity water on the biological components of marine ecosystems, except for anadromous fishes' smoltification. Rivers often supply dissolved nutrients to the coastal systems, leading to trophic stimulation across broad regions. The 'classical' food chain especially is impacted because the new nutrients injected into the coastal system by the freshwater promote diatom growth.

Concentrations of nutrients and suspended matter are typically lower farther away from the river sources because of consumption/dilution and sedimentation. Responses in biological properties are more complicated. Primary production needs optimal correspondence of nutrients and light, so phytoplankton concentration usually increased at some distance from the river mouth, depending on the size of suspended particles in river water. Simultaneously, the species composition of phytoplankton changes. The zone of maximum productivity typically is in the mid-salinity region but does not coincide with an absolute salinity. Responses of higher trophic levels tend to be further shifted seaward but extreme spatial variability and short time scales make understanding of all linkages very challenging. In addition, physical processes associated with the freshwater, including vertical stratification and frontal convergence, can lead to aggregation and concentration of organisms. However, it is definitely clear that species composition of zooplankton and zoobenthos changes from river to sea with complete replacement of freshwater species to brackish-water ones, and then to marine ones.

At least two human dimensions of the fresh water input were noted. The most important is its influence on fisheries always seems to be positive. Highly productive fishery grounds form in the areas of considerable fresh water input because of the high primary productivity of these areas and perhaps also because of favorable conditions for reproduction and survival. Processes that modify freshwater inputs, such as the construction of dams like the Three Gorges Dam, are a concern for fisheries scientists. An interesting possibility was presented concerning the consequences of a much reduced freshwater input from the coast of North America during the most recent ice age for the populating of North America.

These scientific reports and discussions allowed the participants of the session to exchange information and ideas on the session theme and to improve their understanding of the state and functioning of marine ecosystems.

List of papers

Oral presentations:

Thomas C. Royer and Chester E. Grosch (Invited)
The role of freshwater in the coastal circulation in the Northeast Pacific: Past, present and future

Im-Sang Oh and Tae-Wook Park
Numerical experiments on the dispersion of the Yangtze River water in the Yellow and East China Seas

Michael J. Dagg and G.A. Breed
A conceptual model of the biological effects of Mississippi River nitrogen on the northern Gulf of Mexico

Wonho Yih, Young-Geel Kim and Sundo Hwang
Ecosystem response to fresh-water discharge from Keum River estuarine weir: Distribution of phytoplankton and anchovy larvae

Victoria V. Nadtochy, Yury I. Zuenko and Eugene Barabanshchikov
River-sea change of zooplankton species composition: A case of Amur Bay (Japan/East Sea)

Susan E. Allen, Shannon Harris, Beth Bornhold, Jim Gower, Mike Henry, Rich Pawlowicz and Randall Lee
Revisiting the role of fresh water in the timing of the spring bloom in the Strait of Georgia

Elena M. Latkovskaya, T.A. Belan, V.B. Krasavtsev, A.V. Polteva, I.V. Motylkova, T.G. Koreneva and T.A. Mogilnikova

Conditions of hydrobiological community formation in the lagoons of northeastern Sakhalin Island

Anatoly Semenchenko (Invited)
Functional role of coastal waters for salmon: Is it an adaptation zone or a transit way?

Franz J. Mueter and Thomas C. Royer
Recruitment of pelagic and demersal fishes in the Gulf of Alaska in relation to coastal freshwater discharge

Fan Wang
The relationship between thermohaline structure and fish catch in the East China Sea

Richard D. Brodeur and Cheryl A. Morgan
Cross-shelf variability in hydrography, zooplankton and juvenile chinook diets in relation to the Columbia River plume

Churchill B. Grimes (Invited)
The influence of freshwater discharge on fishery production on continental shelves

Posters:

Nadezhda L. Aseeva
Adaptation of freshwater myxosporean parasites to marine habitat

Valentina D. Budaeva, George V. Shevchenko, Vyacheslav G. Makarov, G.A. Kantakov and V.N. Chastikov
Variability of oceanological conditions in Aniva Bay

Gennady A. Kantakov, George V. Shevchenko, Lyudmila Y. Gavrina, Irina Y. Bragina and Marina S. Selina
Low salinity signal in fall as attribute of the East-Sakhalin Current in Aniva Bay, Sea of Okhotsk

Elena M. Latkovskaya and Tatyana Belan
Environmental conditions and macrozoobenthos of Chayvo Bay

Elena M. Latkovskaya and Tatiyana G. Koreneva
River runoff and hydrochemical conditions in Chayvo Bay (northeast of Sakhalin)

Alexander A. Mikheyev
Influence of freshwater discharge on biotope spatial organization of the northeastern Sakhalin shelf

Irina V. Motylkova, Alena I. Latkovskaya, Irina V. Motylkova, Tatiyana A. Mogilnikova and Tatiyana G. Koreneva
Influence of river runoff to formation of phytoplankton communities in Lunskiy Bay (northeast of Sakhalin)

Alexandra V. Polteva and Elena M. Latkovskaya
Influence of hydrological and hygrochemical conditions on formation microbial communities of Chayvo Bay (northeast of Sakhalin)

Aleksei V. Savchenko, Lev M. Gramm-Osipov, Valentina N. Gramm-Osipova and Man Sik Choi
Comparative analysis of the chemical elements behavior when river waters of different nature are mixed with the sea water (based on physical-chemical modeling)

Larissa S. Shkoldina, Olga O. Ermakova-Kalata and Natalja S. Zadvornaja
Distribution of copepods of genus Centropages in estuaries of the large rivers (Peter the Great Bay, Sea of Japan)

Session S3 (CCCC REX Topic Session)
Influence of fishing and/or invasive species on ecosystem structure in coastal regions around the Pacific Rim

Co-Convenors: William T. Peterson (U.S.A.) and Yoshiro Watanabe (Japan)

Background

Based on the theme of PICES XII on "human dimensions", this session focused on the effects of two types of human activities on the structure of coastal marine ecosystems: invasive species and fishing. As such it was an extension of the Science Board Symposium. The session sought to address (and perhaps answer) two questions: (1) Do we know enough about the influence of fishing or invasive species on ecosystem structure to be able to identify an effect? and (2) Can we distinguish the signal from the noise?

Summary of presentations

The session consisted of 6 oral presentations and 5 posters. Attendance was very good and perhaps overwhelmed the room's capacity as each of the 60 chairs was filled for each talk. Others were compelled to stand at the back. We also had sufficient time to devote to careful discussion of each paper. Only one papers dealt with the impacts of invasive copepod species on ecosystem structure; the other five were of a fisheries nature.

The invited paper on "invasive species" by Jeffrey Cordell discussed the introduction of copepods from Asian waters by ships' ballast waters, to the ecosystem structure of several estuaries and rivers along the west coast of North America, and in the Columbia River and San Francisco Bay. The talk focused on the copepods *Pseudodiaptomus inopinus* in the rivers and estuaries of Washington and Oregon and *Tortanus dextrilobatus*. A predatory copepod that has colonized San Francisco Bay, *P. inopinus*, was found to be a dominant prey for mysids and shrimp in the estuaries of Washington and Oregon, and so perhaps is beneficial to the ecosystem. *T. dextrilobatus* is a heavy predator on the common Acartia species. In so doing, the predatory copepod is a direct and efficient competitor with fish species that depend upon *Acartia* for growth and survival.

We learned from Tadanori Fujino's talk that he is just beginning a study of how squid fishing may impact the "biological pump" in the sea of Japan. His hypothesis is that the lights from squid fishing boats cause the very abundant lantern fish, *Maurolicius japonicus*, to not ascend to the sea surface at night during its diel vertical migration, such that it would be less able to feed in surface waters and then excrete nitrogen into deep waters in the subsequent day time. The study has just recently been implemented so the hypothesis has not yet been tested rigorously.

Steven Martell reminded us that we will not get far in understanding effects of fishing on ecosystem structure until we develop models that accurately demonstrate the effects of fishing removals on energy flow and ecosystem structure. His contribution was to critique the ever-popular ECOPATH and ECOSIM models and to show where one can go wrong with these models. For many parameters that fit into this model, we have inadequate information such that we could be led down a blind path.

Anatoly Velikanov discussed the appearance of subtropical fish species in the waters off Sakhalin Island, and suggested that the appearance of these fishes (*e.g.*, sardines, mackerels and others) have changed the ecosystem structure of the epipelagic communities in the Tartar Strait. There were no obvious trends related to climate change, other than the presence/absence of warm water species that would persist for several years.

Douglas Hay reviewed herring spawning in the southern British Columbia waters, and showed that although the amount of herring spawning remains at a high level, the number of sites where herring spawn has decreased greatly. He

did not think that fishing had anything to do with the patterns, but, rather, speculated that an increase in population size of harbor seals, a major predator on herring, may be responsible for the phenomenon observed.

The final talk by Elizabeth Logerwell described a research project which is in its infancy: a study of the possible impacts of fishing activities on the survival of Stellar sea lions in the Aleutian Islands and Kodiak Island. The hypothesis is that fishing activities may impact the foraging success of the sea lions, either through disturbance of prey schools, or through direct competition for a common prey. The fish species studied include walleye pollock, Pacific cod and Atka mackerel. This is a new study without tangible results yet.

List of papers

Oral presentations:

Jeffrey Cordell, Steve Bollens, Olga Kalata, Rian Hooff and Sean Avent (invited)
Introduced copepods and ecological change in estuaries of the Pacific coast of the United States

Tadanori Fujino, Hidetada iyofuji, Kazushi Miyashita and Ryo Kawabe
Do squid fishing lights affect the nitrogen cycle in the Japan/East Sea

Steven Martell and Sean Cox (invited)
Information requirements for assessing trophic impacts of fisheries on ecosystems

Anatoly Velikanov
Long term variability of pelagic fishes composition in the Tartar Strait (Sea of Japan) in connection with migrations of subtropical species

Douglas Hay and Bruce McCarter
Are changes in the abundance, distribution and timing of herring spawning in British Columbia related to changes in climate or anthropogenic factors?

Elizabeth A Logerwell, Anne B. Hollowed, Christopher D. Wilson, M. Elizabeth Conners, Peter Munro, Susanne McDermott, Sandi Neidetcher, Kim Rand, Lowell Fritz, Jim Ianelli, Martin Dorn, Steve Barbeaux, Yunbing Shi and Dan Cooper
The Fishery Interaction Team: Investigating the potential for commercial fishing to compete with endangered Steller Sea Lions for shared prey

Posters:

Larisa Afeichuk
Commercial withdraw influence on the state of arka-anadara (*Andara broughtoni*) in Ussury Bay (Japan/East Sea)

Pavel Balykin, Andrei Vinnikov and Dmitriy Terentiev
Features of fishery by active straining-off fishing gears in the eastern Sea of Okhotsk

Evgeny Drobjazin
Effect of fishing activity on size and sexual structure of *Sclerocrangon salebrosa* populations in Peter the Great Bay

Larisa Gayko
Selection of hydrometeorological factors for the forecast of mariculture yield in the South of Primorski Krai

Sergey Korostelev and P. Vasilets (moved from Oral to Poster)
Composition changes in the bottom biocenoses at the shelf of Kamchatka under the influence of fisheries

Session S4 (MEQ/BIO Topic Session)
Aquaculture in the ocean ecosystem

Co-Convenors: Ik-Kyo Chung, In-Kwon Jang (Korea), Julia K. Parrish and John E. Stein (U.S.A.)

Background

Globally the demand for seafood is rising, with projections that aquaculture will provide a steadily increasing proportion of the supply of seafood for human consumption. With this likely growth, aquaculture operations will expand to additional coastal areas, and most

probably into the exclusive economic zones (EEZ) of several countries. Progress has been made in evaluating the ecological risk and economic benefits from aquaculture in coastal areas, in developing standards for conducting aquaculture operations, and in exploratory research on the feasibility of offshore mariculture operations. The objectives of this session were to highlight recent developments relating to environmentally sustainable aquaculture, research on aquaculture in the EEZ, and to begin exploring marine aquaculture from an ecosystem perspective. One area of interest is the research and science underpinning the harmonization of aquaculture activities with other human activities that occur in the coastal zone, under the concept of integrated coastal zone management. To examine aquaculture within this broader context, presentations exploring the interrelationships between aquaculture and fishery management were also encouraged.

Summary of presentations

The session consisted of 13 oral presentations and 3 posters. The following scientific issues were noted in the presentations (these are not in priority order):

- Can aquaculture responsibly meet the growing demand for seafood products?
- How much biomass can aquaculture sustainably produce?
- How independent is aquaculture production from climate change/regime shifts?
- What are the impacts of trangenics on aquaculture; should we be concerned?
- Can we integrate capture and culture fisheries? Should we?
- Is polyculture or integrated culture a reality in marine systems?
- How can disease (via intensification and/or introduction) be dealt with?
- Is there an opportunity for physical oceanography and aquaculture to integrate vis-à-vis circulation models, water quality, HABs and production?
- Should aquaculture concentrate on total lifecycle culture, or is there a place for wild capture of small individuals and fattening/grow-out? (E.g., crabs, tuna)
- Does aquaculture clean the environment or pollute it?
- Should aquaculture follow an industrial agriculture model (few species outplanted worldwide), or should it adopt a local species culture model instead?
- Is the offshore environment suitable for (industrial) aquaculture?
- Should we develop guidelines for the potential for invasion of our local species in other areas before they are cultured, or introduced accidentally?

Much of the discussion at the session focused on reviewing the Terms of Reference for the proposed PICES Working Group on *Marine aquaculture* (see *MEQ Endnote 6* and *SB Endnote 6*), and identifying scientific issues to be considered in carrying out these Terms of Reference.

List of papers

Oral presentations:

Richard J. Beamish, D. Noakes, C.M. Neville, R.M. Sweeting and A.J. Benson
Will climate change and aquaculture increase the abundance of Pacific salmon?

Sungchul C. Bai, Xiao-Jie Wang, Semin Choi and Kyungmin Han (Invited)
Present status and future prospects of world and Korean aquaculture industry, and development of low pollution diets for a sustainable, environmentally and economically sound aquaculture industry

Mac V. Rawson, Changsheng Chen, Dao-Ru Wang, Charles Yarish and James B. Sullivan (Invited)
Approaching coastal aquaculture from an ecosystem perspective

Yu-Feng Yang, Shi-Kui Zhai, Zhi-Gang Yu and Ik-Kyo Chung
Development of mariculture and its impacts in Chinese coastal waters

Sahoo Dinabandhu
Role of seaweeds in aquaculture – an Indian perspective

Nikoliona Petkova Kovatcheva
Red king crab *(Paralithodes camtschaticus)* artificial cultivation - as a method of restoration its natural populations

Hiroshi Shimada, Hiroki Asami and Iori Tanaka
The occurrence of paralytic shellfish poisoning in summer and distribution of causative organism in the Sea of Okhotsk along the northeastern coast of Hokkaido, Japan

Dan Minchin (Invited)
Between a rock and a hard place: Aquaculture and challenges posed by invasions

Chul-Hyun Sohn, Ik-Kyo Chung, Yu-Feng Yang and Charles Yarish (Invited)
Historical review and future perspectives of aquaculture industry in Korea

Hajime Kimura, Hajime Kimura and Masahiro Notoya
Ulva pertusa and *Undaria undarioides* culture for reducing nitrogen from fish culture area in Wakayama Prefecture, Japan

Hyung-Seop Kim, Wonho Yih, Geumog Myung and Young Geel Kim
Cultured marine photosynthetic ciliate *Mesodinium rubrum* as a potential live feed species for aquacultured animals

Carolyn S. Friedman
Aquaculture, animal health and sustainability

Ik-Kyo Chung, Si-Jung Ryu, Yun-He Kang, Jin-Ae Lee, Tae-Ho Seo, Jong-Ahm Shin, Charles Yarish and Yu-Feng Yang
Evaluation of the bioremediation capability of the seaweed aquaculture in Korea

Posters:

Saywa Kim and Chul-Won Park
Artificial illumination on zooplankton dynamics in aquaculture

Sook-Yang Kim, Wol-Ae Lim, Sam-Geun Lee, Hak-Gyoon Kim and Sang-Ho Jun
Distributional characters of photosynthetic pigments before and after a *Cochlodinium polykrikoides* bloom in the South Sea of Korea

Kenji Tarutani, Takuji Uchida and Yukio Hanamura
Plankton dynamics in relation to the biochemical cycle of nitrogen in Hiroshima Bay, Seto Inland Sea of Japan

Session S5 (CCCC MODEL Topic Session)

Comparison of modeling approaches to describe ecological food webs, marine ecosystem processes, and ecosystem response to climate variability

Co-Convenors: Michio J. Kishi (Japan), Bernard A. Megrey and Francisco E. Werner (U.S.A.)

Background

Contemporary modeling efforts have shown remarkable achievements in the application of simulation, conceptual and analytic modeling to biological systems. This is especially true when it comes to modeling the lower trophic levels of marine ecosystems with NPZ type models (biomass based model), individual based models, and population dynamics models. Recent observations and data collections on marine ecosystem primary and secondary producers have provided the opportunity to generate hypotheses to explain the effects of regime shifts and the influence of climate variability. The objective for the session was to demonstrate the utility of using modeling and models to examine these and similar hypotheses. Papers dealing with linking regional scale models to basin scale models, fisheries migration models, models that link lower trophic level models to higher trophic models, ecological food web models, and marine ecosystem process formulations were encouraged.

Summary of presentations

The session, which consisted of 10 oral presentations and 5 posters, was very well attended with approximately 80 people present in the audience.

The session began with a description of the problems and considerations modelling the physical system (Miller), and was followed by a paper addressing issues related to modelling impacts of climate change on the lower trophic

levels (Peña), and then moving to climate impacts on fisheries systems (Tian *et al*.). With the existing complexities of modelling the marine ecosystem, the last paper of the first segment (Lee *et al*.) examined the use of statistical models to identify and characterize the impact of environmental signals on biological systems.

Two papers describing the application of the NEMURO.FISH coupled model to saury (Ito *et al*.) and herring (Megrey *et al*.) were given showing the progress that has been made in coupling a lower trophic level (nutrient-phytoplankton-zooplankton) model to the upper trophic level (fishes).

The session ended with several case studies from different systems including the California Current (Wainwright), eastern North Pacific (Mackas *et al.* and Allen *et al*.) and Yellow Sea (Yoo *et al*.).

List of papers

Oral presentations:

Arthur J. Miller (invited)
Modeling Pacific decadal variability: Physics, feedbacks, and ecosystem impacts

M. Angelica Peña
Comparing the response of three vertically resolved planktonic ecosystem models to climate change in the NE subarctic Pacific Ocean

Yong-Jun Tian, Tatsuro Akamine and Maki Suda
Impacts of fishing and climate changes on the population dynamics of Pacific saury in the northwestern Pacific: A model approach

Yong-Woo Lee, Bernard A. Megrey and S. Allen Macklin
Comparative analysis of statistical tools to identify recruitment-environment relationships and forecast recruitment strength

Shin-Ichi Ito, Daiki Mukai and Michio J. Kishi
An analysis for seasonal and inter-annual growth change of Pacific saury using NEMURO.FISH

Bernard A. Megrey, Kenneth A. Rose, Douglas E. Hay and Francisco E. Werner
A coupled lower and higher trophic level marine ecosystem model of the North Pacific Ocean including Pacific herring

Thomas C. Wainwright
A comparison of two lower trophic models for the California Current System

David L. Mackas, Mark V. Trevorrow, Douglas R. Yelland, Maia Tsurumi and Mark Benfield
Observations of zooplankton aggregation due to tidal flow over a sill

Susan E. Allen, Debby Ianson, David L. Mackas, Mark V. Trevorrow and Maia Tsurumi
Modelling zooplankton aggregation due to tidal flow over a sill

Sinjae Yoo, Hyun-Cheol Kim and Kyung-II Chang
On the conditions for *Cochlodinium* bloom

Posters:

Alexander I. Abakumov, Lev N. Bocharov and Yeugeny P. Karedin
Mathematical modeling for analysis of multi-species fishery

Harold P. Batchelder
Habitat selection by juvenile chinook salmon in the nearshore and continental shelf of Oregon: Simulations with numerical models

Edward James Gregr, Karin M. Bodtker and Andrew W. Trites
Defining biologically meaningful pelagic regions using physical oceanography

Irina V. Ishmukova
The models for ecosystem of the Okhotsk Sea

Yury I. Zuenko
Using the ecosystem modeling technology to understand a coastal ecosystem functioning

Session S6 (BIO/POC/CCC Topic Session)
Latitudinal differences in the responses of productivity and recruitment of marine organisms to physical variability

Co-Convenors: Steven J. Bograd (U.S.A.), David L. Mackas (Canada) and Yoshiro Watanabe (Japan)

Background

A scientific result of the PICES Symposium on "North Pacific Transitional Areas" (La Paz, Mexico, 2002) was the identification of distinct latitudinal differences in ecosystem structure and variability, including the distribution and productivity of plankton and the recruitment of fish stocks. The goal of the session was to explore latitudinal gradients in the biological and physical structure of marine ecosystems (in the eastern Pacific from Mexico to Alaska, and in the western Pacific from China to Russia), and how these gradients affect life history strategy, physiology, and response to temporal variability of physical forcing.

Summary of presentations

The session had a large participation level, both in the number of contributed papers and in audience attendance. There were two invited papers on relatively large-scale latitudinal and temporal patterns: chlorophyll and transport variability in the California Current system (Thomas and Strub), and the stratification and productivity in the oceanic subarctic Pacific (Tadokoro *et al*.)

Contributed papers (16 oral presentations and 14 posters) covered a wide range of spatial scales and processes. Important and recurring scientific themes included:

- The role of strong local gradients (fronts, meanders, eddies) in regulating distributions and seasonal and inter-annual variability of migratory and advective transport pathways;
- Life stage transitions, and the use of different ocean regions during different parts of the life cycles of key species;
- Physiological rates and constraints, and how these affect population response to spatial and temporal gradients.

List of papers

Oral presentations:

Ki-Tack Seong, Young-Shil Kang and In-Seong Han
Long-term variation in the East Korean Warm Current and its impact on the bio-physical reaction in the southwestern region of the East/Japan Sea

Sachihiko Itoh and Takashige Sugimoto
Effect of eddy transport and blocking on the migration of small pelagic fishes

William T. Peterson, Leah Feinberg, Jaime Gómez-Gutiérrez, Tracy Shaw and Mitch Vance
A comparison of the productivity of the Euphausiid, *Euphausia Pacifica*, in the Oregon upwelling zone to similar findings around the Pacific Rim

Rubén Rodríguez-Sánchez, Héctor Villalobos and Sofía Ortega-García
Seasonal spatial dynamics of the Pacific sardine (*Sardinops caeruleus*) population in the California Current System and its interannual variability as a function of environmental variability during 1980-1997

Young-Shil Kang, Kitack Seong and Young-Sang Suh
Bio-physical reaction to regime shifts in the southwestern region of the East/Japan Sea

Kazuaki Tadokoro, S. Chiba, T. Ono, T. Midorikawa and T. Saino (Invited)
Increase of stratification and decreased primary productivity in the subarctic North Pacific

Toru Kobari adn Toshiyuki Nagaki
Comparative life cycle patterns of interzonal migrating copepods in the North Pacific

Jin-Yeong Kim, Yang-Jae Im, Seok-Gwan Choi, Jina Oh and Tae-Won Lee
The role of the Tsushima Current as the nursery grounds of major fishery resources off Jeju Island, Korea

Svetlana Yu. Glebova
Cyclicity in formation of the types of synoptic situation above the Far East seas as a factor of their ecosystems' changes

Tae-Keun Rho, Terry E. Whitledge and John J. Goering
Interannural variations of nutrients and primary production over the southeastern Bering Sea shelf during spring of 1997,1998, and 1999

Andrew Thomas and P. Ted Strub (Invited)
Latitudinal differences in chlorophyll variability in the California Current

David W. Welch, Marc Trudel, Jen Zamon, John Morris and Mary Thiess
Latitudinal and temporal gradients in ocean productivity and survival of Pacific salmon

Takashi Kitagawa, Shingo Kimura, Hideaki Nakata and Harumi Yamada
Adaptation mechanisms of Pacific bluefin tuna to temperate waters as detected by archival tags

Jaime Farber-Lorda, Miguel Lavin, Armando Trasviña, Marco Guerrreo, Ignacio Romero-Vargas and Cesar Almeda
The relationship between hydrography, trophic conditions and zooplankton biomass in the Eastern Tropical Pacific

Hee-yong Kim, Xin-Yu Guo and Hidetaka Takeoka
Influences of the Kuroshio front variability on the transport of eggs and larvae of pelagic fishes in the East China Sea

Vadim F. Savinykh, Vladimir A. Shelekhov, Svetlana V. Davydova, Svetlana V. Naydenko, Alexey A. Baytaluk, Gennady V. Khen, Gennady A. Shevtsov and Mikhail Zuev
Latiditudinal changes of plankton and nekton biomasses in the Western Transition Zone

Xue-Lei Zhang
Ionic control of settlement and metamorphosis in larvae of the Serpulid Polychaete, *Hydroides elegans* Haswell

Yulia Moseikina, Olga Ivanova and Andrey Krovnin
Latitudinal difference in the Far East salmon stock response to the climate change in the Northwest Pacific region

Posters:

Tatyana A. Belan, Elena Oleynik, Ludmila Belan and Tatyana Konovalova
Characteristics of benthic communities at the Sakhalin island shelf

Tatyana A. Belan, Elena Oleynik, Luisa Propp, Marina Selina, Boris Borisov, Yury Korostelev and Tatyana Konovalova
Some characteristics of pelagic ecosystems of the North-East Sakhalin island shelf

Sanae Chiba , Toshiro Saino, Yuichi Hirota and Seizo Hasegawa
North-south contrast of multi-decadal scale variation of lower trophic level ecosystem in the Japan/East Sea: Light-limited versus nutrients-limited

Natalia T. Dolganova and Hideaki Kidokoro
Compared catch efficiency of different plankton nets in the Japan Sea

Elena V. Gritsay and M.A. Stepanenko
Recruitment of the Bering Sea pollock and identification of its spawning stocks

Young-Shil Kang
Inter-decadal and seasonal variations in calanoid copepods in the southwestern region of the East/Japan Sea

Hyung-Ku Kang, Yong-Joo Kang and Chul Park
Effect of suspended sediment on reproductive responses of *Paracalanus sp.* (Copepoda: Calnoida) in the laboratory

Vladimir V. Napazakov
Trophic structure of the groundfish community in the western Bering Sea

Evgeny E. Ovsyannikov
Size composition of pelagic walleye pollock eggs on spawning areas in the northern Okhotsk Sea

Marina A. Shebanova
Distribution and age structure of *Metridia Pacifica* in the Okhotsk Sea

Jeong-Min Shim, Ki-Tack Seong, Jin-Il Park, Hyun-Gook Jin, Un-Gi Whang and In-Seong Han
Distribution of phytoplankton in Wangdol-cho in the southwestern East/Japan Sea with concerning oceanographic conditions

Anatoly F. Volkov
Biomass, numerosity and size-structure of *Sagitta elegans* in the northern part of the Okhotsk Sea (spring 1997-2002)

Atsushi Yamaguchi, Naonobu Shiga, Tsutomu Ikeda, Shogo Takagi, Yoshihiko Kamei and Keiichiro Sakaoka
Latitudinal characteristics of epipelagaic zooplankton community structure in the western North Pacific during the spring of 2002 and 2003

Seok-Hyun Youn and Joong-Ki Choi
Growth of *Acartia hongi* nauplii in Kyeonggi Bay, Yellow Sea

Session S8 (FIS Topic Session)
Management of eel resources

Co-Convenors: Tae-Won Lee (Korea) and Katsumi Tsukamoto (Japan)

Background

Anguillid eels are important fishes in riverine and estuarine ecosystems in many regions of the world, and are an important food resource in some eastern and western countries. The wild eel populations in several parts of the world have declined sharply in recent years, apparently due to a combination of factors, such as fishing pressure, water pollution, or loss of freshwater and estuarine habitats. In addition, global changes in the ocean-atmosphere system, which may affect larval migration in the ocean, have also been suggested as a possible cause for the decline. Therefore, effective management and research strategies need to be developed to understand the causes of the declines and to help rebuild the stocks. There has been considerable recent scientific research on the ecology, physiology and aquaculture of eels, but as anguillid stocks show evidence of decline worldwide, increased efforts are needed to integrate research and management efforts to avoid another global fisheries disaster as has been seen with so many other fish species.

Summary of presentations

The session, which consisted of 12 oral presentations and 17 posters, was attended by more than 60 scientists. Papers dealt with species identification using new technology and ecological information on eels in various regions including Asian and European countries. Ecological studies on eels are dominant in Asian countries compared to a greater number of eel management papers from European countries.

The oral presentations and posters of the session reflected a broad range of research on the genetics, behavior, physiology, and ecology of eels that is being conducted in East Asian countries and elsewhere, which provided valuable new information about eels. Many of these studies also highlighted the need to continue to gain a greater understanding of the mysterious life cycle of eels in terms of their oceanic spawning, larval migration, recruitment, and the choice that eels make to live in either coastal, estuarine or freshwater habitats. In addition to further research efforts on these and other subjects, such as developing technology for the artificial production of glass eels to meet the demands of aquaculture, this session clearly showed that there is a great need for the development and coordination of management efforts within and among the countries of East Asia and elsewhere to conserve and manage the wild stocks of eels.

List of papers

Oral presentations:

Yuki Minegishi, Jun Aoyama, Jun G. Inoue, Masaki Miya, Mutsumi Nishida and Katsumi Tsukamoto
Definitive identification of all species of the genus *Anguilla* using the complete mitochondrial genome

Sam Wouthuyzen, Jun Aoyama, Shun Watanabe, Michael J. Miller and Katsumi Tsukamoto (Invited)
Resources of tropical anguillid eels in Indonesia

Shingo Kimura and Katsumi Tsukamoto
Landmark for the spawning of Japanese eel

Tsuguo Otake, Michael J. Miller, Tadashi Inagaki, Gen Minagawa and Katsumi Tsukamoto
Evidence for migration of metamorphosing larvae of *Anguilla japonica* in the Kuroshio Current

Michael J. Miller, Jun Aoyama, Sam Wouthuyzen and Katsumi Tsukamoto
New information on the early life history of tropical eels: Implications for population structure and management

Sun-Do Hwang, Won-Seok Yang, Yeong-Jo Jo, Hyeong-Tae Moon, Tae-Won Lee, Ok-In Choi and Chi-Hong Kim
Factors affecting the daily catch of glass eels, *Anguilla japonica*, in the Geum-river estuary, Korea

Wan-Soo Kim, Seong-Jin Yoon and Tae-Won Lee
Effects of sudden changes in salinity on the oxygen consumption of the glass eels, *Anguilla japonica*

Yu-San Han, John Y.L. Yu, I.C. Liao and Wann-Nian Tzeng
Salinity preference of the silvering Japanese eel *(Anguilla japonica)*: Evidences from the pituitary prolactin mRNA levels and otolith strontium/calcium ratios

Aya Kotake, Takaomi Arai, Michael J Miller and Katsumi Tsukamoto
Differences in the migratory history of male and female Japanese eels, *Anguilla japonica*

Jun Aoyama
An initial investigation of the biological characteristics of the Japanese eel stock in Japan

Wann-Nian Tzeng
Relative importance of oceanic, estuarine and riverine growth histories of the Japanese eel, *Anguilla japonica*, as revealed by otolith microchemistry analysis

Eric P. Feunteun (Invited)
Conceptual principles for a restoration plan of European Eel (*Anguilla anguilla*)

Posters:

Tadashi Inagaki, Michael J. Miller, Jun Aoyama and Katsumi Tsukamoto
Current variability in the spawning and larval transport areas of the Japanese eel, *Anguilla japonica*, indicated by drifter buoys

Minjee Jeon, Kyungmin Han and Sungchul C. Bai
Effect of captured location on amino acids profile in domestic wild juvenile and adult eels

Wan-Soo Kim, Seong-Jin Yoon and Tae-Won Lee
The sensitivity of glass eels to water temperature changes

Yobuo Kimura, Satoshi Ishikawa, Mutsumi Nishida and Katsumi Tsukamoto
Population structure of the Japanese conger eel, *Conger myriaster*

Midori Kobayakawa, Yoshitaka Kobayakawa and Noritaka Mochioka
Musculature and skeleton system of leptocephlus eel larvae

Tae-Won Lee, Sun-Wan Hwang and Sun-Do Hwang
Stock size, recruitment and upstream migration rates of glass eels estimated by a marking experiment in the Cheonjeyeon estuary of Jeju Island, Korea

Tae-Won Lee, Hyung-Tae Moon and Sun-Do Hwang
Annual variation in glass eel (*Anguilla japonica)* catch in Korean estuaries

Tae-Won Lee, Hyung-Tae Moon and Gwang-Cheon Kim
Duration of leptocephalus and metamorphosis stages of *Anguilla japonica* as indicated from otolith microstructure in glass eels from the Korean estuaries

Tao Ma, Gen Minagawa, Michael J. Miller, A. Shinoda, Jun Aoyama and Katsumi Tsukamoto
Age, growth and distribution of marine eel leptocephali in the East China Sea

Michael J. Miller, Tadashi Inagaki, Akira Shinoda, Yuki Minegishi, Mari Kuroki, Jun Aoyama and Katsumi Tsukamoto
Transport of an *Anguilla japonica* leptocephalus into the Celebes Sea: Implications for recruitment success or failure

Gen Minagawa, Michael J. Miller, Tadashi Inagaki, Tsuguo Otake and Katsumi Tsukamoto
Larval distributions of marine eels in the Kuroshio Current and East China Sea

Noritaka Mochioka
Feeding ecology of leptocephalus eel larvae: Active feeding occurs during daytime

Akihiro Okamura, Aya Kotake, Katsumi Tsukamoto and Hideo P. Oka
Migratory history of introduced eels, *Anguilla anguilla*, in Mikawa Bay, Japan, revealed by otolith microchemistry

Dong-hwan Shin, Hajime Matsubara, Shohei Kaneko, Tomoya Kotani, Masakene Yamashita, Shinji Adachi and Kohei Yamauchi
Maturational factors as indicators of egg quality in Japanese eel, *Anguilla japonica*

Masanori Takahashi, Noritaka Mochioka, Sekio Shinagawa and Akinobu Nakazono
Distribution patterns of leptocephali in the North Pacific transition zone

Mei-Chen Tseng, Wann-Nian Tzeng and Sin-Che Lee
Historical decline of the Japanese eel, *Anguilla japonica*, in northern Taiwan

Shun Watanabe, Satoshi Ishikawa, Jun Aoyama and Katsumi Tsukamoto
Evaluation of the population structure of *Anguilla marmorata* inferred by meristic characters

Session S9 (TCODE E-Poster Session)
GIS/Geographic-based applications to marine sciences

Co-Convenors: Sung-Dae Kim (Korea) and Bernard A. Megrey (U.S.A.)

Background

Over the past two decades there has been increasing recognition that problems in marine and fisheries science are nearly all manifest in the spatio-temporal domain. Geographical Information Systems (GIS), the natural framework for spatial data handling, are being recognized as a powerful tool with useful applications in marine sciences. GIS are becoming invaluable tools for monitoring and managing both open and coastal marine systems. Widespread acceptance and adoption of these and other geo-referenced methods speak to their power and effectiveness for addressing the diverse mix of factors that impinge on aquatic systems. The aim of this session was to provide an opportunity to showcase new and exciting GIS developments by PICES member countries including coastal, continental and deep ocean studies, dynamic relations that characterize the marine world, and the development of oceanography and fisheries GIS tools and applications.

Summary of presentations

The session consisted of 11 electronic posters dealing with applying new technologies to oceanographic (Dmitrieva *et al*.) and biological data (Miromanova *et al*.), activities of international Data Centers (Jung *et al*.), integrated digital mapping, data information management and decision support systems (Rostov *et al*., Nemchinov *et al*., Matyusheko *et al*.), data visualization software (Suzuki and Oguma), and GIS applications (Volvenko, Moiseenko *et al*., and Megrey *et al*.).

The PICES community seems to accept seeing scientific information presented via E-posters and enjoy the interactive nature of E-posters. Good attendance at such E-poster sessions both this and past Annual Meetings indicates that these sessions are well received. PICES should consider making E-posters a permanent type of presentation alternative to any future poster sessions, and endeavour to make sure that candidate venues can accommodate the technical requirements of this and up-coming presentation formats.

List of E-posters

Elena V. Dmitrieva and Natalia I. Rudykh
New version of integrated oceanographic data base for the Japan Sea

Kyu-Kui Jung, Hee-Dong Jeong and Seung Heo
KODC activities on the oceanographic data management and its geographical application

Bernard A. Megrey, S. Allen Macklin and Kimberly Bahl
North Pacific Ecosystem Theme Page and Metadatabase: A collaborative research tool for fisheries oceanography and ecosystem investigations

Georgiy S. Moiseenko, Olga Moiseeva, Larisa Matyushenko, Ivan Visotskiy and Igor Shevchenko
Using GIS to investigate the ice distribution influence on the activity of catching ships in the Okhotsk Sea

Oleg Y. Nemchinov, Valery V. Peskov and Natalia K. Ni
The initial stage of work on the development of complex information system "Water biological resources and oceanologic conditions of their dwelling"

Oleg Y. Nemchinov and Valery V. Peskov
Creation of a digital map of trade division into districts and division of zones of the sea inspection responsibility in the North Pacific

Igor D. Rostov, Eugene Vyazilov, Nickolai Mikhailov, Victor Chepurnov, Sergey Belov, Sergey Sukhonosov and Vladimir Rostov
Integration of information resources in the Unified System of Information on the World Ocean State (ESIMO) of Russia

Lilya Miromanova, Georgy Moiseenko, Alexander Nikolayev and Igor Shevchenko
Meta-database of echo-integration trawl surveys

Larisa Matyushenko, Georgy Moiseenko and Igor Shevchenko
Electronic atlas of species of commercial value for the North Pacific

Toru Suzuki and Sachiko Oguma
The newest seafloor topography from satellite altimeter measurements in the western North Pacific region

Igor V. Volvenko
New GIS for spatial-temporal dynamics analysis of Okhotsk Sea nekton

Session S10 (MEQ/BIO/FIS Topic Session)
Ecosystem-based management science and its application to the North Pacific

Co-Convenors: Glen Jamieson (Canada), Patricia Livingston (U.S.A.), Vladimir I. Radchenko (Russia), Takashige Sugimoto (Japan), Qi-Sheng Tang (China) and Chang-Ik Zhang (Korea)

Background

Many recent national and international legal agreements use some form of the term "ecosystem-based approaches" when describing new methods to assess and manage marine living resources. These are usually understood to include objectives related to maintaining and monitoring biodiversity, productivity, and the physical and chemical properties of an ecosystem. It is often unclear, however, what this means in practice, what new information will be required, and whether scientific or management actions will actually change under these new approaches. This session invited papers on what ecosystem-based management approaches are, what they involve scientifically (what the information requirements are and if we can provide them), what initiatives are being undertaken elsewhere in the world, and how PICES countries are beginning to address the topic. The session provided a forum for presentations and discussion of how to improve the science that provides the framework for ecosystem-based management initiatives, and its application, in PICES countries.

Summary of presentations

The session consisted of 17 oral presentations and 4 posters. Major themes of the presentations included international and national overviews of the various ways in which ecosystem-based management was viewed, and also some of the research underway to assist nations with moving towards more ecosystem-based management. The effect of climate on fishery resources was a major theme. The use of science-based ecosystem indicators to guide managers was also a central part of many talks. The role of marine protected areas was also discussed. Stakeholder involvement in the identification of ecological problems and the desired ecosystem state was mentioned as an important aspect of ecosystem-based management. Technological advancements were also mentioned as solutions to some human-induced impacts. Loss of marine habitat through human land reclamation, trawling, or environmental degradation was an important issue. Fishing effects on species composition, trophic level and biological characteristics of fish communities were demonstrated. Protection of biodiversity, long-term sustainability, and humans as ecosystem components were common goals of ecosystem-based management policies. Non-fishing threats to biodiversity included oil development, mining byproducts, chemical and nutrient pollution. Communication of ecosystem research and goals to the public was another facet of making progress with ecosystem-based management. Eco-regions or ecological boundary areas were considered an important aspect to an ecosystem approach.

Much of the concluding discussion focused on reviewing the Terms of Reference for the proposed joint FIS/MEQ Working Group on *Ecosystem-based management science and its application to the North Pacific* (see *MEQ*

Endnote 5 and *SB Endnote 5*). The following was noted:

- Charge of this Working Group was not thought to be the development of indicators, but rather, just listing indicators that were presently in use, and thus taking outputs from the symposium 2004 on "Quantative ecosystem indicators for fisheries management" might be most useful;
- Evaluation of indicators against a set of criteria as to their usefulness would be good;
- Stronger linkage between environmental management and fisheries management is desired;
- Identifying impacts in each area is needed to know what indicators should be considered;
- Feedback to FIS and MEQ after one year would be important;
- Joining efforts with other international organizations such as ICES is crucial.

List of papers

Oral presentations:

Chris Frid (Invited)
Ecosystem based management: A NE Atlantic view

Thomas C. Malone
Implementing the integrated design plan of the coastal module of GOOS

Hiroyuki Matsuda
Adaptive management and community interaction in fisheries

Glen S. Jamieson and Bob O'Boyle
Canadian initiatives towards the achievement of ecosystem-based management

Vjacheslav P. Shuntov and Vladimir I. Radchenko
Ecosystem based management of marine biological resources: Illusion and the reality

David L. Fluharty
Backing into the ecosystem: Development of practices for ecosystem-based fishery management in the United States

Xian-Shi Jin, Qi-Sheng Tang and Xian-Yong Zhao
Management implication of changes in ecosystem with reference to the eastern China seas

Chang-Ik Zhang, Sung-Il Lee and Jong-Man Kim
Ecosystem-based management of fisheries resources in the Tongyeong marine ranching area in Korea

Kaoru Nakata, Hirokatsu Yamada, Minoru Tomiyama, Katsuyuki Sasaki, Tadafumi Ichikawa and Hiromu Zenitani
Effects of variabilities in climate and planktonic ecosystem on fisheries management of sand lance in Ise Bay, Japan

Alexander Tkalin
Implementation of GEF projects as a tool for ecosystem-based management

Patricia A. Livingston
Ecosystem-based science for management of Alaskan fisheries

Richard J. Beamish, R.M. Sweeting, C.M. Neville and A.J. Benson
The importance of considering the impact of regimes when establishing ecosystem-based approaches to fisheries management

Shang Chen, Ming-Yuan Zhu and De-Wen Ding
Guidelines of marine ecological survey of China: Ecosystem health consideration

Franz J. Mueter and Bernard A. Megrey
Species-based indicators to assess the status of the Gulf of Alaska and Bering Sea ecosystems with reference points

William J. Sydeman, Kyra L. Mills, Diana Watters, Steve Ralston and Tom Laidig
Wings, fins, and the black box: Management implications of marine bird and fish trophic similarities

Sergey A. Bakharev and Svetlana Rjanitsyna
About the ecosystem approach to the problem of continental shelf bioresources management

Tatsu Kishida, Muneharu Tokimura and Tokimasa Kobayashi
Variable pelagic and demersal marine ecosystems and fisheries around Japan

Posters:

Kimberly Y. Bahl, S. Allen Macklin and Bernard A. Megrey
North Pacific Ecosystem Theme Page and Metadatabase

Yeong Gong and Young-Sang Suh
Effect of the environmental conditions on the structure and distribution of Pacific saury in the Tsushima Warm Current region

Alexander V. Nikolayev and Michael Kuznetsov
Acoustic monitoring as method for ecosystem studies in the northwestern Bering Sea

Konstantin A. Zgurovskiy, Vassily Spiridonov and Andrey Malyutin
Marine protected areas of the Russian Far East in ecosystem based management: Problems and perspectives

FIS Paper Session (FIS)

Co-Convenors: Yukimasa Ishida (Japan) and Chang-Ik Zhang (Korea)

Background

At the FIS meeting in 2002 (PICES XI), it was noted that there was no FIS Paper Session that year, and was pointed out that convening such a session at PICES XII would enhance fisheries science activities in PICES, and allow participation by more fisheries scientists with different interests.

Summary of presentations

The session consisted of 49 papers (9 oral presentations and 40 posters) submitted by scientists from almost all PICES member countries. Papers dealt with different aspects of fishery sciences in the North Pacific and its marginal seas. Most oral presentations were on fish biology and fishery ecology, including species such as Pacific salmon, Pacific saury, sablefish, jack mackerel, pollock, hake, and Pacific ocean perch. One paper dealt with cephalopods and another paper was on sea lions. Abundances and recruitments of some fish species were correlated with environmental characters such as oceanic fronts (Pacific saury), current transports (jack mackerel), and water temperatures (walleye pollock and sablefish). Feeding ecology of chum salmon was compared between the western Bering Sea and the North Pacific. Oxygen isotopes provided environmental characteristics for walleye pollock, and parasites were used to determine stocks for shrimp. Study on the roar sound of the sea lion provided a lot of information on their behavior.

List of papers

Oral presentations:

Elena Dulepova
Comparison of feeding ecology of chum salmon in the western part of the Bering Sea and adjacent waters of the Pacific Ocean

Nozomi Ishiko, Hidetada Kiyofuji and Sei-Ichi Saitoh
Relationship between Pacific saury fishing grounds and the Oyashio front in the northwestern North Pacific

Michael J. Schirripa and Jim J. Colbert
Changes in sablefish *(Anoplopoma fimbria)* recruitment in relation to oceanographic conditions

Jae-Bong Lee, Chang-Ik Zhang, Anne Hollowed, James Ingraham and Young-Yull Chun
Relationship between potential transport and abundance of jack mackerel in Korean waters

Yoon-Seon Yang, Su-kyung Kang and Suam Kim
Oxygen isotopes evidence for environmental characteristics from walleye pollock *(Theragra chalcogramma)* otoliths

John R. Bower and Shogo Takagi
Vertical distribution of cephalopod paralarvae in the Northeast Pacific

Tae-Geon Park, Kohji Iida and Haruo Ogi
Relationship between roar sound and behavior of Steller sea lion, *Eumetopias jubatus*, migrating to the west coast of Hokkaido, northern Japan

Susan Coccetti and Michael J. Schirripa
Difficulty of age determination between Pacific hake *(Merluccius productus)*, Pacific Ocean perch *(Sebastes alutus)*, and sablefish *(Anoplopoma fimbria)*

Jung-Hwa Choi, Sung-Yun Hong, Hyung-Kee Cha and Glen Jamieson
Distinguished southern penaeid stock from western stock in Korea

Posters:

Alexander A. Bonk and A.Yu. Dubinina
Spawning grounds location influence upon the duration of embryonic development of herring eggs in the Western Bering Sea

Alexander A. Bonk
Consumption of herring eggs by predators in the Western Bering Sea

John R. Bower
Preliminary observations on gonatid paralarvae from the Northeast Pacific

Oleg A. Bulatov
The fishery and condition of the walleye pollock (*Theragra chalcogramma*) stock in the Bering Sea in 1979-2002

Seok-Gwan Choi, Won-Seok Yang, Jong-Bin Kim, Hyun-Su Jo and Yeong-Chull Park
Factors affecting the distribution of walleye pollock in the Aleutian Basin

Young-Min Choi, Chang-Ik Zhang and Jae-Bong Lee
Stock assessment and management implications of chub mackerel, *Scomber japonicus*, in Korean waters

Jung-Hwa Choi, Sung-Yun Hong, Chae-Woo Ma and Chul-Woong Oh
Growth and reproduction of *Metapenaeopsis dalei* (Decapoda, Penaeidae) in the western sea of Korea

Svetlana V. Davydova
The comparison of the peculiarity of spawn and egg/larvae distribution of the mass of subtropical fish species in coastal and open waters the northwestern Japan/East Sea

Alexander I. Glubokov
New data on the Pacific sleeper shark, *Somniosus pacificus* (Squalidae), in the northwest part of the Bering Sea

Stanislav Gorskiy, Daisei Ando, Yasuyuki Miyakoshi, Mitsuhiro Nagata and Masahide Kaeriyama
Distribution and growth of the ALC-marked juvenile chum salmon *(Oncorhynchus keta)* in the early marine life period

Kohji Iida, Tae-Geon Park and Haruo Ogi
Acoustic characteristics and morphological observation of roar sound of Steller sea lion, *Eumetopias jubatus*, migrating to the west coast of Hokkaido, northern Japan

Yukimasa Ishida, Tsutomu Saito, Shinji Uehara, Minoru Ishida, Hideki Akiyama, Takumi Mitani, Akihiko Yatsu, Ken Mori, Yasuhiro Ueno and Koji Takahashi
Detection of physical and biological regime shifts in the Kuroshio Current

Zoya G. Ivankova
Biology and stock condition of flounders in Peter the Great Bay (Japan Sea)

Elsa R. Ivshina
To the qestion of Sakhalin-Hokkaido herring decline in Sakhalin Island waters

Masahide Kaeriyama
Carrying capacity, population dynamics of Pacific salmon in the North Pacific Ocean in relation to the long-term climate change

Sung-Il Lee, Sung-Gyu Yun, Chang-Ik Zhang and Sang-Gyu Paik
An ecological study of benthos in the Tongyeong marine ranching area for ecosystem modeling

Igor V. Melnikov and Alexei M. Orlov
Sharks of the Russian EEZ in the Northwestern Pacific: An overview

Masayasu Nakagami, Satoshi Suyama and Yasuhiro Ueno
Long-term variability in length and condition factor of Pacific saury *(Cololabis saira)*

Jeffrey M. Napp, Russell Hopcroft, Christine T. Baier and Cheryl Clarke
Distribution and species-specific egg production by *Pseudocalanus* spp. in the Gulf of Alaska

Yury V. Novikov and Oleg A. Rassadnikov
Distribution of Pacific salmon in the period of anadromous migrations in the north Kuril Islands region in 2002

Vladimir A. Nuzhdin
The mechanism of formation of walleye pollock generations with various numbers

Jina Oh, Tae-Won Lee, Jin-Ku Kim and Jin-Yong Kim
Diurnal variation in catches of fish larvae collected by IKMT in the water off Jeju Island

Taeg-Yun Oh, Jae-Bong Lee, Hyung-Kee Cha, Jung-Hwa Choi, Jang-Uk Lee and Ju-Hee Lee
The biology of Penaeid shrimp stocks off Geomun, southern Korea

Kyum Joon Park, Chang Ik Zhang, Kyum Joon Park, Jong Hun Na, Zang Geun Kim and Hawsun Sohn
Abundance and growth of finless porpoise, *Neophocaena Phocaenoides*, in the west coast of Korea

Jong-Hwa Park, Yang-Jae Im, Hyung-Kee Cha and Young-Sang Suh
The relationship between oceanographic conditions and fishing conditions of anchovy, *Engraulis japonica*, in the Southern Sea of Korea

Eugene V. Samko, Alexander V. Kapshiter and Eugene V. Slobodskoi
Contemporary analysis of the neon flying squid distribution and satellite altimetry data

Young-Il Seo, Chang-Ik Zhang, Jae-Bong Lee and Jong-Hwa Park
Stock assessment using standardized fishing effort of purse seine fisheries in Korean waters

Dong-Wha Sohn, Sukyung Kang and Suam Kim
Stock identification of chum salmon *(Oncorhynchus keta)* using trace elements in otolith

Yuki Sugawara and Masahide Kaeriyama
Infection of *Anisakis simplex* in chum and sockeye salmon collected in the Gulf of Alaska, the Bering Sea, and rivers in Hokkaido, Japan

Akifumi Suzaki, Yasunori Sakurai, Jun Yamamoto, Tomonori Hamatsu, Shinichi Ito and Tsutomu Hattori
Influence of the Oyashio Current on stock fluctuation of walleye pollock in the Tohoku region, northern Japan

Katsuya Suzuki, Tsutomu Takagi, Yutaka Moritomi, Shinsuke Torisawa, and Kazushi Miyashita
A stochastic model of the schooling behavior of chub mackerel, *Scomber Japonicus*, in finite space

Kazuhisa Uchikawa, John R. Bower, Yasuko Sato and Yasunori Sakurai
Diet of the squid, *Berryteuthis anonychus* (Cephalopoda: Gonatidae), in the Northeast Pacific

Andrei V. Vinnikov
Stock abundance and peculiarities of fishing of Pacific cod in the eastern Sea of Okhotsk

Andrei V. Vinnikov
About 3 species of sharks sampled by bottom trawl on shelf of western Kamchatka (Sea of Okhotsk)

Takashi Yanagimoto, Yoshimi Takao, Kouichi Sawada and Neal J. Williamson
Distribution properties of walleye pollock, *Theragra chalcogramma*, in the Aleutian Basin of the Bering Sea

In-Ja Yeon, Hak-Jin Hwang, Young-Min Choi and Yang-Jae Im
Summer spatial distribution and abundance of major fisheries resources in the Yellow Sea of Korea

In-Ja Yeon, Byung-Kyu Hong and Joo-Il Kim
Long-term changes in the yellow croaker, *Pseudosciaena manchurica*, population in the East China and Yellow Seas

Ikuko Yosho
Long-term changes in distribution pattern of some demersal fishes in the Sea of Japan

Ikuko Yosho and Takashi Yanagimoto
Morphological variation in *Chionoecetes japonicus* (Decapoda, Majidae) in Japanese waters: A preliminary observation

Chang-Ik Zhang, Sang-Cheol Yoon and Jin Woo Choi
A population ecological study of puplish washington clam *(Saxidomus purpuratus)* in adjacent waters of Geoje island, Korea

POC Paper Session

Convenor: Kuh Kim (Korea)

Background

The session consisted of 12 oral presentations and 20 posters on various aspects of physical oceanography in the North Pacific Ocean and the Japan/East Sea, and the air-sea interactions over the Yellow Sea and the East China Sea.

Summary of presentations

Physical oceanographic observations on the Juan de Fuca Eddy collected in June 2003 and preliminary circulation modeling results were described by Foreman.

Subsurface frontal waves with a wavelength of 70-100 km were observed in the Kuroshio Extension, which grow and propagate downstream. These unstable waves play a key role in strong isopycnal mixing and cross-stream exchange between the Kuroshio and Oyashio waters, and that is a major formation process of the North Pacific Intermediate Water (Yasuda). An inverse method is employed to quantify the effect of cabbeling, which accounts for the

density increase during the formation of the North Pacific Intermediate Water (NPIW). The total diapycnal volume convergence into the NPIW may be up to 2.3 Sv in the entire NPIW region (Yun).

The duration of the 5°C isotherm presence south of 50°N was chosen as a criterion for the estimation of the cold period in the Far East Seas and the whole Northwest Pacific since 1966. There was a constant increase in the duration of the cold period from 70 to 170 days, associated with the early beginning of the winter season and late spring-summer warming (Krovnin). Application of the multiple imputation method developed for biomedical researches shows that the temperature contrast in the Subtropic Western Pacific increased, while the air temperature contrast over the East Asia decreased during the second half of the 20th century (Kaplunenko).

The disappearance of the East Korean Warm Current was examined in relation to the transport variation in the Korea Strait and the deep currents in the Ulleung Basin (Chang). Trajectory data from subsurface floats were used to understand intermediate circulation in the southwestern part of the Japan/East Sea (Park). The sea level response to atmospheric pressure is not isostatic due to a Helmholtz-like resonance between the Japan/East Sea and the North Pacific Ocean through straits. Thus special care is necessary in analyzing TOPEX/POSEIDEN altimeter data (2-20 day periods) taken in this region (Nam). A series of cruises with CTD and chemical observations implemented during 1999-2003 has provided an evidence of deep convection and water mass formation processes in the northwestern Japan/East Sea (Lobanov). The effect of the inflow condition on the circulation in the Japan/East was examined through numerical ocean modeling using the GFDL Modular Ocean Model (MOM3) (Kim).

Model hindcast winds were compared with the winds observed from JMA ocean buoys and the Kyushu ocean observation tower. Both the typhoon model and the primitive vortex model underestimate the observed winds (Kang). The formation and advection of fog in the Yellow Sea along the eastern coast of China and the western coast of Korea depend strongly on the wind field and sea states (Choi).

List of papers

Oral presentations:

Michael Foreman, Barbara Hickey, Vera Trainer, Amy MacFadyen and Emanuele Di Lorenzo
Preliminary modelling and observational studies of the Juan de Fuca Eddy

Ichiro Yasuda, Shinya Kouketsu and Yutaka Hiroe
Frontal waves and the formation of North Pacific intermediate water along the Kuroshio extension

Jae-Yul Yun and Lynne D. Talley
Cabbeling and the density of the North Pacific intermediate water quantified by an inverse method

Andrei S. Krovnin, Marat A. Bogdanov and George P. Moury
Recent climatic changes in the Northwest Pacific

Dmitri D. Kaplunenko and Vladimir I. Ponomarev
Assessing the climate change tendencies in the Northeast Asia and Northwest Pacific using the multiple imputation method

Kyung-Il Chang and Y.B. Kim
Disappearance of the East Korean Warm Current in the southwestern East Sea

Young-Gyu Park, Kyung-Hee Oh, Moon-Sik Suk and Kyoung-Il Chang
Intermediate level circulation in the southwestern part of the Japan/East Sea from subsurface floats

Sung-Hyun Nam, Sang-Jin Lyu and Kuh Kim
The corrections of the high-frequency (2-20 days) fluctuation effects on the TOPEX/POSEIDON altimeter data in the East (Japan) Sea

Young-Ho Kim and Kuh Kim
The effects of horizontal resolution in a Z-coordinate model of the East/Japan Sea

Vyacheslav Lobanov, Vladimir Ponomarev, Anatoly Salyuk, Pavel Tishchenko, Lynne Talley, Kuh Kim, Kyung-Ryul Kim, Dong-Jin Kang and Guebuem Kim
Ventilation of the Japan/East sea bottom layer

See-Whan Kang, Ki-Cheon Jun, Kwang-Soon Park and Sang-Ik Kim
A sensitivity analysis of typhoon wind models with wind observations in Northeast Asian Sea

Hyo Choi and Yuan-Hang Zhang
Modification of sea fog by sea-land breeze and sea surface temperature

Posters:

Li-Qi Chen, Zhong-Yong Gao, Wei-Qiang Wang and Xu-Lin Yang
Characteristics of pCO_2 in surface water of the Bering Abyssal Plain and their effects on the carbon cycling in the western Arctic Ocean

Pavel A. Fayman
Calculation of Peter the Great Bay (Japan Sea) currents using the adaptation model

Gennady A. Kantakov
Comparing moorings and PALACE data in the northern part of the Japan Sea

Vyacheslav G. Kuzlyakin
Intraannual variability of the heat content of waters in the California Current region

Carol Ladd, George Hunt Jr., Calvin Mordy, Sigrid Salo and Phyllis Stabeno
Marine environment of the central and eastern Aleutian Islands

Carol Ladd, George Hunt Jr., Dave Kachel, Sigrid Salo, and Phyllis Stabeno
Satellite tracked drifter studies in the eastern Aleutian Passes

Jong-Jin Park and Kuh Kim
Importance of surface water property in previous winter on the formation of HSIW in the East/Japan Sea

Kyung-Ae Park, Kyung-Ryul Kim, Jong-Yul Chung and Kuh Kim
Spatial and temporal variability of sea surface winds and Ekman pumping retrieved from satellite scatterometer-observed wind vectors over the East Sea

Vera A. Petrova, Alexander D. Nelezin and Alexander N. Manko
Annual variability of the sea surface heat fluxes in the North Pacific

Young-Jae Ro and Yong-Hoon Youn
Data assimilation experiment in the East (Japan) Sea based on POM-ES

Sergey I. Rybalko and George V. Shevchenko
Sea currents variability on the Sakhalin northeastern shelf (instrumental observations)

Nikolay A. Rykov
Variability of water temperature and salinity on the NE Sakhalin shelf in summer 2000-2002

Georgy Shevchenko, Gennady Kantakov and Valery Chastikov
The first ADP current measurements in the area of La Perouse Strait

Moon-Bo Shim, D.K. Lee, J.Y. Park, H.Y. You, J.W. You, S.Y. You and S.B. Oh
A study of sea surface currents of the East Sea using SVP drifter

Seung-Hyun Son, Janet Campbell, Mark Dowell and Sinjae Yoo
Seasonal and interannual variability of satellite measured chlorophyll and temperature in the Yellow and East China Seas

Valery Sosnin, Pavel Tishchenko and Nicole Biebow
Diapycnal entrainment of shelf waters into intermediate depths across the Sakhalin continental slope (Sea of Okhotsk)

Phyllis Stabeno, George Hunt Jr., David Kachel, Carol Ladd, Calvin Mordy and Sigrid Salo
Flow through the Aleutian Passes

Marina M. Subbotina, Richard E. Thomson and Mikhail Anisimov
Simulation of the currents, induced by hydrothermal vent field at Endeavour Ridge

Frank A. Whitney, Kim Conway, Richard Thomson, Vaughn Barrie and Manfred Krautter
Oceanographic habitat of sponge reefs on the western Canadian continental shelf

Ichiro Yasuda and Hiroaki Tatebe
Oyashio southward intrusion, associated cross-gyre transport and the formation of North Pacific Intermediate Water

Workshop W1 (MONITOR)
Examine and critique a North Pacific Ecosystem Status Report

Co-Convenors: Vyacheslav B. Lobanov (Russia), David L. Mackas (Canada), Phillip R. Mundy (U.S.A.), Sei-ichi Saitoh (Japan) and William J. Sydeman (U.S.A.)

Background

An important goal for the "operational" monitoring of the changing ocean conditions is the timely conversion of raw data to scientific and management "decisions". Many different steps are implicit in this process: (i) compiling and summarizing a diverse suite of variables, measured by multiple data-collectors at multiple locations; (ii) recognizing "local" changes quickly; (iii) making comparisons among variables and among locations for evidence of consistency, spatial extent, and likely ecological impact; (iv) notifying "clients" (including policy makers, resource users, other scientists, and the general public); and (v) possibly triggering alterations in data collection or ecosystem management strategies.

In general, the marine science community lacks both the tools and the habits needed to carry out these steps on a routine basis. As a step toward developing these tools and habits, the MONITOR Task Team convened a workshop to identify what should be addressed in the North Pacific Ecosystem Status Report (NPESR), using relevance to management decisions and relation to other pieces in other areas of the North Pacific as selection criteria. The format was invited cross-disciplinary presentations from each nation or region, followed by plenary and/or breakout discussion of if and how these pieces fit together as a picture of the entire North Pacific. The workshop was primarily seen as an exercise in 'process', and was not intended to produce a polished final product. However, the prototype report will be 'published' on the PICES web site.

Summary of presentations

The first day of the workshop included:

- Invited presentations on ecosystem status monitoring and assessment efforts carried out by ICES (Brander) and CCAMLR (Reid). The invited talks stimulated much good discussion of Ecosystem Status Report goals, content, user groups, and logistics. On the topic of 'standardization of sampling methods' – both speakers noted that maintaining consistency within time series is usually more important and more feasible than altering ongoing programs to obtain standardization across time series.
- Synopsis of the draft PICES NPESR (Perry). This report will be printed in early 2004 after a final round of revision and review. It will include a summary chapter (Perry), a chapter on large-scale climate indices (Overland), several chapters on regional ecosystems, and chapters on trans-boundary fish stocks. The role of the MONITOR Task Team in this process and in the production of future versions of NPESR was a major topic of the plenary discussion at the end of the workshop (see below).
- Invited and contributed regional reports describing monitoring and status assessment efforts in different parts of the North Pacific (Hidaka, Kantakov, Shevchenko, Tan, Zhu, Mueter, Livingston, McFarlane, Bograd). Several of these were summaries of chapters in the NPESR.

The second day included:

- Discussions of some new monitoring approaches and hypotheses:
  - Proposed workshop on to identify global synchrony of zooplankton variability (Perry);
  - Multi-trophic level monitoring from ships of opportunity: CPR, physical variables, bird/mammal observations (Batten);
  - Ecosystem status information available from data on marine birds and mammals (MBM-AP: Sydeman, Thayer, Kato).
- Presentations on operational oceanography in western Pacific marginal seas: CREAMS (Kim) and NEAR-GOOS (Lobanov):

- Both of these are ongoing programs that are entering a second phase of design and implementation, and both are becoming more cross-disciplinary in focus;
- Notable effort and successes with real-time data transfer and analysis. These can be used as models for other regional monitoring efforts now being developed.

▪ Extensive plenary discussion of how to produce future editions of NPESR. Topics included NPESR content (what is in the report now, what should be added next time), update interval and format ('as available' on web, ~3-5 year interval as printed document), quality/completeness checks and peer review mechanisms (combination of internal and external), tools for outreach to 'users' and feedback from 'users', and broadening the base of PICES contributors.

▪ Discussion on the role of MONITOR in NPESR preparation and review. Task Team members agreed that this is important present and future work for MONITOR. Potential actions and activities are:
- contribute expertise to 'scientific peer review';
- initiate future NPESR editions (however, this role assumes a 'permanent' mandate for MONITOR, probably extending beyond the duration of the CCCC Program);
- help future chapter authors find relevant 'data' and 'specialist expertise';
- contribute to 'outreach' communication.

List of papers

Keith Brander (Invited)
Choosing, presenting and maintaining indicators for marine ecosystem monitoring - Experience from the NE Atlantic

Keith Reid (Invited)
The CCAMLR ecosystem monitoring programme: Application to the management of krill fisheries

R. Ian Perry
The PICES North Pacific Ecosystem Status Report

Kiyotaka Hidaka, Kaoru Nakata and Shin-Ichi Ito
Ecosystem monitoring in the western North Pacific off Japan

Gennady A. Kantakov
SST vs. layer temperature anomaly in the Western Subarctic Pacific: Contradictory or joint monitor tools?

George Shevchenko, Constantine Puzankov and Valery Chastikov
Monitoring of the Tsushima Warm Current in the northern Japan Sea in spring 2003

Jae-Bong Lee, Chang-Ik Zhang and Seok-Gwan Choi
Climate-induced variations in the abundance of fisheries resources and ecosystem structure in Korean waters

Dong-Yong Lee, Gong-Ke Tan, C.S. Kim and J.Y. Han
Approach to the operational ocean observing system in the Yellow Sea through China-Korea bi-lateral cooperation

Ming-Yuan Zhu, Rui-Xiang Li and Bin Xia
Marine ecosystem status in China Seas

Patricia Livingston
Ecosystem status of the Bering Sea

Franz Mueter
The Gulf of Alaska ecosystem: Status and recent trends

Gordon A. McFarlane
State of the ocean off the Pacific coast of Canada in 2002

Steven J. Bograd
A status report of recent environmental and ecosystem trends in the California Current system

R. Ian Perry, Harold P. Batchelder, Sanae Chiba, Edward Durbin, Wulf Greve, David L. Mackas and Hans M. Verheye
Identifying global synchronies in marine zooplankton populations: Issues and opportunities

Sonia Batten, William Y. Sydeman, David Hyrenbach, Ken Morgan, Peggy Yen, Mike Henry and David Welch
Multi-ecosystem sampling in the North Pacific Ocean using the Continuous Plankton Recorder

PICES Advisory Panel on Marine Birds and Mammals
Monitoring marine birds and mammals - summary of activities and MBM workshop discussions

Kuh Kim and Vyacheslav Lobanov
Summaries of CREAMS and NEAR-GOOS programs

Workshop W2 (MBM-AP)
Combining data sets on distributions and diets of marine birds and mammals

Co-Convenors: Hidehiro Kato (Japan) and William J. Sydeman (U.S.A.)

Background

The goal of the workshop was to explore the temporal and spatial patterns of ecosystem co-variation, production of lower trophic level prey organisms by biophysical and climate forcing mechanisms, and the response of marine bird and mammal diets to those patterns. We focused on two species of birds (Rhinoceros Auklet, *Cerorhinca monocerata*, and one other) and two species of mammals (Steller sea lions, *Eumetopias jubatus*, and one other) that have representation on both sides of the North Pacific Ocean, and sufficient time series information to facilitate meaningful comparisons, either within or between regions. The workshop was built on previous efforts to examine bird and mammal prey consumption within the PICES region (PICES Sci. Rep. No. 14, 2000). We expected that the direct comparisons of data sets which have been examined in isolation in the past would facilitate the detection of underlying causes for regional differences in ecosystem organization, trophic transfer, and the timing of responses of marine birds and mammals in relation to climate change events. We also hoped that the workshop would provide a forum for discussions with physical, biological and fisheries oceanographers, and would serve to launch future collaborations within the PICES community.

Summary of presentations

The workshop consisted of 6 oral presentations, including 2 talks on marine birds (Rhinoceros Auklet), 3 talks on marine mammals (Steller's sea lion, minke whale and sei whale), and a brief overview of how to investigate predator behavior in the marine environment. A total of 19 people were in attendance.

Watanuki and Deguchi demonstrated that changes in the strength of the warm Tsushima Current affect anchovy biomass and growth and breeding success of Rhinoceros Auklet in the Japan/East Sea.

Thayer *et al*. reported that Rhinoceros Auklet diet composition reveals spatial and temporal variations in forage fish communities in coastal regions of the North Pacific, some of which appeared to be related to oceanographic regime shifts.

Loughlin reviewed the available information on Steller's sea lion diet from the 1950' to the present in both western and eastern populations, and showed how the diet fluctuates spatially and temporally in the North Pacific Ocean.

Tamura and Kato described changes in common minke whales diet from the 1960's to the present in the western North Pacific, using data collected from the past commercial whalings and research taken under the scientific permit. They revealed a remarkable switching (on decadal scale) in preys that are likely related to regime shifts.

Ohki *et al*. demonstrated associations of sei whales with a region of elevated chlorophyll concentrations in the western North Pacific using remote sensing.

Hunt discussed how foraging seabirds sample the marine environment and highlighted the need for calibration of the marine bird and mammal data with independent measurements of prey availability and distribution.

Presentations and associated discussion revealed the following:

- Diet composition of birds and mammals varies between the western and eastern North Pacific;
- Diet composition of top predators has switched dramatically at decadal levels, probably due to regime shifts;
- Marine birds and mammals, including at

least Rhinoceros Auklet, Steller's sea lion and minke whale, can be used as an ecosystem indicator;
- There is a "hot spot" at about 40ºN, 160ºE supported by higher chlorophyll concentration (and probably by other oceanographic factors) where marine birds and mammals are abundant.

List of papers

Yutaka Watanuki and Tomohiro Deguchi
Effect of physical factors and prey availability on diet and chick growth of Rhinoceros Auklet at Teuri Island in Japan/East Sea

Julie Thayer, Leslie Slater, Yutaka Watanuki, Douglas F. Bertram and William J. Sydeman
East, West, North and South: Spatio-temporal variation in the diet and prey characteristics of Rhinoceros Auklets in the North Pacific Ocean

Thomas R. Loughlin
Review of Steller sea lion diet in the eastern and western North Pacific

Tsutomu Tamura and Hidehiro Kato
Long-term changes in food and feeding habits of the common minke whales in the western North Pacific

Sachi Ohki, Sei-Ichi Saitoh, Hiroshi Kiwada and Koji Matsuoka
Relationship between sei whales distribution and the environmental conditions in the western North Pacific using multi-sensor remote sensing

Workshop W3 (WG 15/TCODE)
Harmful algal blooms – harmonization of data

Co-Convenors: Hee-Dong Jeong (Korea) and Vera L. Trainer (U.S.A.)

Background

Our ability to manage the Pacific coastal region seafood harvest is dependent, in part, on our ability to assure the safety of this harvest to human consumers. Our understanding of factors contributing to harmful algal bloom (HAB) events is limited by our access to comparative data from similar coastlines that face the same challenges from harmful biotoxins. A free flow of information to all interested investigators is vital in planning experiments, analyzing data, modeling HABs, and in putting together the broad picture of the relationship between biological, physical and chemical factors that influence the development of blooms in Pacific coastal regions. It is also critical to improve the forecasting of future bloom events and the protection of coastal fisheries in all PICES member countries. However, the historical data sets available for the analysis of coastal HAB events are widely dispersed among the various agencies responsible for monitoring biotoxin events. These data exist in various degrees of processing, quality assurance, and public availability, and much of the available data (*e.g.* on phytoplankton assemblage characteristics) are in forms that are difficult to use. The goals of this workshop were (1) to look at and discuss the interest of PICES member countries in the establishment of a common database; and (2) to examine mechanisms for the integration of the ICES and PICES harmful algal bloom databases.

Summary of presentations and discussion

The workshop was held on October 10-11, 2004, in conjunction with PICES XII. After welcoming 18 participants (an additional 6-8 people also attended during various times), the convenors stated the goals of the workshop that included determining how harmful algal bloom and red tide data could be shared among PICES member countries. The agenda included 11 presentations.

Henrik Enevoldsen spoke first and discussed the IOC/ICES database for the North Atlantic, called the Harmful Algae Events Database or HAE-DAT. The main purpose of creating HAE-DAT is to develop an international structure for data storage that allows easy integration of data,

efficient search tools, and the possibility of conducting data analysis. This database does not share raw data and only includes harmful events that cause economic loss and human illness. Problems that must be overcome in a harmful algae database comprise: (1) some events are very difficult to compile in a common database; (2) some data are not accessible to the public; (3) data types are sometimes not comparable; and (4) compilation of the database is very resource intensive. HAE-DAT has been available since October 1999 and includes 1109 reports. The ambition is that HAE-DAT will eventually become a global database and will incorporate information on North America and Europe (including the Mediterranean Sea region), IOC ANCA (Caribbean), IOC FANCSA (South America), the North Africa network, and PICES, thereby establishing a world-wide system for sharing biological data.

HAE-DAT currently runs under the MS Access 97 programming routine (scheduled for replacement in the near future) and includes the general (location and date, microalgae type, environment and harmful effects) and complementary information about harmful algal blooms. HAE-DAT maps of HAB occurrences are not yet linked automatically to the database, although this is anticipated to occur next year. Decadal maps are prepared by IFREMER in France. The information plotted includes the presence of toxins or observations of mortalities (regardless of levels of toxicity). Blooms of potentially toxic species have been omitted. In the future, ICES delegates will divide their countries into HAE regions to overcome data sensitivity issues.

Nicolaus Adams spoke about the availability of harmful algal bloom data on the west coast of the United States and the formation of a regional HAB database. He focused on shellfish monitoring efforts in Alaska, Washington, Oregon, and California along with ancillary data that are being collected as part of routine monitoring programs. Initially, he compared and contrasted the HAB monitoring programs that occur in each west coast state. All of the west coast states have some sort of shellfish monitoring program that involves the testing for Paralytic Shellfish Poison Toxins (PSP) and Domoic acid (DA). Each of the states adopted the testing for DA after the events that occurred on the west coast in 1991. Some of the differences included the species that were tested. For example, there is no good sentinel species for DA in California, whereas in Washington the razor clam is used as the test species for DA as blue mussels do not retain DA for very long.

Next, the HAB data availability in each state, starting with Alaska and progressing southward state-by-state, was discussed. The shellfish toxin data are mainly collected by departments in each state's government that are tasked with protecting public health.

In Alaska, the bulk of the available data are PSP in shellfish data, there are some data available for DA as well.

Washington State was discussed in more depth than the other states. In Washington, there is a long record of PSP data as well as a good dataset for DA starting in 1991. The Washington State Department of Health monitors all commercial and recreational harvesting areas as well as a network of >70 sentinel mussel cages throughout Washington State. There is no phytoplankton monitoring program that is run in conjunction with the shellfish testing program. However, there is a separate monitoring program on the Pacific coast of Washington, coordinated by the Marine Biotoxin Program of NOAA Fisheries that includes phytoplankton monitoring at 10 beach sites as well as DA analysis of the particulate fraction of seawater at 4 beach sites. Additionally, phytoplankton data have been collected at various sites in Washington State for many years by Dr. Rita Horner. There have been numerous ship-of-opportunity cruises from which data have been collected (*e.g.* oceanographic, phytoplankton, DA) by the Marine Biotoxin Program.

Most of the shellfish testing in Oregon centers around the oyster industry, although other species are routinely tested for PSP and DA. Within the last 6 months, a phytoplankton monitoring and DA analysis of seawater has

commenced at razor clam harvesting areas on the northern coast of Oregon State.

In addition to PSP and DA testing, California has a program that monitors the phytoplankton for harmful species. There is a network of >45 volunteers that collect samples along the entire coast of California. A core group of these volunteers performs the identifications and reports the data to the California Department of Health Services. These are qualitative data and are reported on a relative abundance scale.

There are some coast-wide HAB data that are available in addition to data from each individual state. These data comprise standard oceanographic measurements, nutrients, DA in the particulate fraction of seawater, and phytoplankton cell counts.

Shellfish toxin data in electronic format are available: from 1989-present for Alaska, 1957-present for Washington, 1997-present (most likely includes older data as well) for Oregon. California's data are in a separate database so the information has not been received yet. Data prior to 1989 and 1957 for Alaska and Washington, respectively, are available only in hardcopy format. The hardcopy data are currently being digitized for entry into a database. All of the ship-of opportunity data collected by the Marine Biotoxin Program in Seattle are in electronic format, as are the data they have collected at the beach sites. Beach monitoring data and regional HAB project data from other states are in separate databases. There are also data stored on obsolete electronic media (*e.g.* magnetic tape) that are being recovered. Some problems and successes with sharing of these data were discussed and further work needed to streamline the database was outlined. The database initially started utilizing shellfish toxin data but now is expanding to include the other data types listed above.

Robin Brown gave a presentation of data prepared by Max Taylor and Ian Whyte on Canada's HABs. Canada's data are highly site specific and therefore aggregation may be confusing. Monitoring for PSP and ASP is done by a Federal agency (Canadian Food Inspection Agency). Data are heavily biased to southern British Columbia where most people live and sites are easier to access for monitoring. For the most part, mussels are monitored as a sentinel species using standard methods. No phytoplankton monitoring takes place as part of routine sampling. What we know about HABs in Canada is that (1) there is inter-annual variability, and small scale variability – linked to local mixing and exchange; (2) exposed areas are less susceptible than sheltered areas; and (3) fish killing algae are not a high priority. Nicky Haigh from the Pacific Biological Station has a program on phytoplankton monitoring (called HAMP) that focuses on HABs that do not affect people, rather, done at and for fish farms. Participants and locations of farms change every year. Sampling includes phytoplankton (HAB species), nutrients, and some environmental data in order to provide early warning. Using this system, fish farmers can warn their neighbors of *Heterosigma, Chaetocers, Cochlodinium,* etc. blooms. Concerns that Canada has regarding a global HAB database include: (1) the security and preservation of older data, especially inspection data; (2) proprietary nature of industry data; (3) Canadian data are listed as occurrences and do not focus on commercial impact; (4) cooperation from investigators is a concern; and (5) support is required for a database effort.

Tatiana Orlova spoke about HABs on the Russia east coast. In that region, there are active fisheries contributing over 80% of the total Russian production. About 6 million people live in this region and it remains largely unpopulated, that is why there is no shellfish monitoring program. Scallop culture in Primorye was exhausted due to poaching. In 1971 there was the first scallop culture in Russia. The number of scallop farms increased from 3 (1980) to 20 (2000). HABs data in coastal waters of Primorye are available from 1980-2003. Each year there have been observations of recurrent blooms of nontoxic species, including *Skeletonema, Chaetocerus*, and others. Sampling has begun for *Alexandrium* and *Pseudo-nitzschia*. A *P. multiseries* isolated from eastern Russian waters was tested for toxicity by S. Bates, and a level of

180 ng/ml was measured. A recommendation was made for a shellfish testing program in Russia to the Academy of Science.

Paul Harrison reported about HABs in Hong Kong. There, phytoplankton monitoring is done rather than measurement of shellfish toxicity. In Hong Kong, "red tide" means colored water. In this region there are more fish kills than shellfish toxicity. Fish kills are largely due to oxygen problems. Hong Kong is at the end of the Pearl River basin (13th largest river in the world). A large sediment load comes out of the river. The Hong Kong government samples a fairly small area, but coverage is adequate to determine spatial and temporal variability. Upwelled water from the South China Sea is low in oxygen, and does not bring in high nutrients. The agencies involved in monitoring are:

1) Agriculture, Fisheries and Conservation (AFCD) - does phytoplankton monitoring and is charged with red tide management in fish culture zones;
2) Environmental Protection Department (EPD) - performs widespread monitoring of 94 stations in 10 water quality zones.

Ming-Yuan Zhu reported on HAB monitoring in China. There has been an increase in red tide occurrence since 1980. The three areas with frequent HABs are the Bohai Sea, the East China Sea, and the coast water of Guangdong. A new research project called CEOHAB (China Ecology and Oceanography of Harmful Algal Blooms) has the following objectives: (1) to measure the distribution and diversity patterns of key species; (2) to measure nutrients and HABs; (3) to look at key physical, biological and chemical environmental factors; and (4) monitoring, harmfulness and control. The ultimate goal for CEOHAB is to obtain some predictive capabilities for HABs. This project hopes to become part of the GEOHAB program. The body of the project is 5 research cruises every year. The data management system in China can be seen on www.china-hab.ac.ca, which includes mainly cruise data.

Yasuwo Fukuyo reported on HAB databases in Japan. He stated that the difficulty in "data harmonization" comes from the nature of HAB monitoring and management in Japan, in that there are too much data on red tides and toxic contamination. All reports are written in Japanese. Translation is not possible due to budget limitations (cost *vs*. benefit). At present, Japan thinks that it is impossible to input Japanese data into a PICES database.

Monitoring in Japan consists of: (1) red tides (routine monitoring and emergency monitoring); (2) toxic plankton blooms (monitoring of shellfish); and (3) monitoring by research organizations – plankton, shellfish toxicity and/or oceanographic data. Several prefectures have monitoring programs (mostly in the south). Dr. Fukuyo questioned whether all Japan's data should be input into the database? Who will do the work? What budget will be used? He remarked that most of the data are not properly published. In Japan, about 10% of the red tides are harmful. Others are harmless to fisheries industry. There are more than 80 different red tide species. In red tide cases there are: (1) high *vs*. smaller cell numbers, (2) large *vs*. small areas are affected, and (3) different durations of events ranging from 1 day to three months. These data are available at the website of the Fisheries Agency and local governments. The cautionary cell number *vs*. "alarm" cell number is different for each species. Red tide monitoring (cells) *vs*. toxin monitoring (DSP and PSP) must be considered. Domoic acid monitoring in seafood and seawater was done for 3 years. No domoic acid was seen, and so monitoring was stopped. Decadal maps of DSP and PSP in Japan are available.

Keiko Ide described the NOWPAP Data Action Plan for the Northwest Pacific. The area of NOWPAP interest includes the Japan/East Sea and the Yellow Sea. NOWPAP is a database and information management system, survey of monitoring programs, and a tool for cooperation, networking, increasing public awareness, and assessment of land-based activities. NOWPAP will develop tools for environmental assessment that can be used and shared among member countries. NOWPAP's WG-3 on *Harmful Algal Blooms* (under CEARAC in Japan) will discuss coastal environmental assessment and evaluate the state of HABs in the NOWPAP region. This

WG will provide policy makers with information and establish collaborative monitoring programs. Their first meeting will be held at the end of October 2003. The NOWPAP data-related goals include: (1) to collect, analyze and provide data and (2) to establish a database. NOWPAP will use secondary data including papers and published literature for their database.

Hak-Gyoon Kim described HABs in Korea. Recently, fish-killing *Cochlodinium* has been a big problem. Types of data in Korea include cruises, coastal patrol, and aircraft that monitor the coast on a daily, weekly, and monthly basis. Both red tides and shellfish poisoning (ASP, DSP, PSP) are documented, as well as data on environmental quality and ocean dynamics. Routine monitoring is done from February through November at 77 stations. Fish-killing (red tide) monitoring takes place in June, July (weekly), and August through September (daily). The following agencies are involved in monitoring: NFRDI has research vessels, MOMAF assists with onshore watch and vessels, and NMFA has helicopters that assist with daily monitoring.

A hands-on demonstration of data visualization using Surfer was given by Nicolaus Adams. About 8 participants followed the demonstration by plotting data on their own computers.

The final presentation was on objectives and status of the GEOHAB Program by Henrik Enevoldsen.

The following problems with data sharing were identified during the presentations and the discussion that followed:

- Data are collected by managers and are not always accessible to researchers;
- Different countries have definitions of what constitutes a harmful algal bloom (*e.g.*, in China and Japan, "red tides" are defined as those algal blooms that attain sufficient densities to discolor water, but do not necessarily produce a toxin, while in Canada and the United States these algal blooms are not normally considered harmful);
- Different toxins are monitored in different countries (*e.g.*, whereas both DSP and PSP toxins are routinely monitored in Japan, in Canada or the western United States shellfish are only monitored for PSP and ASP toxins);
- Data are not always GIS-referenced, rather, shellfish closures are recorded for a region, not for a specific site;
- Shellfish monitoring is intense in some countries, but not in others (*e.g.*, in Russia, although HAB species are identified, there is currently no routine monitoring of toxins);
- Data are site specific (*e.g.*, most shellfish monitoring in western Canada occurs in the southern regions where commercial shellfish and fish farms are concentrated); and
- Data available from offshore research cruises indicating high toxin concentrations or elevated cell abundance estimates may not result in any significant coastal impact. Should such data be included in an "events" database?

All PICES member countries unanimously decided to adopt the IOC/ICES database for a one-year trial period. This database will now be called the HAE-DAT joint database to reflect the fact that PICES is actively using it. It was agreed that:

- Each country will enter one year's HAB data in the database using a year of their choice;
- Each country will decide which data to enter, or in other words, will decide what constitutes a "problem" HAB in their country;
- Each country will define "regions" for their data entry that could include exact locations or more general areas (*e.g.* prefectures in Japan). This will allow issues of data sensitivity to be overcome;
- Each country will decide on a point person to oversee data entry into HAE-DAT during the next year; and
- For the next PICES Annual Meeting (October 2004, Honolulu, U.S.A.), each country will complete a "report card" describing what worked within the database, types of data that were difficult to deliver

(data access issues, etc.), and the overall usefulness of the database.

The following offered to be contact point people for data entry using HAE-DAT in their country:
- Canada, to be determined
- Japan, Ichiro Imai
- China, Ming-Yuan Zhu
- Korea, Hak-Gyoon Kim & Chang-Kyu Lee
- Russia, Tatiana Orlova
- USA, Vera Trainer & William Cochlan

In addition, contact will be made with Mexico to determine whether they would like to participate in this exercise.

The workshop participants unanimously recommended to convene a 1-day follow-up workshop on "Developing a North Pacific HAB data resource" at PICES XIII in Honolulu (see *MEQ Endnote 9* for description), and have determined that IOC involvement will be essential.

It was also recommended that the possibility of NOWPAP acting in some way as a data manager for Western Pacific countries be considered at the upcoming meeting of the NOWPAP Working Group 3 on *Harmful Algal Blooms*. At this meeting, the state of HABs in NOWPAP region will be discussed.

List of papers

Henrik O. Enevoldsen and Monica Lion
The harmful algal event meta-data base HAE-DAT

Nicolaus G. Adams, Vera L. Trainer
A harmful algal bloom database for the US West Coast

Robin Brown (for F.J.R. Max Taylor and Ian Whyte)
HABs and shellfish toxicity monitoring and data in British Columbia, Canada

Tatiana Y. Orlova
Harmful algae from the Russian Pacific coast

Paul J. Harrison
HAB data in Hong Kong

Tian Yan and Ming-Jiang Zhou (presented by Ming-Yuan Zhu)
Introduction of HAB data in China (W3-1172)

Yasuwo Fukuyo, Satoru Toda, Shigeru Itakura, Ichiro Imai and Masaaki Kodama
HAB data management in Japan and inherent difficulty in joining PICES database

Keiko Ide
NOWPAP and developing a new database of red tides and related science based on secondary data

Hak-Gyoon Kim, Young-Shil Kang, Kui-Young Kim, Chang-Kyu Lee, Wol-Ae Lim, Sook-Yang Kim, Tae-Seek Lee, Ji-Hoe Kim, Jong-Su Park and Hee-Dong Jeong
HABs data collection and management in Korea

VIDEO PRESENTATION: Nicolaus G. Adams
Data visualization using Surfer

Donald M. Anderson, Patrick Gentien, Grant Pitcher and Henrik O. Enevoldsen
GEOHAB

Workshop W4 (MIE-AP)
Planning a micronekton sampling gear intercalibration experiment

Co-Convenors: Michael P. Seki (U.S.A.) and Evgeny Pakhomov (Canada)

Background

While a number of gears are presently being used to sample micronekton in the North Pacific and other parts of the world's oceans, there has been little effort expended in comparing the relative sampling efficiency and selectivity of these gears. At the recommendation of PICES Working Group 14 on *Effective sampling of micronekton*, a new PICES field effort to evaluate the efficacy of sampling gear and procedures employed by different agencies to

sample micronekton in the North Pacific was launched, the *Micronekton sampling gear Intercalibration Experiment* (MIE). This ½-day workshop of the MIE-Advisory Panel (MIE-AP) overseeing the field program was convened to discuss the goals, objectives, and status of the experiment, and begin the formal organization and planning process for the experiment. No formal presentations were scheduled or made at the workshop, other than a short presentation on the facilities and capabilities of the research vessel for the initial phase of the experiment. A detailed discussion can be found in the report of the MIE-AP (see *BIO Endnote 4*).

Workshop W5 (BASS)
Linkages between open and coastal systems

Co-Convenors: Vladimir Belyaev (Russia), Gordon A. McFarlane (Canada) and Akihiko Yatsu (Japan)

Background

Recent BASS/MODEL workshops synthesized data and examined trophic relationships in the eastern and western subarctic gyres. These workshops facilitated our understanding of how these systems respond to natural and anthropogenic change. Participants at these workshops suggested the next phase of this work, from the standpoint of understanding the gyres, would integrate coastal, marginal seas and boundary current dynamics and linkages between gyres. To begin the process, this workshop was proposed to examine current information of the oceanographic and biological linkages between open ocean and coastal systems in the North Pacific Ocean.

Summary of presentations

In general, the oceanography and ecology of the subarctic Pacific gyres and Transition Zone (TZ) are poorly understood relative to coastal areas. Yet it is known that these gyres and TZ areas are extremely productive as evidenced by their abundance of fish, birds and mammals. Up to now, there has been little effort directed at understanding the relationships between these open ocean areas and coastal ecosystems. This workshop brought together physical, biological and fisheries oceanographers, as well as marine bird and mammal researchers to begin to remedy this.

The workshop consisted of 15 oral presentations prepared by "teams" of invited investigators, and 5 posters. Presenters reviewed existing data, and developed hypotheses for mechanisms that link open ocean and coastal systems. Presentations examined the physical oceanography of the western (Watanabe, Shin *et al*., Gayko) and eastern (Ladd *et al*..) areas, primary (Tadokoro and Kobari, Whitney *et al.*) and secondary (Naydenko, Mackas and Coyle) productivity in both areas; mesopelagics (Yamamura *et al.*, King *et al.*); migratory pelagics (Yatsu and Kaeriyama, Beamish *et al.*, Belyaev); marine birds (Hunt *et al.*) and marine mammals (Ohki *et al.*, Ream *et al.*) or a combination of a number of disciplines (Sugimoto *et al.*, Aydin *et al.*, Bosley *et al.*, Kaneda *et al.*).

These presenters showed many instances of complex ecosystem linkages between the coastal and open ocean, but identified gaps in our knowledge which must be addressed in order to improve our understandings of these relationships. For example, the role of the gyres in controlling (maintaining, enhancing) productivity in the North Pacific, as well as how the systems may respond to climate forcing.

Some key issues raised during the sessions:

- A number of possible physical oceanographic mechanisms of variability was presented, which are most important in terms of linkages. What is the influence of large-scale forcing on local dynamics (fronts and currents)? What is the importance of the transfer of water masses (eddies), fresh water forcing and upwelling and downwelling?
- What are the key species at each trophic level? Do we have the minimum data, basic

biological parameters, fisheries statistics? What are the biological mechanisms for the transfer of energy, and which are most important? For example, is it the migration of forage fishes between areas (myctophids, saury, sardine, *etc.*) or is it through predation-related mechanisms (tunas, mammals, birds, *etc.*)?

- Are some areas more closely linked than others? For example, Gulf of Alaska, Oyashio/Kuroshio, Western Subarctic Gyre?
- In general, are physical linkages or biological linkages more critical, or combinations of a number of ecosystem levels?
- How do these linkages between systems change in relation to climate changes?

Selected papers from the workshop will be published in a special issue of *Deep-Sea Research II*.

List of papers

Oral presentations:

Tomowo Watanabe (Invited)
Structure and variability of the upper layer of the Western Subarctic Gyre

Hyo Choi
Wind-induced variability of sea surface temperature patterns in the eastern coast and open sea of Korea

Carol Ladd, Phyllis Stabeno, Nicholas Bond, Al Hermann, Nancy Kachel and Calvin Mordy (Invited**)**
Cross-shelf exchange in the Gulf of Alaska

Kazuaki Tadokoro and Toru Kobari (Invited**)**
Comparison of seasonal variations in Chlorophyll-a concentrations and oceanographic conditions between Oyashio and Ocean Weather Station P

Frank A. Whitney, P.J. Harrison and W.R. Crawford (Invited**)**
Enhancement of primary productivity in the Gulf of Alaska by transport between coastal and oceanic regions

Svetlana V. Naydenko (Invited**)**
Structure of zooplankton communities in the Russian Far Eastern region (Okhotsk and Bering Seas, and Pacific waters south off Kuril Islands)

David L. Mackas and Kenneth O. Coyle (Invited**)**
Cross-shore exchange processes, and their effect on zooplankton biomass and community composition patterns in the Northeast Pacific

Orio Yamamura, Kazuhisa Uchikawa, Masatoshi Moku and Hiroya Sugisaki (Invited**)**
Myctophids in the neritic and offshore areas of the subarctic North Pacific

Jacquelynne R. King, Richard J. Beamish and Gordon A. McFarlane (Invited**)**
How do myctophids get from the Eastern Subarctic Gyre to the coastal ecosystems of the Northeast Pacific?

Akihiko Yatsu and Masahide Kaeriyama (Invited**)**
Linkages between coastal and open ocean habitats of chum salmon and small pelagic fishes in the Northwestern and Central Pacific

Richard J. Beamish, Gordon A. McFarlane and Jacquelynne R. King (Invited**)**
Linkages between open and coastal ecosystems on the Pacific coast of North America

Takashige Sugimoto, Jun-Ichi Takeuchi and Takafumi Yoshida (Invited**)**
Processes of water exchange between coastal and open oceans, and their effects on plankton community and fish recruitment

Vladimir A. Belyaev (Invited**)**
Pelagic fishes of the Northwest Pacific and relationship between coastal and open ocean ecosystems

George L. Hunt, Jr., John Piatt and Leandra de Sousa (Invited**)**
The use and transfer of energy by marine birds in the Gulf of Alaska

Sachi Ohki, S.I. Saitoh, H. Kiwada and K. Matsuoka (Invited)
Variability of coastal and open ocean habitats of Sei whales in the western North Pacific using multi-sensor remote sensing

Rolf Ream, Jeremy Sterling and Tom Loughlin (Invited)
Oceanographic influences on Northern Fur Seal migratory movements

Posters:

Kerim Y. Aydin, Gordon A. McFarlane, Jacquelynne R. King, Bernard A. Megrey, and Sarah K. Gaichas
Linking subarctic shelf and oceanic food webs through fluctuations in Pacific salmon production

Keith L. Bosley, J. William Lavelle, Richard D. Brodeur, W. Waldo Wakefield, Robert L. Emmett, Edward T. Baker, and Kara M. Rehmke
Biological and physical processes in and around Astoria Submarine Canyon, Oregon, USA

Larissa A. Gayko
Cyclicity of long-term fluctuation of hydrometeorological parameters in the northwestern part of the Sea of Japan

Atsushi Kaneda, Taisuke Inai and Hidetaka Takeoka
Influence of the cross-shelf flows on the catches of the pelagic fishes in the Bungo Channel, Japan

Kyung-Hoon Shin, Tomoyuki Tanaka, Noriyuki Tanaka and Akihiko Murata
Linkage betw**e**en coastal and shelf system in the western Arctic Ocean

Workshop W6
Status of the Yellow Sea and East China Sea ecosystems

Co-Convenors: Sinjae Yoo and Hyung-Tack Huh (Korea); R. Ian Perry and Stewart M. McKinnell (PICES)

Background

The Yellow Sea and East China Sea (YS-ECS) are epi-continental seas bounded by the Korean Peninsula, mainland China, Taiwan, and some Japanese islands (Ryukyu and Kyushu). Presumably, the YS-ECS ecosystems, with a dense population living along the coasts, are amongst the ecosystems in the Pacific, that are under the strongest influence of various human activities such as fishing, mariculture, waste discharge, dumping, and habitat destruction. There has also been strong evidence showing a gradual increase in water temperature in the past decades. Given the variety of forcing factors, complicated changes in the ecosystem are anticipated. Indeed, rapid changes and large fluctuations in species composition and abundance in the major fisheries have occurred. In this respect, it was timely that the YS-ECS ecosystem status was evaluated as a part of the PICES and Census of Marine Life (CoML) efforts of status assessment of the North Pacific Ecosystems. A workshop for this purpose was scheduled in April 2003 to gather scientists who have been working in this region, and to discuss and summarize what they learned about the YS-ECS ecosystems during the past. Many scientists expressed interests in participating the workshop. However, the workshop was postponed twice due to the outbreak of SARS in the spring of 2003. The workshop was finally held October 9, 2003, immediately prior to PICES XII. A draft chapter on the status of YS-ECS ecosystems for the PICES North Pacific Ecosystem Status Report was written before the workshop based on the contributions by Drs. Hiroshi Ichikawa, Xian-Shi Jin, Young-Shil Kang, Suam Kim, Jai-Ho Oh, Sinjae Yoo, and Chang-Ik Zhang, instead of writing the draft after the workshop as was originally planned. The workshop was focused on the discussion of the draft.

Summary of presentations

About twenty scientists from all PICES member countries participated in the workshop. Dr. Ian Perry gave a general introduction to the NPESR project. The objectives, structure and target audience of the report were briefly explained.

Dr. Sinjae Yoo presented the outline of the draft for the YS-ECS chapter. First, geography, topography, circulation, flora and fauna of the region were described as background information. Next, potential critical factors causing change in the YS-ECS ecosystems were identified: environmental contamination, eutrophication, habitat destruction, over-exploitation, and changes in the circulation. In addition to climate-related changes in the circulation, the building of the Three-Gorges Dam in the upper reaches of the Changjiang River could bring changes to the ecosystem. Possible adverse effects were pointed out, such as a decrease in the primary productivity in the vicinity and reduced flushing in the YS. Then, details were described for physics, climate and chemistry of the region. There has been an

increase of 1.8ºC in the water temperature in February in the seas around Korea during the past one hundred years. The rate of change became greater during the past decade. The nutrient loads into the sea have more than doubled during the last two decades. Data of heavy metals, PCBs, PAHs, and other persistent organic pollutants were shown. Phytoplankton species composition and primary productivity of the region were discussed next. There seem to be still uncertainties in the primary production estimates for both the YS and ECS. It seems interesting that the biomass of both phytoplankton and zooplankton increased in the YS since the late 1980's. Another sign of ecosystem change is the abrupt increase in HAB incidences in Chinese and Korean waters, causing huge economic damages. Concurrently with the changes in the physics, chemistry and lower trophic level, there have been dramatic changes in the higher trophic level in the YS and ECS as evidenced by fisheries data in the past three decades. Such changes can be summarized as follows. First, declines in biomass and catch of demersal species have occurred, and as a result, in catch proportions, pelagics have increased, while demersals have decreased. Second, the catch of pelagics species showed large fluctuations. Third, the average trophic level of fishery catches has gradually decreased, more rapidly in the YS than in the ECS. Following fisheries data, a brief description was made on the endangered species in the YS.

After the presentation of the draft outline, talks were given for each area ranging from climate and physics to fisheries. Dr. Jai-Ho Oh reported on long-term changes in the air temperature in Korean cities. He showed that there has been an increase of 0.11~0.23°C/decade since the 1910's in eight cities. The number of summer days increased by 22, while the number of winter days decreased by 27 days, showing a clear trend of warming. He also presented projections of future acceleration in the temperature rise using the regional climate MM5 model.

The next two presentations were on physical oceanography of the region by Drs. Heung-Jae Lie and Hiroshi Ichikawa. Dr. Lie discussed the origins of the Jeju Warm Current and Tsushima Warm Current, and seasonality of the coastal currents. Using drifter data, he showed that the Tsushima Current branches from Kuroshio along the shelf edge of the ECS. In the YS, strong cyclonic circulation develops along the coasts in summer, while in winter southward currents develop along both Chinese and Korean coasts. Dr. Ichikawa summarized the general characteristics and forcing of the regional currents. His talk focused on the inter-annual variation in the Changjiang River discharge and its influence on the oceanographic properties in the vicinity. Classification analysis of water masses in the ECS using T, S, nutrients and chlorophyll-*a* was also presented.

After presentations on physics and climate in the morning session, talks on chemistry and biology followed in the afternoon. Dr. Jae-Ryoung Oh showed results of the pollution surveys in the YS in 2000. Heavy metals and organochlorine compounds, including pesticides, PCBs and PAHs, were analyzed from samples of sediments, tissues and liver of fish. Except for a few hotspots, in most of the samples, the level of these pollutants was below the known safe values. However, there are no criteria for safety for some chemical species, and continued monitoring is necessary.

Dr. Xian-Shi Jin presented Chinese records of dominant species of phytoplankton, zooplankton, and major fisheries species in the YS, ECS and Bohai Sea. The trend of major fisheries species composition paralleled what was observed in the Korean waters, *e.g.*, pelagics increased while demersal decreased. As an example of large fluctuations in the pelagics, he described the case of Japanese anchovy (*Engraulis japonicus*) which collapsed in the early 2000's. In contrast to the Korean records that showed a doubling trend in the zooplankton biomass in the YS since the late 1980's, the zooplankton biomass in the Chinese side decreased during the same period.

Dr. Ming-Yuan Zhu presented the recent trend in HAB outbreaks in the ECS. The most frequent time of the outbreaks was from May to June. There was a dramatic increase in the reported HAB outbreaks since 2001, partly due

to intensified monitoring activities. He also reported on oceanographic conditions of the outbreaks in 2002. In 2002, 79 events were reported, 55 of which occurred in the ECS and 4 occurred in the YS. It was suggested that changes in the N/P ratio might be important in the HAB outbreaks.

Investigation, using satellite data, on whether there have been real changes in the YS ecosystem over the past two decades was the topic of the next presentation by Seung-Hyun Son. He compared data of two ocean color sensors CZCS (Coastal Zone Color Scanner: 1978~1986) and SeaWiFS (Sea-viewing Wide Field-of-view Sensor: 1997~present). On the average, higher chlorophyll values were seen in SeaWiFS data. Likewise, water-leaving radiance decreased at 443 nm and increased at 555 nm. The *in-situ* data showed less evidence of decadal trends, but there were slight increases in temperature and zooplankton biomass, and slight decreases in salinity and Secchi depth.

Dr. Bernard Megrey gave a brief introduction to the North Pacific Ecosystem Metadatabase promoted by NOAA. He demonstrated the metadatabase web page and asked the audience for future participation.

The following discussion focused on how to improve the draft of the YS-ECS chapter. The main question was "What is missing and whether such information is available?". A number of items were listed, including alien species, parasites, disease, and bacterioplankton. Data might be available for these items but are too scanty to be representative values. There are some items such as benthos with good data coverage, and certainly should be incorporated in the draft. Also, the distribution and productivity of commercial invertebrates, and the impact of aquaculture on natural communities would be valuable information for assessing the ecosystem status. Fish catch data in China as well as in Korea in the draft need to be updated, as some pelagic fishes show high frequency fluctuation. In addition to the missing data, discrepancies were found between datasets. For example, the zooplankton biomass in Korean waters in the YS increased since the late 1980's, while that in Chinese waters decreased in the same period. Sampling details should be compared to interpret such discrepancy. This illustrates the need for comparable sampling methods and gear in the future. There were different views about the impact of the Three-Gorges Dam on the YS-ECS ecosystems: some think the impact would be substantial, while others believe not. But most participants agreed on the need to monitor the future change. Then there was a suggestion that a PICES Working Group might be needed for this interesting semi-natural macrocosm experiment. The YS and ECS are the ecosystems where you can find complicated action of multiple forcing factors. Will we ever be able to understand what factors contribute, and how much, to the ecosystem change we observe?

List of papers

Oral presentations:

Sinjae Yoo and Suam Kim
North Pacific Ecosystem Status Report: Yellow Sea and East China Sea

Jai-Ho Oh
Climate Changes in Northeast Asia

Heung-Jae Lie, Cheol-Ho Cho and Suk Lee
An overview of shelf circulation of the Yellow and East China Seas

Hiroshi Ichikawa
Recent developments in the study of the current system in the Yellow and East China Seas

Xian-Shi Jin
Brief review of variability and status of the Yellow and East China Sea Ecosystem

Ming-Yuan Zhu
Occurrence of HAB in China in 2002

Bernard Megrey
North Pacific Ecosystem Metadatabase: A collaborative research tool for fisheries oceanography and ecosystem investigations

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ACCEO	Alliance for California Current Ecosystem Observations
ACIA	Arctic Climate Impact Assessment Program (ACIAP of AMAP)
AFSC	Alaska Fisheries Science Center
AFS-CAR	American Fisheries Society Program on Climate and Aquatic Resources
AGU	American Geophysical Union
AMAP	Arctic Monitoring and Assessment Program
AOOS	Alaska Ocean Observing System
APEC	Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fisheries Commission
APN	Asia Pacific Network
Argo	International Program for deployment of profiling floats
ASLO	American Society of Limnology and Oceanography
BASIS	Bering-Aleutian Salmon International Survey, NPAFC
BASS	Basin Studies Task Team, PICES
BIO	Biological Oceanography Committee, PICES
CAOS	Coastal Alaskan Observing System
CCCC	Climate Change and Carrying Capacity Program, PICES
CDIAC	Carbon Dioxide Information and Analysis Center
CEOHAB	Chinese National Harmful Algal Bloom Program
CFAME	Climate Forcing and Marine Ecosystem Task Team, PICES
CKJORC	China-Korea Joint Ocean Research Center
CLIVAR	Climate Variability and Predictability Program
CoML	Census of Marine Life Program
CPR-AP	Advisory Panel on the Continuous Plankton Recorder Survey in the North Pacific, PICES
CREAMS	Circulation Research of the East Asian Marginal Seas Program
DBCP	Data Buoy Cooperation Panel
EASEC	East Asian Eel Committee
EBM	Ecosystem-Based Management
EC/IP	Executive Committee / Implementation Panel for CCCC
ECOHAB	Ecology and Oceanography of Harmful Algal Blooms Program
ECOR	Engineering Committee on Oceanic Resources
ENSO	El Niño-Southern Oscillation
EVOS	Exxon Valdez Oilspill Trustee Council
FAO	Food and Agriculture Organization
FIS	Fishery Science Committee, PICES
GCM	General Circulation Model
GCOS	Global Climate Observing System
GCP	Global Carbon Project
GEM	Gulf of Alaska Ecosystem Monitoring and Research Program
GEOHAB	Global Ecology and Oceanography of Harmful Algal Blooms
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GIPME	Global Investigation of Pollution in the Marine Environment
GLOBEC	Global Ocean Ecosystem Dynamics Programme
GLODAP	Global Ocean Data Analysis Project

GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
GTC	Global Telecommunication System
HAB	Harmful Algal Blooms
HAE-DAT	ICES-IOC Harmful Algal Event Data Base
HTL	Higher Trophic Level
IASC	International Arctic Science Committee
IAST	International Argo Science Team
IATTC	Inter-American Tropical Tuna Commission
IBSFC	International Baltic Sea Fishery Commission
ICES	International Council for the Exploration of the Sea
ICSU	International Council of Scientific Unions
IFEP	Advisory Panel on Iron Fertilization Experiment in the Subarctic Pacific, PICES
IGOSS	Integrated Global Ocean Services System
IGPB	International Geosphere Biosphere Programme
IHDP	International Human Dimensions Programme on Global Environmental Change
IMECOCAL	Investigaciones Mexicanas de la Corriente de California, Mexico
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission
IOCCP	International Ocean Carbon Coordinated Project
IODE	International Oceanographic Data Information Exchange (IOC)
IOS	Institute of Ocean Sciences
IPCC	International Panel on Climate Change
IPHC	International Pacific Halibut Commission
IPO	International Programme Office
IPRC	International Pacific Research Center
IWC	International Whaling Commission
JAMSTEC	Japan Marine Science & Technology Center
JGOFS	Joint Global Ocean Flux Study
JMA	Japan Meteorological Agency
JODC	Japanese Oceanographic Data Center
KODC	Korean Ocean Data Center
KORDI	Korea Ocean Research and Development Institute
LTL	Lower Trophic Level
MBM-AP	Advisory Panel on Marine Birds and Mammals, PICES
MEDS	Marine Environmental Data Service
MEQ	Marine Environmental Committee, PICES
MIE-AP	Advisory Panel on Micronekton Inter-calibration Experiment, PICES
MIRC	Marine Information Research Center
MODEL	Conceptual / Theoretical and Modeling Studies Task Team, PICES
MONITOR	Monitor Task Team, PICES
MRC	Marine Resources Conservation
MSC	Meteorological Service of Canada
NAFO	North Atlantic Fisheries Organization
NAO	North Atlantic Oscillation
NASCO	North Atlantic Salmon Conservation Organization
NASA	National Aeronautics and Space Administration, U.S.A.
NDBC	National Data Buoy Center, U.S.A.
NDC	National Data Centre

NEAR-GOOS	North East Asian Regional GOOS
NEMURO	North Pacific Ecosystem Model for Understanding Regional Oceanography
NEXT	NEMURO Experimental Planning Team
NIES	National Institute for Environmental Studies, Japan
NMFS	National Marine Fisheries Service, U.S.A.
NOAA	National Oceanographic and Atmospheric Administration, U.S.A.
NODC	National Oceanographic Data Center
NOWPAP	Northwest Pacific Action Plan
NPAFC	North Pacific Anadromous Fish Commission
NPDB-AP	North Pacific Data Buoy Advisory Panel, PICES
NPEM	North Pacific Ecosystem Data Base
NPESR	North Pacific Ecosystem Status Report
NPRB	North Pacific Research Board
NSF	National Science Foundation, U.S.A.
NWFSC	Northwest Fisheries Science Center
OACES	Ocean Atmosphere Carbon Dioxide Exchange Study
OCEANS	Ocean Biogeochemistry and Ecosystems Analysis Program
ONR	Office of Naval Research, U.S.A.
PaCOS	Pacific Coast Observing System
PICES	North Pacific Marine Science Organization
PICNIC	PICES Carbon Dioxide Related Data Integration for the North Pacific
PNW-IOOS	Pacific Northwest Integrated Ocean Observing System
POC	Physical Oceanography and Climate Committee, PICES
POGO	Partnership for Observation of the Global Ocean
PSC	Pacific Salmon Commission
PSG	Pacific Seabird Group
PSP	Paralytic Shellfish Poisoning
REX (TT)	Regional Experiments (Task Team), PICES
SAHFOS	Sir Alister Hardy Foundation for Ocean Science
SB	Science Board, PICES
SCOPE	Scientific Committee on Problems of the Environment
SCOR	Scientific Committee on Oceanic Research
SEEDS	Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study
SERIES	Subarctic Ecosystem Response to Iron Enrichment Study
SGCP	Studu Group on Capacity Building, PICES
SOLAS	Surface Ocean Low Atmosphere Study
SPACC	Small Pelagic Fishes and Climate Change Program of GLOBEC
SPC	South Pacific Commission
SPREP	South Pacific Regional Environmental Program
START	South Asian Regional Committee for the System for Analysis, Research and Training
TCODE	Technical Committee on Data Exchange, PICES
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WCRP	World Climate Research Program
WESTPAC	IOC Sub-Commission for the Western Pacific
WG	Working Group
WGZE	Working Group on Zooplankton Ecology, ICES
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment