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REPORT OF OPENING SESSION

The Opening Session was called to order on October 21, 2002, at 8:30 a.m. The Chairman, Dr. Hyung-Tack Huh, welcomed delegates, observers and researchers to the PICES Eleventh Annual Meeting.

Welcome address on behalf of the hosting city

Dr. Huh introduced the Assistant to the Mayor of Qingdao, Mr. Bao-Zhan Xu, who greeted participants on behalf of the host city (*OP Appendix 1*).

Welcome address on behalf of the Government of the People's Republic of China

Dr. Huh asked Prof. Qi-Sheng Tang, Academician of the Chinese Academy of Engineering and Director of the Yellow Sea Fisheries Research Institute, to welcome participants on behalf of the host country (*OP Appendix 2*).

Remarks by representatives of Contracting Parties and the Chairman of PICES

Dr. Huh called upon Dr. Laura Richards 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 Appendix 3*.

Dr. Huh invited Dr. Tokimasa Kobayashi to speak on behalf of the Japanese Government. Dr. Kobayashi addressed the session and his remarks are appended to the report in *OP Appendix 4*.

Dr. Huh then asked Dr. Yeong Chull Park to speak on behalf of the Korean Government. Dr. Park addressed the session and his remarks are appended to the report in *OP Appendix 5*.

Dr. Huh called upon Dr. Lev N. Bocharov to speak on behalf of the Russian Government. Dr. Bocharov addressed the session and his remarks are appended to the report in *OP Appendix 6*.

Dr. Huh invited Dr. Vera Alexander to make a statement on behalf of the U.S. Government. Dr. Alexander addressed the session and her remarks are appended to the report in *OP Appendix 7*.

Dr. Huh called upon Mr. Hai-Qing Li to make a statement on behalf of the Chinese Government. Mr. Li addressed the session and his remarks are appended to the report in *OP Appendix 8*.

Dr. Huh thanked Mr. Bao-Zhan Xu, Prof. Qi-Sheng Tang, and all the delegates for their remarks and spoke on behalf of PICES. The text of his address is appended to the report in *OP Appendix 9*.

Wooster Award presentation ceremony

Dr. Huh 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 scientific 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.

Dr. Perry quoted the following citation from Science Board for the 2002 Wooster Award:

Two nominations were received for the 2002 PICES Wooster Award. The unanimous choice by the Science Board is Dr. Yutaka Nagata of Japan.

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.*

Dr. Nagata exemplifies all of these criteria. He has demonstrated sustained excellence in science, teaching and administration of marine science in the North Pacific region. After retiring from being a Professor at two Japanese Universities, he established for himself a "second career" as a manager of oceanographic data, products, and their quality control (he is the first Director of the Marine Information Research Center in Japan). He has over 70 publications in English, with further publications in Japanese, including 10 books. He has served a leadership role in oceanography in Japan, and on several international oceanographic committees in addition to those of PICES. Dr. Nagata has a broad inter-disciplinary range, with publications from core physical oceanography to lobster biology. He has been a central figure in the successful establishment of PICES, including serving as the first Chairman of the Physical Oceanography and Climate Committee, Co-Chairman of the Climate Change and Carrying Capacity Program, and member of Working Group 1 on Okhotsk Sea, along with an important role in the formation of the Technical Committee on Data Exchange. Science Board is very pleased to name him as the recipient of the PICES Wooster Award for 2002.

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

In PICES, we have emphasized international and interdisciplinary approaches to marine science, and as the Science Board citation makes clear, all of these have characterized Professor Nagata's professional life. There is another, interpersonal, dimension that is vital for the success of any collaborative effort, and the friendships that have developed within the PICES family have accounted for much of its effectiveness.

The day will come when winners of this award will not have been personal friends of mine, but I am happy that this is not the case with this year's winner. My friendship with Yutaka Nagata goes back to our first encounter, in the late 1960's when he came to La Jolla for a stay at Scripps. As described in Bruce Taft's encomium in PICES Press*, it was then and is now, Yutaka's warm personality, sense of humor, and frankness that make friendship with him so rewarding. Even though absent from this occasion, I send from afar my sincerest congratulations to Nagata-san whom we all recognize as one of the jewels in the PICES crown.*

Dr. Huh presented a commemorative plaque to Dr. Nagata. A permanent plaque identifying Wooster Award winners resides at the PICES Secretariat in Sidney, British Columbia, Canada.

PICES scientific accomplishments in 2001

Dr. Perry reviewed PICES' scientific accomplishments in 2001 (*OP Appendix 10*).

Keynote lecture

The Science Board Chairman introduced the keynote speaker, Prof. Dun-Xin Hu (Institute of Oceanology, Chinese Academy of Sciences). Prof. Hu gave a keynote lecture titled "The ocean's role in global change: Global oceanography has come". The abstract of his presentation is appended to the report in *OP Appendix 11*.

The Opening Session closed at 10:30 a.m.

OP Appendix 1

Welcome address on behalf of the Qingdao Municipal Government by Mr. Bao-Zhan Xu

Mr. Chairman, distinguished participants, ladies and gentlemen:

On behalf of the Qingdao Municipal Government, I would like to forward my sincere congratulations to the PICES Eleventh Annual Meeting, and my warm welcome to all the scientists attending this Meeting.

Qingdao is a famous seaside city. It has solid research strength in marine science and technology. Several national level oceanography research institutes and universities are situated in this city, which have attracted more that half of all the marine science researchers in China, including 16 academicians who major in this field. Marine science and technology has, as a result, become one of the key industries in Qingdao.

Opening widely to the outside world, Qingdao is quickening its pace towards the future as an international cosmopolitan. As the host of various significant international conferences, and the aquatic sports events of the 2008 Olympic Games, Qingdao has many attractions.

We will follow the progress of the PICES Eleventh Annual Meeting with great interest. Hosting this meeting is a further indication that Qingdao has become a center for research and education in marine sciences, and it will also enhance Qingdao's internationalization.

I hope this meeting will be a great success and that you will have an enjoyable stay in our beautiful city.

Thank you!

OP Appendix 2

Welcome address on behalf of the Government of the People's Republic of China by Prof. Qi-Sheng Tang

Mr. Chairman, distinguished delegates, ladies and gentlemen:

On behalf of the Chinese Government, it is my pleasure to welcome you to the Eleventh Annual Meeting of the North Pacific Marine Science Organization (PICES). Personally, I would also like to express my warm greetings to the participants from all over the North Pacific region, who have come to our country and the city of Qingdao.

The 21st century is the century of the ocean. The fast growth of the world population has put higher and higher demands on the ocean for food and energy. We need novel technologies and scientific methods for the development and management of the marine environment. We also need to further our understanding into the Ocean. Last month, at the World Summit on Sustainable Development held in South Africa, the Johannesburg Declaration on Sustainable Development and the Plan of Implementation were publicized. The plan for the development of the global society in the oncoming decades has been set by these two important documents. Chinese Premier Zhu Rongji made an announcement on behalf of the Chinese Government during this meeting, declaring that China is determined to go along the way of sustainable development. At the same time, the Chinese Government has also proclaimed its Compendium on Sustainable Development of Science and Technology. Three of the twelve major established fields are related to the ocean, including ocean monitoring and resource development, control of environmental pollution and integrated ecological management, and the problems of global environment. What will be the aim for PICES' future development as a regional scientific organization, under this situation? Personally, I think that the development of marine sustainable science needs the contribution of us all. The objectives of sustainability cannot be achieved nationally, or even regionally; sustainability is an issue of

the entire world. I hope that PICES' activities will be pushed toward a global perspective in the future.

Ever since its creation, PICES has been an active player on the global platform of marine science research. It has become the crux of information exchange, the network of excellence and the nurturing bed for cooperation. You are a remarkable group of scientists! Your experiments and joint programs have significantly enlarged our knowledge of the Pacific Ocean as well as the global environment. I believe that PICES will do better and better.

This is the second time that Qingdao has hosted the PICES Annual Meeting, and it is a further indication that this city is one of the major marine science centers around the North Pacific. I believe the Chinese Government will give its full support to this center, so that it will play a more vibrant part in PICES' joint programs.

Finally, I would like to wish the meeting great success in its discussions, and all the participants an enjoyable stay in Qingdao city and China.

Thank you for your attention!

OP Appendix 3

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

Mr. Chairman, distinguished guests and colleagues:

On behalf of Canada and the Canadian delegation, I would like to thank the People's Republic of China and the Yellow Sea Fisheries Research Institute for inviting us here to Qingdao, a city with such a strong connection to marine science.

In July 2002, Canada released an "Ocean Strategy" that announces Canada's intent to improve our scientific knowledge base for estuarine, coastal and marine ecosystems. The strategy acknowledges the need for better understanding of ecosystem dynamics including climate, variability and the impact of change on living marine resources, as well as a new orientation towards operational oceanography. The strategy also promotes the development of a "State of the Oceans Reporting system". These goals fit well with the purpose and current activities of PICES.

In September, I had the honour of attending the 30th anniversary celebration of the Japan Marine Science and Technology Center (JAMSTEC), together with other Directors of oceanographic institutes. There, we signed the "Yokosuka Statement", where we committed to work together on issues such as establishing global observation networks and developing technologies for more effective observations and better predictions.

PICES has already anticipated these scientific and policy developments, as demonstrated by this year's theme of "Technological advancements in marine scientific research".

Last year at PICES' Tenth Anniversary, we took the opportunity to look back and reflect on our achievements over the past ten years. We also committed to a review of PICES that should help us prepare for an organization well placed for the future. I look forward to these discussions over the next week.

International collaboration is essential for addressing global problems like climate change and the sustainability of marine resources. Canada is pleased with the success of various international projects that will be reported at this meeting, including SOLAS, CLIVAR and GLOBEC. These types of interactions will ensure that all components of the North Pacific ecosystem become integrated into our knowledge base to improve understanding of the changes in the North Pacific.

Let's build on our successes to ensure a vibrant PICES organization!

OP Appendix 4

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

Distinguished delegates, ladies and gentlemen, on behalf of Japanese participants, I am honored to have the opportunity to make these remarks.

First of all, I would like to express my sincere thanks to the delegates of the People's Republic of China, the Government of People's Republic of China, the Qingdao Municipal Government and the Yellow Sea Fisheries Research Institute for their arrangements for the Eleventh Annual Meeting in this beautiful city of Qingdao.

The Fourth PICES Annual Meeting was held here in Qingdao, in 1995. Since that time PICES has established a structure and steadily expanded its activities. With the contribution of not only the Contracting Parties, but also the Chairman and the Secretariat, PICES has entered into the second developmental stage and has been fostering collaboration with international scientific organizations such as ICES, IOC, SCOR, GLOBEC, GOOS, etc., and of course including NPAFC. Japanese scientists are very proud of being a part of this major effort from the beginning.

Well, it is said that the conservation of the environment will be a big issue in the 21st century, due to the anxiety about global environmental degradation, such as global warming and the loss of biodiversity. On the other hand, in accordance with the increase of population, the establishment of a stable supply of food is becoming one of the serious subjects. Therefore the role of fisheries production is getting bigger and bigger, and more suitable and sustainable utilization of fisheries resources is required. PICES is expected to lead the scientific investigation on the preservation and sustainable utilization of marine resources based on the ecosystem in the North Pacific more than before. Japan expects that PICES will examine and adopt a long-term plan to advance the scientific knowledge and shape up the strategies of research and investigation. And PICES set up the Review Committee at the last Anniversary Annual Meeting, which has begun to examine the role and structure of the Organization. We hope this review will bring prosperous development and efficient activities to PICES. Of course, there is no doubt that Japan will continue her positive support towards PICES to contribute in its activities in the second era as always.

By the way, I have to tell you an unfortunate story. Sad to say, Dr. Takashi Sasaki, who gave remarks on this stage seven years ago as a Japanese delegate, passed away in March. He contributed as one of the organizers of PICES in Japan from the beginning of its establishment. He always said that fisheries management based on the ecosystem is important and indispensable, which is also the approach of PICES. We would like to express our sympathy.

Finally, I am sure the Eleventh Annual Meeting will become a great success.

Thank you for your attention.

OP Appendix 5

Remarks at the Opening Session by Dr. Yeong Chull Park (Republic of Korea)

Mr. Chairman, distinguished delegates, local organizing committee members, ladies and gentlemen:

It is a great pleasure for me to attend the PICES Eleventh Annual Meeting and to meet fellow scientists and national delegations from member countries here in Qingdao. On behalf of the Korean delegation and scientists, I would like to express my heartfelt appreciation to the PICES Secretariat and the Government of the People's Republic of China for organizing this excellent Annual Meeting, and also extend my thanks to the PICES Chairman, Dr. Hyung-Tack Huh, for giving me a chance to speak.

Since PICES I in Victoria, Canada, in 1992, PICES has made steady progress in the sharing and exchange of information and knowledge among scientists on marine and fisheries science of the North Pacific region. I would like to comment on the progress that has been made through PICES symposia, workshops and joint conferences to ensure the sustainable use of renewable resources of the North Pacific.

Bearing in mind our PICES spirits, Korean scientists have studied long-term variation in the marine ecosystem and conservation strategies for fisheries resources, through hard activities in oceanographic observation and living marine resources research. In addition, the Korean GLOBEC program has been adopted as a model for our study of climate change and carrying capacity in the Northwest Pacific.

Korean scientists are highly supportive of cooperative studies with the view to promoting and coordinating marine and fisheries science in the North Pacific. I hope those studies will be highlighted at PICES XII, to be held in Korea in 2003. I am sure that these activities are promising in the development of PICES for sustaining marine living resources in this century.

The Korean delegation wishes all participants at PICES XI success in their scientific undertaking. And see you all again in Korea next year. Thank you for your attention.

OP Appendix 6

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

Mr. Chairman, distinguished delegates, ladies and gentlemen:

First of all, let me thank you on behalf of the Russian delegation for the opportunity to take part in the Eleventh Annual Meeting, for the chance to visit Qingdao, China's east coast treasure, once again. I would like to specially note the excellent work of the Local Organizing Committee, and appreciate their tremendous efforts to successfully host this meeting.

PICES is now in its second decade. Over the time past, the scope of PICES' activities has multiplied. Extensive and elaborative work is being done now even between the Annual Meetings. The relations and cooperation with other international forums have significantly strengthened. 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 and exploitation of the Oceans, who are here today.

It is a special pleasure for me to see here again many of those who recently visited Vladivostok and attended the NPAFC Tenth Anniversary Meeting. NPAFC is another body, whose activities are being closer and closer coordinated with PICES, and it is the only other marine commission that brings together specialists from Russia and other North Pacific nations. It is very important for PICES to use every possibility to increase the number of PICES member nations.

Exploration and rational exploitation of the oceans is the essential priority for Russia. In September 2002, there was the All-Russian Conference on assessing the results of the first five years of the Federal Program "World Ocean". This Program involves all the Ministries and organizations that are concerned with appropriating the ocean resources. These activities are extensive and long-term-oriented. It was emphasized that many problems, because of their diversity and complicatedness, require stronger international cooperation. PICES is a perfect forum to address them.

We have lots of tasks to accomplish during this Annual Meeting. I believe we shall make every effort for the Meeting to become a new landmark for the development and progress of PICES. Good luck to the Meeting and thank you.

OS Appendix 7

Remarks at the Opening Session by Dr. Vera Alexander (U.S.A.)

Mr. Bao-Zhan Xu, Prof. Qi-Sheng Tang, Mr. Chairman, distinguished delegates, ladies and gentlemen:

I am deeply honored to speak on behalf of the United States delegation. It is indeed a pleasure to be back in the beautiful seaside city of Qingdao. I was here for the PICES Annual Meeting several years ago, and I have noticed many changes, but the warm welcome has remained the same. The United States delegation thanks our hosts for the excellent arrangements and hospitality.

As PICES matures, its programs and activities are growing and expanding, and becoming very ambitious. The word "billowing" comes to mind. For example, the commitment to produce a report on the status of the ecosystem is certainly ambitious, but it follows logically after the Climate Change and Carrying Capacity Program. I think that PICES can be successful in producing this report, and that it will be a very useful product.

I particularly value PICES for the extensive involvement, or rather, control, of the activities by scientists. It is an organization for the international North Pacific scientific community. Each year, the number of participating scientists grows. As Working Groups conclude their tasks, and new ones are appointed, new scientists are brought into the PICES family. Scientific concerns and scientists lead the Organization's agenda. PICES does not dictate or regulate, it forms and provides a forum for synthesis and the development of ideas. This meeting is notable for the number of other organizations that are present. 16 organizations have sent representatives, and yesterday, the Governing Council heard from 5 of them. The next decade of PICES will, I believe, witness increasing collaboration. This, too, is a part of PICES' evolution as the Organization matures.

This year, two organizations have met in conjunction with the PICES Annual Meeting. The GLOBEC International, and the Scientific Steering Committee of the Census of Marine Life. GLOBEC is, of course, the major marine ecosystem program, now in mid-life; its goals mesh with PICES very well. The Census of Marine Life is a visionary international program, very ambitious. It already has ties with PICES in supporting, or rather, adopting, some of PICES' high priority projects. We look forward to continuing these relationships.

Finally, all this would not be possible without the excellent PICES Secretariat. I have never before witnessed such high quality, high quantity of work produced by so few. It is amazing!

Thank you again, to our hosts, the Yellow Seas Fisheries Research Institute and the City of Qingdao, to the Local Organizing Committee, and especially, to the Government of China for inviting PICES to hold its Meeting here.

OP Appendix 8

Remarks at the Opening Session by Mr. Hai-Qing Li (People's Republic of China)

Dr. Huh, Chairman of PICES, distinguished guests, ladies and gentlemen:

I am very pleased today to address the Eleventh Annual Meeting of the North Pacific Marine Science Organization (PICES) in Qingdao, a beautiful coastal city in north China. First of all, please allow me to extend, in my personal capacity as the Chinese Delegate to PICES, as well as on behalf of the Chinese Government, our hearty congratulations to the opening of the meeting, and warmest welcome to all participants.

As everybody knows, the ocean is the cradle of life and an essential component of the global

life-support system. With the depletion of the world's terrestrial resources, the ocean provides a valuable source of food, energy, mineral resources, and perhaps a vast reservoir of fresh water. The coastal areas provides an ideal home for some 60% of the world's population, the fastest locomotive of the world's economy, as well as a valuable asset for sustainable development of the world. In the 21st century, the ocean's strategic importance is increasing in political, economic and social development of the world. In 2001, the United Nations declared that "the 21st century is the century for the Ocean", and the last frontier for human development.

However, to ensure long-term sustainable development, we need to better understand the ocean. There are still various scientific uncertainties of which the ocean is an important component. For instance, the ocean is not only a sink, but also a source of CO_2. The El Niño phenomenon, La Niña, the southern oscillation, etc., all play an important role in global climate change, and yet we have not a grasp of the mechanism of their incidence. This is where marine science comes in to help, and this is where PICES comes in to help.

I first physically got to know PICES in 1999, when PICES had its Eighth Annual Meeting in Vladivostok. As an inter-governmental scientific organization, PICES concentrates its research efforts on the North Pacific. Through more than 10 years' effort, PICES has become a major forum for international cooperation in marine science around the world, by displaying its important role in the promotion and coordination of marine research; advancing scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities; and promoting the collection and rapid exchange of scientific information on these issues. Especially in recent years, PICES has taken the lead in joining forces with other international organizations and programmes such as GLOBEC, ARGO, GOOS, etc., and great achievements have been made. I should like to congratulate PICES for all its remarkable achievements.

As a country with important marine science capabilities, China attaches great importance to marine scientific research and to PICES. Despite various difficulties, China is becoming more and more involved in PICES through encouraging the participation of Chinese scientists in PICES activities. In order to encourage more young Chinese scientists to be involved in PICES activities, drastic changes of Chinese membership in some Standing Committees and *ad hoc* groups have been made. I believe, with their participation, the Chinese scientists will greatly benefit from PICES programmes on the one hand, and will also become an important linkage between China and PICES, as well as between China and the international marine science community on the other.

Today, I am very happy to see this grand gathering of so many marine scientists, which I believe, is a very important occasion for promoting and enhancing cooperation and exchange in marine science in the area of the northern North Pacific. Besides the meeting, scientists from outside China could have interactions with Chinese marine scientists. In this connection, I would like to inform you that Qingdao is not only famous for its beauty as a coastal city, it is the cradle of China's marine sciences, and the most important base for China's marine scientific research. I hope, through the meeting and visits outside the meeting, scientists from outside China could have interactions with the Chinese marine scientists, so that everybody could benefit from each other, and more and more Chinese marine scientists can get to know PICES and participate actively in PICES activities.

Finally, I wish this meeting great success, and everybody a happy stay in Qingdao. Thank you!

OP Appendix 9

Welcome Address by Dr. Hyung-Tack Huh, Chairman of PICES

Mr. Bao-Zhan Xu, Prof. Qi-Sheng Tang, distinguished participants, ladies and gentlemen:

It gives me great pleasure to welcome you all to the opening of the Eleventh Annual Meeting of PICES.

First of all, I would like to begin my remarks by thanking our host, the Government of the People's Republic of China, for hosting this meeting, and the Yellow Sea Fisheries Research Institute and City of Qingdao for their hard work in arranging the meeting. I am particularly grateful to the Qingdao Municipal Government for hosting PICES Annual Meeting for the second time in this beautiful ocean city.

This is the first meeting in the second decade of PICES. At the Tenth Anniversary Meeting held last year in Victoria, Canada, we looked back with satisfaction at what was done by PICES during the first decade of its existence. Now we can look forward with confidence at what should be done in the next 10 years.

I am proud of the fact that in ten years PICES has grown into a major international forum in marine science representing the North Pacific Ocean. I am sure that the second decade will be a period of scientific take-off for PICES to be a strong and leading international marine science organization.

As this meeting is the last Annual Meeting for me as Chairman, it is worth recalling the changes I have seen during the last few years. PICES has made significant advancements in marine science research in the North Pacific by promoting and coordinating regional and international research programs, integrating knowledge across the marine science disciplines, and disseminating research results and data through conferences, workshops, symposia and publications.

Considerable progress has been made in strengthening its interactions with other international organizations and programs, notably IOC, ICES, SCOR, GOOS, CLIVAR, GODAE, IGBP, GLOBEC, ARGO, GEOHAB, etc. It is very encouraging to see a steadily increasing number of attendees at the Annual Meetings of PICES, as these meetings become the choice and attractive forum for the ocean science in the North Pacific. I feel that I was very fortunate in having been the Chairman, witnessed the pioneering activities and growth of PICES during its early stage of development.

The last inter-sessional period has also been a very productive year for the Organization. PICES convened or co-sponsored 17 international meetings, produced 14 publications including special issues of *Journal of Oceanography* and *Progress in Oceanography*, and participated in 13 international programs jointly with other international scientific organizations and programs. A new PICES database has been established, through which information of all contacts, organizational activities and programs will be efficiently produced and managed.

As we move forward from the September 2002 World Summit on Sustainable Development (WSSD) toward the future, "a new imperative is emerging that calls for a radical shift in thinking about how marine ecosystems are to be managed". At the WSSD, the importance of the oceans has been reaffirmed, as the oceans has sustained living resources and their habitats for millennia and represent a vital life support system for humanity in the 21st century. It is known to be the most bountiful and yet the most threatened natural resource of the planet. Therefore, wise management of the oceans based on scientific knowledge is becoming the central issue in the 21st century, "the Century of the Oceans". The collective efforts, wisdom and commitments of all states are required to maintain the sustainability of the oceans.

As we all know, PICES was established ten years ago to promote international cooperative research efforts to solve key scientific problems in the North Pacific, and has been developing to

strengthen such a function. PICES will be a full partner in the continuing quest to examine scientific uncertainties of oceanic processes, in the provision of forecasting marine environments, in the understanding of productivity, ecology and health of the oceans, and in the exploration of its resources.

The Eleventh Annual Meeting of PICES is designed to provide many insightful agendas with topic sessions, symposium and workshops for scientists from the region as well as from other areas of the world. I am confident that PICES XI will be another fruitful occasion for all of us in enriching our knowledge and renewing friendships with colleagues from other countries. I wish that all of you will find everything to your satisfaction and have an enjoyable stay in Qingdao.

Thank you very much for your attention.

OP Appendix 10

PICES "Year-in-Review" 2002 by Dr. Ian Perry, Chairman of Science Board

PICES continued to be a very busy and productive organization throughout 2002. Several important publications were produced, and significant meetings and workshops were held during the past year. Most impressive was publication in the primary scientific literature of two volumes of papers presented during sessions at PICES X, in October 2001. These volumes ("Physics and biology of eddies, meanders and rings in the PICES region", *Journal of Oceanography* 58(5), edited by W. Crawford, A. Bychkov, S. McKinnell, and T. Sugimoto; "Variability of Bering Sea ecosystems", *Progress in Oceanography* 55(1-3), edited by A. Macklin, J. Napp, V. Radchenko, S. Saitoh, P. Stabeno and S. McKinnell) went through submission, review, revision and publication in well under 12 months! Primary papers from two other sessions at PICES X, on "Migration of key ecological species in the North Pacific Ocean" and "Plankton size classes, functional groups and ecosystem dynamics" are expected to be published soon. Four reports were published in the PICES Scientific Report Series, including two from the CCCC Program (PICES Scientific Reports Nos. 20 and 21), one from Working Group 15 on Ecology of harmful algal blooms (PICES Scientific Report No. 23), and the series of invited papers from the Science Board Symposium at PICES X titled: "PICES Science: The first ten years and a look to the future" (PICES Scientific Report No. 22).

In addition to the Eleventh Annual Meeting held in China this year, PICES also co-sponsored 5 symposia: "The causes of marine mortality of salmon in the North Pacific and North Atlantic and in the Baltic" (with NPAFC, NASCO, ICES and IBSFC, March, in Vancouver); "North Pacific transitional areas" (with CIBNOR and CICIMAR, April, in La Paz, Mexico); "Recent progress in studies of physical processes and their impact to the Japan/East Sea ecosystem" (with CREAMS; August, in Seoul); "Synthesis of JGOFS North Pacific process study" (with JGOFS, October, in Sapporo), and "GLOBEC 2nd Open Science Meeting" (with GLOBEC, October, in Qingdao). These all dealt with organizations and scientific aspects of the North Pacific which PICES hopes to encourage and enhance. I wish to draw particular attention to the joint "Transitional areas" symposium, which was highly successful and represented the first formal event held by PICES in Mexico. The year was also busy with meetings and workshops of specific groups within PICES. These included meetings of the various Working Groups and CCCC Task Teams (notably two workshops dealing with lower and upper trophic level models in the North Pacific, and monitoring systems).

PICES has in place two field projects, both of which were very active in 2002. The Continuous Plankton Recorder (CPR) Program conducted surveys from merchant marine vessels along meridional transects in the eastern North Pacific (Alaska to California) and zonal transects from Canada/U.S. to Japan. Results from these and earlier surveys are now *in press*

in the scientific literature, and further publications are being prepared. In addition, this program was awarded further funding from the *Exxon Valdes* Oil Spill Trustee Council in Alaska to continue sampling through 2003. The Iron Fertilization Experiment Panel (IFEP), an Advisory Panel under the CCCC-BASS Task Team, conducted a collaborative (Canada-Japan) iron enrichment experiment in the Northeast Pacific during summer 2002. This experiment was so successful that the resulting phytoplankton bloom was visible from the SeaWiFS satellite, and was observed and puzzled over by remote sensing laboratories in North America.

Two major projects were also begun during 2002. One was the CCCC Integration Workshop, which was held just prior to PICES XI to review the accomplishments of the CCCC program and to consolidate its next steps. The initial results of this workshop are published elsewhere in this Annual Report; the detailed results will be presented in the PICES Scientific Report Series.

The other project was the North Pacific Ecosystem Status Report. This is a major effort to integrate and assess the ecosystems of the North Pacific, identify critical factors causing changes, and to try and forecast the consequences of these changes. Funding support was awarded by the National Marine Fisheries Service and the *Exxon Valdes* Oil Spill Trustee Council. A "draft for discussion" of a sample Ecosystem Status Report was prepared prior to PICES XI, and received considerable comment. A proposal was submitted and funding was subsequently awarded by the Census of Marine Life (through the Alfred P. Sloan Foundation) for a parallel collaborative effort with PICES on "Marine life in the North Pacific: The known, unknown, and unknowable". These will be major initiatives for PICES during 2003.

As with every growing organization, PICES faces several challenges. Since PICES is now 10 years old, both the Science Board and the Governing Council conducted reviews of what has worked well for PICES over the past 10 years, and what the weaknesses were. In addition, the Science Board examined issues that appear to be emerging as important topics in global science and that are likely to be significant drivers of research activities over the next five to ten years. The Science Board review contributed to the Governing Council Review Committee Report, which is published elsewhere in this Annual Report. Two significant conclusions of this latter report were a need for a stronger sense of direction for the Scientific Committees of PICES, and therefore for PICES as a whole, and following this, the need for stronger interaction among the Scientific Committees and the CCCC Program. Significant emerging scientific issues included biodiversity, ocean observing systems, ocean-climate interactions, and understanding the combined impacts of climate and direct human forcing on marine systems. A central theme was proposed that may help to integrate these new and existing scientific issues, and help to provide a stronger sense of direction for PICES: What are the problems in the North Pacific in the next 5-10 years, and how can PICES position itself to understand and be prepared to offer advice on these problems? The approval at PICES XI of an inter-sessional Science Board meeting will provide an opportunity to discuss these issues in much more detail, and to continue the high level of action that PICES has demonstrated in the past few years.

OP Appendix 11

The Ocean's role in global change: Global oceanography has come
Abstract of the keynote lecture by Prof. Dun-Xin Hu (People's Republic of China)

The ocean occupies 71% of the earth surface, so it plays a very important role in many aspects of global change.

The ocean is not only the main source, but also the purifier of global fresh water. The ocean receives human-polluted water from land, and

provides the atmosphere with purified fresh water through evaporation, making the global water cycle complete. What would happen to the global water cycle with a continuous decrease of riverine water discharge by dam construction, irrigation and so forth?

The ocean is not only a component, but also the main regulator of the global climate system. Because of its huge heat capacity, thermal inertia and circulation characteristics, the importance of the ocean in global climate change has been recognized through TOGA, WOCE and CLIVAR. What should man do to further understand the ocean's role in global climate change, even beyond CLIVAR?

The ocean carbon cycle is an important integral part of the global carbon cycle, which is one of the main issues of global change, associated with global warming. How much have we known about the ocean carbon cycle? What should we do after JGOFS? And can we foresee how the ocean carbon cycle changes with global warming?

The ocean will be the main protein source for humans. With global change, especially anthropogenic impact, can living marine resources be sustainably preserved in the future? What could and how should we do beyond GLOBEC for living marine resources?

In this lecture, a review and a prospective are made on issues of the ocean, such as climate, fresh water, carbon cycle and living resources, *etc*.

In sum, global change is a big challenge and at the same time it provides a good opportunity for oceanography, because it made global oceanography come into being.

REPORT OF GOVERNING COUNCIL MEETING

The Governing Council met from 13:30-17:30 on October 20 and October 25, and from 9:00-12:00 on October 26, under the chairmanship of Dr. Hyung-Tack Huh. Dr. Alexander S. Bychkov served as rapporteur.

All Contracting Parties were represented at the three sessions (*GC Endnote 1*). Mr. Hai-Qing Li attended only the first session. The Chairman of the Science Board, Dr. R. Ian Perry, was in attendance during part of the first session and 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. Qian-Fei Liu represented Mr. Zheng-Ping Tang (China); Dr. Hee-Dong Jeong represented Mr. Young-Suk Kim (Korea); and Dr. Won-Seok Yang represented Mr. Jin Hak Noh (Korea).

Agenda Item 2. Adoption of agenda

The Chairman reviewed the agenda (*GC Endnote 2*) and suggested the order in which to take up the various items. Canada proposed the adoption of the agenda without changes, seconded by the Russian Federation. 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 X (*GC Endnote 3*).

Agenda Item 4. Report of PICES Review Committee

PICES X provided an opportunity to review progress made by PICES from its inception in 1992, and to discuss the future development of the Organization. To ensure that PICES can take on new activities and continue to serve as a major international forum for marine science in the North Pacific, Council decided to perform an internal evaluation of the Organization (Decision 01/A/7).

Inter-sessionally, Council approved the membership for the Review Committee that includes: the Chairman of the Finance and Administration Committee (Richard J. Marasco), the Chairman of the Science Board (R. Ian Perry), most recent outgoing Chairman of the Science Board (Patricia Livingston), Warren S. Wooster (founder and first Chairman of PICES) and one member each from the People's Republic of China (Zhi-Xin Chen), Japan (Tokimasa Kobayashi), Republic of Korea (Young-Suk Kim), and Russian Federation (Lev N. Bocharov). Countries not specifically mentioned (Canada and U.S.A.) are represented by the Science Board Chairman and the F&A Chairman, respectively.

The Review Committee was charged with the following tasks:

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

A draft report was circulated to all Review Committee members in mid-August 2002, and a second draft was sent to Contracting Parties on September 13, 2002. The Review Committee also met twice during PICES XI.

The Chairman of the Review Committee, Dr. Marasco, presented a draft report at the second session on October 25. Council endorsed the Review Committee Report and its recommendations (Decision 02/A/9).

Council noted and supported actions suggested by the Finance and Administration Committee on items that might potentially have budgetary implications. The Executive Secretary was requested to (1) explore the costs of having an external review of current publication practices of the Organization; and (2) jointly with Dr. Laura Richards examine action on the re-naming of positions in the Secretariat to ensure that the act is budget-neutral.

Council also agreed with the recommendation from the Science Board to discuss implementation of the various aspects of the Review Committee Report at the interim Science Board/Governing Council meeting in spring 2003.

Agenda Item 5. Membership and observers from other countries

The Secretariat did not receive proposals from non-member countries to accede to the PICES Convention in 2002.

At PICES X, Council noted a steady progress in developing PICES-Mexico relations, and agreed that the next step should be an international scientific symposium organized by PICES and hosted by Mexico (Decision 01/S/1). A 3-day international Symposium on *North Pacific transitional areas* (April 2002, La Paz) was the first scientific meeting convened by PICES in collaboration with Mexican scientists from CIBNOR and CICIMAR, on Mexican soil. This symposium was a great success, with 92 participants from Canada, Japan, Mexico and U.S.A. Selected papers from the symposium will comprise a special issue of *Journal of Oceanography* to be published in 2003.

In June 2002, Drs. Hyung-Tack Huh and Alexander Bychkov met with Ing. Marco Polo Bernal Yarahuan, Subsecretario de Educación e Investigación Tecnológicas and national Mexican representative on the Intergovernmental Oceanographic Commission (IOC), to further explore the interest of Mexican government agencies involved, and the formal procedures to be followed to have Mexico accede to the PICES Convention. It was agreed that the Mexican IOC National Committee could be instrumental in convincing Mexico to join PICES in the near future. Active regional organizations can greatly strengthen the implementation of IOC programs, and thus by joining PICES, Mexico would not only benefit its own scientific programs but also contribute to those of IOC in which Mexico has already played an important part. To follow this development, Ing. Bernal has been invited to participate in PICES XI as an observer from Mexico. Unfortunately he was unable to attend due to other commitments.

The Executive Secretary reported that 24 scientists from all major Mexican marine research institutes presented papers at the last two Annual Meetings: 18 at PICES X (Victoria, Canada) and 6 at PICES XI (Qingdao, China). 11 of them received travel grants from PICES.

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 meeting in La Paz is going slower than expected, and the current status of the "presentation" document is still unknown. This document indicating the importance and relevance of PICES for Mexican scientists, and the suggestion of the accession of Mexico to the Organization, was prepared on behalf of major Mexican marine research institutes and circulated to relevant government agencies.

Canada, Japan and the United States suggested that PICES should continue its effort to encourage Mexico to join the Organization through contacts with the directors of major Mexican marine research institutes and the Mexican national IOC Committee. China recommended sending a formal invitation letter

to the Mexican Ministry of Foreign Affairs. Council instructed the Chairman and Executive Secretary to explore both approaches.

The Republic of Korea advocated that the Twelfth Annual Meeting in Seoul is a perfect 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. China noted that the State Oceanic Administration has relations with some government agencies in the D.P.R. Korea, and offered to provide a list of contacts.

Agenda Item 6. Relations with relevant international organizations

At the Tenth Annual Meeting, Council approved some additions to the Standing List of International Organizations and Programs, and agreed with priorities for interaction in 2002 (Decision 01/S/6(i)). The Science Board Chairman and Executive Secretary reported on communication with the relevant organizations and programs since last year's meeting (details are reflected in the Report on Administration (*GC Endnote 3*) and in the Science Board Report). Council noted impressive progress in integration and coordination with other international organizations and major international programs of regional and global scale, and thanked the Science Board and the Secretariat for their efforts.

Council reviewed and approved the revised Standing List of International Organizations and Programs as recommended by the Science Board (*SB Endnote 8*) and agreed with identified priorities for interaction in 2003 (Decision 02/S/6).

Letters of invitation to attend the Eleventh Annual Meeting were sent to inter-governmental and non-governmental organizations/programs on the agreed Standing List, and the following sent observers:

Census of Marine Life Program (CoML)	Dr. Jesse Ausubel
Climate Variability and Predictability Program (CLIVAR)	Dr. Kelvin Richards
Coastal Alaskan Observing System (CAOS)	Dr. David L. Musgrave
Global Ocean Data Assimilation Experiment (GODAE)	Dr. Neville R. Smith
Global Ocean Ecosystem Dynamics (GLOBEC)	Dr. Manuel Barange
Global Ocean Observing System (GOOS)	Dr. Neville R. Smith
Gulf Ecosystem Monitoring Program (GEM)	Dr. Phillip Mundy
International ARGO Science Team (IAST)	Dr. Stephen C. Riser
International Council for the Exploration of the Sea (ICES)	Dr. Keith Brander
International Geosphere-Biosphere Program (IGBP)	Dr. Roger Harris
Intergovernmental Oceanographic Commission (IOC)	Dr. Jilan Su
	Dr. Umit Unluata
International Whaling Commission (IWC)	Dr. Hidehiro Kato
Joint Global Ocean Flux Study (JGOFS)	Dr. Toshiro Saino
North East Asian Regional GOOS (NEAR-GOOS)	Dr. Dong-Young Lee
North Pacific Anadromous Fish Commission (NPAFC)	Mr. Vladimir Fedorenko
	Dr. Vladimir I. Karpenko
North Pacific Research Board	Dr. Phillip R. Mundy
Sir Alister Hardy Foundation for Ocean Science (SAHFOS)	Dr. Sonia D. Batten
Scientific Committee on Oceanic Research (SCOR)	Dr. Edward Urban
IOC Sub Committee for the Western Pacific (WESTPAC)	Mr. Hai-Qing Li

Time was reserved at the first session of the Governing Council (October 20, 2002) for some of these organizations (IOC, GOOS, SCOR, ICES and IGBP) to express their views on potential areas of collaboration with PICES. Remarks of their representatives are appended to the report as *GC Endnotes 4-8*.

At PICES X, Council specifically discussed cooperation with ICES, and recommended that the Science Board develop potential areas of cooperation between the two Organizations (Decision 01/S/6(ii)). At the 2002 ICES Annual Conference, Dr. R. 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 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*. At PICES XI, these themes were further discussed by the Scientific Committees and the CCCC Program, and specific recommendations were made on communication between various PICES and ICES groups.

Agenda Item 7. PICES Intern Program

The Executive Secretary reviewed the status of the PICES Intern Program approved in 1999 (Decision 99/A/7) and commenced in 2000 (see *GC Endnote 3* for details). Council examined the results from the first three years of the Intern Program, and concluded that PICES and member countries benefit from the Program, and that it should be continued.

The following discussion focused on various approaches for financing the Intern Program in the future. It was pointed out that the Intern Program was not budgeted for in the years 2000-2002, and was financed solely by voluntary contributions. Council commended the United States, Canada and the Russian Federation for their contributions to the Trust Fund to support the Program, and instructed the Executive Secretary to send letters inviting member countries to provide voluntary contributions to support the Intern Program in 2003 and beyond.

Council confirmed that the practice of using registration fees collected from the Annual Meeting to finance the Program (Decision 01/A/4(iv)) will continue, and approved a transfer of fees collected from PICES XI to the Trust Fund to finance the 2003 Intern Program at the projected level of $27,500.

According to the Guidelines for application and selection procedure, national Delegates should invite and review applications for the 2003 PICES Internship from their home country and submit their nominations to the Executive Secretary by the date of the first Governing Council meeting at PICES XI (October 20, 2002). One nomination was received prior to the deadline. The Chairman of PICES, in consultation with the Executive Secretary and the Chairman of Science Board reviewed this application and approved Mr. Chuanlin Huo (National Marine Environmental Monitoring Center, State Oceanic Administration, People's Republic of China) as the Intern for the year 2003.

Council agreed to re-visit the Guidelines for application and selection procedure, methods for advertising the Intern Program, as well as financial aspects at the next Annual Meeting.

Agenda Item 8. PICES Visiting Scientist Program

At the Tenth Annual Meeting, 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 provides an opportunity for national agencies and/or other international science organizations to contribute "in kind" toward achieving PICES goals, and improve the way the Organization functions, and it was seen as an alternative way to enhance the ability of the Organization and the Secretariat to support the high priority projects and increasing work demand. The expectation was that the Program will commence in 2002, and will be closely linked to the development of the PICES North Pacific Ecosystem Status Report.

The Executive Secretary reported that PICES did not receive proposals on secondment from

national agencies and/or other international science organizations this year. Council reviewed the Visiting Scientists Program and discussed ways for implementing the Program in *FY 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 agreed to work with the Executive Secretary to implement these suggestions.

Agenda Item 9 PICES capacity building

Cooperative marine research depends on the combined efforts and continuous involvement of all member countries. This requires sharing of basic and specialized skills as well as of "vision", experience and infrastructure. Council agreed that to support its goals of promoting and coordinating marine scientific research, PICES must recognize the importance of capacity building. Discussion took place on principles and key elements of capacity building, potential partners and sources of funding to support these activities. Dr. Ian Perry reported that each Scientific Committee was requested to include this issue in its agenda at PICES XI, and that the recommendation is to establish a Study Group on *PICES capacity building* under the direction of the Science Board to develop a capacity building strategy and implementation plan for the Organization. Council approved this proposal (Decision 02/S/5) and recommended membership and terms of reference (*GC Appendix B*).

Agenda Item 10. Schedule and financing of future Annual Meetings of the Organization

At PICES X, Council endorsed the proposal by the Republic of Korea to host the Twelfth Annual Meeting in 2002 (Decision 01/A/4(ii)). By the recommendation of the Finance and Administration Committee, Council approved a transfer of $40,000 (from $50,000 in the proposed *FY 2003* budget) to Korea to partially cover costs of PICES XII.

Council approved the proposal of the United States of America to hold the Thirteenth Annual Meeting from October 15-23, 2004, in Honolulu, Hawaii (Decision 02/A/4(i)), and requested that sufficient budgetary information be provided as soon as possible, to facilitate *FY* 2004 budget planning.

In keeping with the six-year rotation cycle, Council invited the Russian Federation to explore the feasibility of hosting PICES XIV in October 2005, and inform the Secretariat on this matter by May 31, 2003 (Decision 01/A/4(ii)).

Council confirmed that the practice of charging a registration fee for future PICES Annual Meetings will continue, and adopted the registration fee structure. Council also agreed that national representatives at the Council and F&A meetings are exempted from registration fees (Decision 02/A/4(iii)).

Council discussed but did not approve the proposal by Canada, supported by the Finance and Administration Committee, to discontinue the practice of transferring funds from PICES to member countries to partially cover Annual Meeting costs. It was agreed that members would be prepared to discuss this issue again at the next Annual Meeting.

Council strongly supported holding an interim Science Board meeting, with participation of the Governing Council, in spring 2003, in Sidney, Canada (Decision 02/A/4(iv)). This meeting is needed to provide time for the Science Board and Council 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.

Agenda Item 11. Election of Chairman and Vice-Chairman

According to the Rules of Procedure (Rule 7), "*The Chairman and the Vice-Chairman shall be elected from amongst the Delegates for a term of two years and each shall be eligible for re-election only once for a successive term. They shall take office at the conclusion of the Annual Meeting at which elected.*" Dr. Hyung-Tack

Huh of the Republic of Korea and Dr. Vera Alexander of U.S.A. were elected the Chairman and Vice-Chairman, respectively, at PICES VII in 1998 (Fairbanks, U.S.A.), and both were re-elected at PICES IX in 2000 (Hakodate, Japan), with their second terms ending at the conclusion of this year's meeting.

Dr. Huh called for nominations for the Chairman of Council in accordance with the Rules of Procedure. Dr. Vera Alexander was nominated by the Russian Federation and seconded by the Republic of Korea. She was unanimously elected as Chairman for a first term (Decision 02/A/5).

Dr. Huh called for nominations for the Vice-Chairman of Council in accordance with the Rules of Procedure. Dr. Tokimasa Kobayashi of Japan was nominated by Canada and seconded by the U.S.A. He was unanimously declared as Vice-Chairman for a first term (Decision 02/A/5).

Delegates congratulated Drs. Alexander and Kobayashi on their election, who expressed their thanks for the support given by Council.

The Executive Secretary noted that at the PICES Fifth Annual Meeting in 1996 (Nanaimo, Canada), Council approved that the immediate past Chairman shall be invited to serve in an ex-officio advisory capacity, and to attend the Annual Meetings of Council for the period during which the incumbent is Chairman of Council. Council agreed that a Rule change was not required for this purpose (Decision 96/A/5).

The U.S.A. made a motion that Council invite Dr. Huh to serve as an advisor and, in this capacity, to attend the meetings of Council for the period during which Dr. Alexander is Chairman. This proposal was unanimously accepted by Council (Decision 02/A/6).

Agenda Item 12. Appointment of F&A 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. He/she shall take office at the conclusion of the Annual Meeting at which elected*". 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), with his second term ending at the conclusion of this year's meeting.

Canada noted that Dr. Marasco is doing an excellent job as the F&A Chairman and, with a reference to a precedent, suggested that Council extended his term for one year. This motion was supported by all other member countries and approved by Council (Decision 02/A/7).

Agenda Item 13. Executive Secretary position

The term of office for the Executive Secretary is five years and may be renewed/extended at the discretion of Council. Dr. Alexander Bychkov accepted the Executive Secretary position on June 1, 1999, and his first term will come to an end on May 31, 2004, between the Twelfth (Seoul, October 2003) and Thirteenth (Honolulu, October 2004) Annual Meetings.

The United States recommended that Council offer Dr. Bychkov a second term. This proposal was seconded by the People's Republic of China and unanimously accepted by Council (Decision 02/A/8). Dr. Bychkov confirmed he would be prepared to serve a second term.

Agenda Item 14. Report of Finance and Administration Committee

The Finance and Administration Committee 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.

14.1 Audited accounts for fiscal year 2001

At the recommendation of the F&A Committee, Council accepted the audited accounts of *FY*

2001, and agreed to retain the existing auditor *Flader & Greene* for another year (Decision 02/A/1).

14.2 Annual contributions

Council discussed the payment schedule of annual fees to the Organization (*F&A Endnote 4*), and directed the Executive Secretary to send a letter to member countries commending them for improved performance in submitting annual contributions in 2000-2002, and advising on the benefits of paying contributions by the first day of the PICES fiscal year (January 1), as required by Financial Regulation 5(ii) (Decision 02/A/2(i)). Council approved the other actions recommended by the F&A Committee to ensure timely payment of annual contributions (Decisions 02/A/2(ii) and 02/A/2(iii)).

14.3 Fund-raising activities

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 only the rise in operating costs. Council agreed that funding constraints can impede improvement of the Organization, and therefore fund-raising is an essential function of the F&A Committee. The responsibility of the Science Board is to provide fully developed project proposals to facilitate these activities.

Council noted a higher level of external funding and significant voluntary contributions for various activities initiated by PICES (see *GC Endnote 3* for details), and thanked the Science Board Chairman and the Secretariat for their effective fund-raising efforts.

14.4 Budget

14.4a Estimated accounts for fiscal year 2002

The estimated accounts for *FY* 2002 were reviewed by the Finance and Administration Committee and approved by Council (Decision 02/A/3(i)).

14.4b Proposed budget for fiscal year 2003

Council approved the proposed *FY* 2003 budget of $692,500. The amount of $110,500 will be transferred from the Working Capital Fund to the General Fund to reduce the total required contribution to $582,000, setting the 2003 contributions at $97,000 per Contracting Party (Decision 02/A/3(ii)).

14.4c Forecast budget for fiscal year 2004

The *FY* 2004 forecast budget of $660,000 was prepared under the guideline adopted by Council in 1999 (Decision 99/A/2(ii)), examined by the Finance and Administration Committee, and presented as an information item for Contracting Parties. It will be further discussed at PICES XII.

Starting from the next Annual Meeting, Council will consider and adopt the budget for the ensuing and subsequent financial years. This action will require changes in the Rules of Procedure (Rule 15) and the Financial Regulations (Regulation 3(v)). The Executive Secretary was requested to develop the appropriate wording changes for consideration at PICES XII.

14.4d Working Capital Fund

The balance in the Working Capital Fund is forecast to be about $271,500 at the end of 2002. Council approved two transfers from the Working Capital Fund: $110,500 to the General Fund, and $47,400 to the Trust Fund. Council also approved a transfer of $1,730 from the Home Leave and Relocation Fund to the Working Capital Fund. After all inter-fund transfers (Decision 02/A/3(iii)), the Working Capital Fund will total approximately $113,600.

14.4e Home Leave and Relocation Fund

The status of the Home Leave Relocation Fund was reviewed. There were no expenditures in *FY 2002*, and the Fund will total about $111,730 by the end of the fiscal year. This amount

exceeds the required balance of $110,000, and the extra of $1,730 will be transferred to the Working Capital Fund.

14.4f Trust Fund

In *FY 2002*, the Trust Fund was used to bring young scientists from all PICES member countries, and scientists from countries with "economies in transition" to the PICES Eleventh Annual Meeting, finance the Intern Program, and support activities of Working Groups and Task Teams. These expenditures were compensated only partly by voluntary contributions from Canada, Russia and U.S.A. for the Intern Program, a travel grant from the Scientific Committee of Oceanic Research (SCOR), and bank interest (for details see *GC Endnote 3*). As a result, the Trust Fund would be approximately $80,100 at the end of 2002.

Council approved a transfer of $19,900 from the Working Capital Fund to the Trust Fund to recover all 2002 expenditures and restore the Trust Fund to the level of $100,000. Council confirmed that this practice of transferring residual surpluses from the Working Capital Fund should continue, but recommended that the Finance and Administration Committee explore other options for the Trust Fund replenishment, as it is unlikely that surpluses of this magnitude will remain in the future.

Council approved an additional transfer of $27,500 from the Working Capital Fund to the Trust Fund to finance the 2003 Intern Program.

Agenda Item 15. Report and recommendations 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 *Appendices A and B*.

Agenda Item 16. Other business

Dr. Kobayashi brought up the issue of the naming for the body of water surrounded by the Japanese Archipelago and the Korean Peninsula, which is currently in dispute between the countries concerned. He noted that the FIS Topic Session convened at PICES XII was entitled "*Comparison of the productivy of marginal sea with emphasis on the western Pacific (Japan/East Sea, Yellow Sea and East China Sea) with a focus on small pelagics*", and stated Japan's position that the only name "Sea of Japan" should be used in the international arena, as this name is geographically and historically established and is suggested in the recent edition of the International Hydrographic Organization's "Limits of Oceans and Seas 1953" (*GC Endnote 9*). Dr. Jeong responded that Korea's position is that the names "East Sea" and "Japan Sea (Sea of Japan)" should be used simultaneously in the classification of the Sea area concerned, until a final resolution is agreed upon between the relevant countries, as recommended in the Resolution No. III/20 of the United Nation Conference on *the Standardization of Geographical Names* in 1997 (see *GC Endnote 9*).

The Chairman advised that PICES is a scientific organization and should not focus on diplomatic problems. At the same time, the Organization needs consistent terminology for its operations. He reminded Council that it was earlier verbally agreed to use the name "Japan/East Sea" for all official documents and materials prepared by the Scientific Committees, Working Groups and the Secretariat, and that PICES has been using this approach since 1995 when the Working Group on *Circulation and ventilation in the Japan/East Sea* was established.

The following discussion indicated that each federal government has a strict single name policy for high seas features, but there is no clear international standard for them. No decision was made at that time, and it was agreed to re-visit this matter at the inter-sessional Council meeting in spring 2003.

GC Appendix A. **Decisions**

02/A/1: Auditor

Council accepted the audited accounts for 2001 and agreed to retain *Flader and Greene* as auditor for another year.

02/A/2: Annual contributions

i. Council instructed the Executive Secretary to send a letter to member countries commending them for improved performance in submitting annual contributions in 2002, and advising on the benefits of paying contributions by the first day of the PICES financial year (January 1), as required by Financial Regulation 5(ii).

ii. 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)), which states that the annual contributions will increase at the rate of inflation in Canada (currently about 3%).

iii. Starting from the next Annual Meeting, Council will consider and adopt the budget for the ensuing and subsequent financial years. This action will require changes in the Rules of Procedure (Rule 15) and the Financial Regulations (Regulation 3(v)). The Executive Secretary will develop the appropriate wording changes for consideration at the Twelfth Annual Meeting.

02/A/3: Budget

i. Council accepted the estimated accounts for 2002.

ii. Council approved the 2003 budget at a level of $692,500. The amount of $110,500 will be transferred from the Working Capital Fund to reduce the total required contribution to $582,000, setting the 2003 contributions at $97,000 per Contracting Party.

iii. Council approved the following inter-fund transfers:

- A transfer of $110,500 from the Working Capital Fund to the General Fund for 2003. This amount includes a grant of $69,500 from the Sloan Foundation for the preparation of the report for the Census of Marine Life, and $41,000 to support high priority PICES projects;
- A transfer of $19,900 from the Working Capital Fund to the Trust Fund to recover all 2002 expenditures and to restore the Trust Fund to the level of $100,000;
- An additional transfer of $27,500 from the Working Capital Fund to the Trust Fund to finance the 2003 Intern Program;
- A transfer of $1,730 from the Home Leave Relocation Fund to the Working Capital Fund.

02/A/4: Schedule and financing future Annual Meetings

i. Council approved the proposal of the United States of America to hold the Thirteenth Annual Meeting, October 15-23, 2004, in Honolulu, Hawaii.

ii. Council requested the Russian Federation to explore the possibility of hosting the Fourteenth Annual Meeting, and inform the Secretariat on this matter by May 31, 2003.

iii. Council agreed that national representatives at the Council and F&A meetings are exempted from registration fees for the PICES Annual Meetings and approved the following registration fee structure for 2003:

Type	CDN $
Registration fee	150
Early registration fee	100
Students	40

iv. Council agreed to hold an interim meeting in spring 2003 (Sidney, Canada), in conjunction with the Science Board meeting.

02/A/5: Election of Chairman and Vice Chairman

Council unanimously elected Dr. Vera Alexander (U.S.A.) and Dr. Tokimasa Kobayashi (Japan) as Chairman and Vice-Chairman, respectively, for a first term.

02/A/6: Past Chairman

Council invited Dr. Hyung-Tack Huh (Republic of Korea), the immediate past Chairman, to serve in an advisory capacity, and to attend the meetings of Council for the period during which the current incumbent is Chairman of Council.

02/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.

02/A/8: Appointment of Executive Secretary

Council offered Dr. Alexander Bychkov, the current Executive Secretary, a second 5-year term starting June 1, 2004.

02/A/9: Review Committee Report

Council endorsed the Review Committee Report and its recommendations.

02/A/10: Intern Program

i. Council confirmed that the practice of transferring the registration fees collected from the Annual Meetings from the Working Capital Fund to the Trust Fund should continue to support the Intern Program.

ii. Council directed the Executive Secretary to invite member countries to provide voluntary contributions to support the Intern Program in 2003 and beyond.

02/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 (see Acronym List at the end of the Annual Report):

- A 2-day Fifth Annual Workshop on *Salmon ecology in coastal ecosystem*, February 11-12, 2003, Newport, U.S.A.;
- A MODEL workshop to *Embed NEMURO and NEMURO.FISH into a 3-D circulation model*, March 2003, Yokohama, Japan;
- An Inter-comparison on *Underway and drifting/mooring $p(CO_2)$ measurement systems*, March 10-14, 2003, Tsukuba, Japan;
- A PICES/CoML *Regional marine life expert* Workshop I, March 2003, venue TBD;
- A 3-day interim Science Board/Governing Council meeting, March-April 2003, Sidney, Canada;
- A Workshop on *Variability and status of the East China Sea and Yellow Sea ecosystems*, in conjunction with the PAMS/JECSS Workshop, April 14-16, 2003, Hangzhou, People's Republic of China;
- A 4-day ICES/PICES/GLOBEC Symposium on *Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans*, May 19-23, 2003, Gijón, Spain;
- The Third PICES Workshop on *Okhotsk Sea and adjacent areas*, June 4-6, 2003, Vladivostok, Russia;
- A 3-day *North Pacific Ecosystem Status Report* Workshop, August 2003, Sidney, Canada;
- A 2-day WG 15/TCODE Workshop on *Harmonization of HAB data*, October 2003, Seoul, Republic of Korea (in conjunction with PICES XII);
- A 1-day MONITOR Workshop to *Examine and critique a North Pacific Ecosystem Status Report*, October 2003, Seoul, Republic of Korea (in conjunction with PICES XII);

- A 1-day BASS Workshop to *Examine linkages between open and coastal systems*, October 2003, Seoul, Republic of Korea (in conjunction with PICES XII);
- A 1-day MBMAP Workshop on *Distribution and diets of marine birds and mammals: Patterns produced by biophysical coupling and lower trophic level dynamics*, October 2003, Seoul, Republic of Korea (in conjunction with PICES XII);
- A PICES/CoML *Regional marine life expert* Workshop II, November 2003, Sidney, Canada;
- A 3-day IFEP Workshop on In situ *iron enrichment experiments in the eastern and western subarctic Pacific*, December 4-6, 2003, Sidney, Canada;
- A 4-day SCOR/IOC/PICES/GLOBEC *Indicator Conference*, March 31-April 3, 2004, Paris, France;
- A BASS/NPAFC Workshop *on Open Ocean and Coastal Systems*, October 2004 Honolulu, U.S.A. (in conjunction with PICES XIII);
- A PICES/CLIVAR Workshop to further develop interaction with CLIVAR, October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A REX Workshop on *The climate shifts of 1977, 1989 and 1999: Differential physical forcing and ecosystem response in the PICES region*, October 2004, Honolulu, U.S.A. (in conjunction with PICES XIII);
- A major inter-sessional symposium to synthesize the CCCC questions and results, in 2005/6.

02/S/2: Travel support

PICES will provide travel support for:

- One invited speaker per Scientific Committee for Topic Sessions at the PICES Twelfth Annual Meeting (additional requests by the Scientific Committees are subject to fund availability; the Science Board Chairman and Executive Secretary are instructed to use criteria suggested by the Science Board in prioritising these requests);
- Seven scientists to attend CCCC-related meetings: inter-sessional MODEL (1) and IFEP (1) Workshops; BASS (1) and MONITOR (1) Workshops in conjunction with the PICES Twelfth Annual Meeting; MODEL (1) and REX (1) Topic Sessions at the Twelfth Annual Meeting, and ICES/IOC Steering Group for GOOS meeting (1);
- PICES Convenor and selected speakers to attend the PICES/ICES/GLOBEC Zooplankton Production Symposium (May 2003, Gijón, Spain);
- One scientist to attend the PAMS/JECSS Workshop and associated PICES Workshop on *Variability and status of the East China Sea and Yellow Sea ecosystems*; (April 2003, Hangzhou, People's Republic of China;
- Two scientists to attend the Third PICES Workshop on *Okhotsk Sea and adjacent areas* (June 2003, Vladivostok, Russia);
- Two to three scientists to attend the *North Pacific Ecosystem Status Report* Workshop (August 2003, Sidney, Canada);
- One Russian scientist to attend the meeting of the Advisory Panel on *Marine Birds and Mammals* (October 2002, Seoul, Republic of Korea), and two young Chinese scientists to attend FIS Topic Sessions at PICES XII (support will be provided from the Trust Fund);
- Science Board Chairman to attend the IGBP OCEANS Open Science Meeting (January 2003, Paris, France), the PICES/ICES/GLOBEC Zooplankton Production Symposium (May 2003, Gijón, Spain), and the ICES Annual Conference (September 2003, Tallinn, Estonia);

02/S/3: Publications

The following publications were approved:

<u>PICES Scientific Report Series in 2003</u>

- Final report of WG 13 on *CO_2 in the North Pacific*;
- Proceedings of the 2002 CCCC Integration Workshop;
- Report of the 2002 MONITOR Workshops on *Requirements and methods for early detection of ocean change* and *Monitoring from moored and drifting buoys*;

- Report of BASS and MODEL Task Teams on *Ecosystem models for the subarctic Pacific gyres*;
- Report for the Census of Marine Life on *Marine life in the North Pacific Ocean: The known, unknown and unknowable*.

PICES Scientific Report Series in 2004

- Final report of WG 14 on *Effective sampling of micronekton*;
- Final report of WG 16 on *Climate change and fisheries management*;
- Report of the 2003 IFEP Workshops;
- Proceedings of the Third PICES Workshop on *Okhotsk Sea and adjacent areas*;
- Guide of best practices for oceanic CO_2 measurements and data reporting (WG 17);
- North Pacific Ecosystem Status Report.

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

- *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* (Guest editors: Richard D. Brodeur, John Dower, Stewart M. McKinnell and Orio Yamamura);
- *Journal of Marine Systems* - selected papers from the 2002 POC/FIS Topic Session on *Detection of regime shifts in physics and biology* (Guest editors: Jacquelynne R. King and James E. Overland);
- *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* (Guest editors: Kuh Kim, Makoto Terazaki and Stewart M. McKinnell);
- *Journal of Oceanography* - invited papers on *Synthesis of JGOFS North Pacific Process Study* (jointly with JGOFS) (Guest editors: Alexander S. Bychkov, Chen-Tung A. Chen, Paul J. Harrison, Toshiro Saino);
- *ICES Journal of Marine Research* - selected papers from the ICES/PICES/GLOBEC Symposium on *Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans.*

02/S/4: Future of current Working Groups

- WG 14 on *Effective sampling of micronekton* to continue its activities and produce a final report in 2003;
- WG 15 on *Ecology of harmful algal blooms in the North Pacific* to continue for an additional year to clearly define the terms of reference and items to be addressed in an on-going manner for potential development as an Advisory Panel or "Section" under MEQ;
- WG 16 on *Climate change, shifts in fish production and fisheries management* to continue its activities and produce a final report in 2003.

02/S/5: New PICES Groups

- A Working Group on the *North Pacific Ecosystem Status Report* will be organized under the direction of the Science Board (see *GC Appendix B* for terms of reference);
- A Study Group on *PICES Capacity Building* will be established under the direction of the Science Board to develop a capacity building strategy and an implementation plan for the Organization (see *GC Appendix B* for terms of reference);
- An *ad hoc* NEMURO Experimental Planning Team (NEXT) will be organized

under the CCCC Implementation Panel to develop the scientific strategy to use ecosystem models to examine the central CCCC hypotheses. This team would work by electronic communication (see *GC Appendix B* for terms of reference);

- An Advisory Panel on *Micronekton sampling inter-calibration experiment* will be formed under BIO to develop and oversee the implementation of a project to compare different micronekton sampling devices at sea (see *GC Appendix B* for terms of reference).

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

Council approved the revised Standing List of International Organizations and Programs and agreed with identified priorities for interaction in 2003 (*SB Endnote 8*).

GC Appendix B Terms of reference for new PICES groups

Working Group on *North Pacific Ecosystem Status Report*

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.

Study Group on *PICES Capacity Building*

1. Identify the capacity building needs of PICES.
2. Develop a proposal to address the capacity building needs of PICES, including consideration of possible collaborations with other organizations.
3. Draft report is due to Science Board at their next meeting (tentatively the inter-sessional meeting in April 2003).

Ad hoc NEMURO Experimental Planning Team (NEXT)

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.

Advisory Panel on *Micronekton sampling inter-calibration experiment*

1. Develop a proposal for a micronekton sampling inter-calibration experiment, arising from the work of PICES WG 14 on *Effective sampling of micronekton*. Advise on appropriate locations as well as identify micronekton sampling gears and other quantifying technologies for inclusion in the inter-calibration experiment.
2. Facilitate the experiment by identifying and securing commitments for resources (personnel and ships) to ensure success of the experiment; provide technical advice in development of sampling protocols and experimental design.
3. Oversee post-survey analysis of samples and data; provide guidance in preparation of results for final report and publication(s).

GC Endnote 1

Participation List

Canada
- Denis D'Amours (alternate Delegate)
- Laura Richards

Japan
- Tokimasa Kobayashi
- Tokio Wada (advisor)

People's Republic of China
- Hai-Qing Li
- Qian-Fei Liu (alternate Delegate)

Republic of Korea
- Hee-Dong Jeong (alternate Delegate)
- Won-Seok Yang (alternate Delegate)

Russia
- Lev N. Bocharov
- Vladimir A. Belyaev (advisor)
- Alexander A. Kurmazov (advisor)
- Igor I. Shevchenko (advisor)

U.S.A.
- Vera Alexander
- Richard J. Marasco
- Elizabeth J. Tirpak (advisor)

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

GC Endnote 2

Governing Council Meeting Agenda

1. Opening remarks
2. Adoption of agenda
3. Preliminary report on administration
4. Report of PICES Review Committee
5. Membership and observers from other countries
6. Relations with relevant international and regional organizations/programs
7. PICES Intern Program
8. PICES Visiting Scientist Program
9. PICES capacity building
10. Schedule and financing of future Annual Meetings of the Organization
11. Election of Chairman and Vice-Chairman
12. Appointment of Finance and Administration Committee Chairman
13. Executive Secretary position
14. Report and recommendations of Finance and Administration Committee
    - 14.1 Audited accounts for financial year 2001
    - 14.2 Annual contributions

14.3 Fund-raising activities
14.4 Budget
   a. Estimated accounts for fiscal year 2002
   b. Proposed budget for fiscal year 2003
   c. Forecast budget for fiscal year 2004
   d. Working Capital Fund
   e. Home Leave and Relocation Fund
   f. Trust Fund
15. Report and recommendations of Science Board
16. Other business

GC Endnote 3

Report on Administration for 2002

I. National contributions

According to Regulation 5(ii) of Financial Regulations, all national contributions to PICES are payable by the first day of the financial year (January 1) to which they relate. Dues for 2002 were paid as follows:

Japan ---------- November 27, 2001
U.S.A. ---------- December 24, 2001
Canada ---------- January 21, 2002
Russian Federation ---------- June 10, 2002 (72%) and October 10, 2002 (28%)
Republic of Korea ---------- August 26, 2002
People's Republic of China ---------- October 8, 2002 (95.7%)

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:

- A grant from the Nakajima Foundation, approved in 2001, was used this year to finance a MODEL/REX Workshop on *Improvements to the PICES NEMURO Model*, held January 24-27, 2002, in Nemuro/Yokohama, Japan.
- A grant of $5,000, provided by Fisheries and Oceans Canada in 2001, was used this year to support the participation of two Canadian academics in PICES XI.
- National Marine Fisheries Service (NMFS, U.S.A.) and Gulf of Alaska Ecosystem Monitoring and Research Program (GEM) of EVOS (Exxon Valdez Oil Spill Trustee Council, U.S.A.) contributed $37,500 (US $24,260) and $15,300 (US $10,000), respectively, to finance the production of a pilot *North Pacific Ecosystem Status Report*. A part of the NMFS contribution (US $9,260) was received in 2001.
- A grant of $69,480 (US $45,000) from the Alfred P. Sloan Foundation was received to produce a report entitled "*Marine life in the North Pacific Ocean: The known, unknown and unknowable*" by December 31, 2003.
- GEM allocated a total of $185,300 (US $121,000) to support the PICES Continuous Plankton Recorder (CPR) survey in 2002, and to install a thermosalinograph and fluorometer system on the tankers that are towing the CPR.
- GEM also contributed $6,000 (US $3,860) to support a MONITOR Workshop on *Voluntary observing systems*, held April 4-6, 2002, in Seattle, U.S.A.
- In addition to their annual fees, Canada, Russia and U.S.A. contributed $10,000, $2,300 (US $1,500) and $15,200 (US $9,900), respectively, to finance the 2002 PICES Intern Program.
- SCOR provided a grant of $7,600 (US $5,000) to support travel of scientists from countries with "economies in transition" to PICES XI.

III. Inter-sessional meetings

The following inter-sessional meetings were convened/co-sponsored, for which financial,

travel and logistical arrangements were made:

- A 4-day MODEL/REX Workshop on *Improvements to the PICES NEMURO Model: To build a nutrient-phytoplankton-zooplankton-fish version of the model* (co-sponsored by Nakajima Foundation and Nemuro-city), January 24-27, 2002, Nemuro/Yokohama, Japan;
- A 2-day Fourth Annual Workshop on *Salmon ecology in coastal ecosystem*, January 2002, in Santa-Cruz, U.S.A.;
- A 2-day meeting of WG 14 on *Effective sampling of micronekton*, February 16-17, 2002, Honolulu, U.S.A. (in conjunction with the Ocean Sciences Meeting);
- A 2-day NPAFC/NASCO/IBSFC/PICES/ ICES Symposium on *Causes of marine mortality of salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea*, March 14-15, 2002, Vancouver, Canada;
- A 3-day MONITOR Workshop on *Voluntary observing ssystems* (co-sponsored by EVOS), April 5-7, 2002, Seattle, U.S.A.;
- A 2-day BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system*, April 21-22, 2002, La Paz, Mexico;
- A 3-day International Symposium on *North Pacific transitional areas* (co-sponsored by CIBNOR and CICIMAR), April 23-25, 2002, La Paz, Mexico;
- A 3-day meeting of the North Pacific Data Buoys Advisory Panel (co-sponsored by WMO and IOC), June 4-6, 2002, Victoria, Canada;
- A 3-day CREAMS/PICES Symposium on *Recent progress in studies of physical processes and their impact to the Japan/East Sea ecosystem*, August 22-24, 2002, Seoul, Republic of Korea;
- A 2-day JGOFS/PICES Workshop on *Synthesis of JGOFS North Pacific Process Study* (co-sponsored by the Japan Oceanographic Society and Hydrospheric Atmospheric Research Centre of Nagoya University), October 1-2, 2002, Sapporo, Japan (during the JOS meeting organized in conjunction with the 26th SCOR General Meeting);
- A joint meeting of CCCC MODEL Task Team and GLOBEC Focus 3 Working Group on *Linking biophysical and upper trophic level models*, October 18, Qingdao, People's Republic of China (in conjunction with PICES XI and 2nd GLOBEC OSM);
- A ½-day Workshop of CCCC MONITOR Task Team and GLOBEC Focus 1 Working Group on *Requirements and methods for early detection of ocean change*, October 19, 2002, Qingdao, People's Republic of China (during PICES XI);
- A 1-day PICES/GLOBEC Data Management Workshop on *Exchange, inventory and archival of GLOBEC data*, October 19, 2002, Qingdao, People's Republic of China (during PICES XI);
- A 1-day CCCC Integration Workshop, October 20, 2002, Qingdao, People's Republic of China (during PICES XI);
- A 1-day PICES/CLIVAR Workshop on *Climate variability in the Pacific and its impact on the marine ecosystem*, October 20, 2002, Qingdao, People's Republic of China (during PICES XI);
- A ½-day Workshop on *Monitoring from moored and drifting buoys*, October 23, 2002, Qingdao, People's Republic of China (during PICES XI);
- A 1-day PICES/CKJORC Workshop on *Regional cooperation and management of the marine environment and resources in the Yellow Sea*, October 25, 2002, Qingdao, People's Republic of China (during PICES XI).

Preparation and arrangements are in progress for the 3rd Zooplankton Production Symposium on *The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Oceans* (co-sponsored by ICES, PICES and GLOBEC) to be held May 20-23, 2003, in Gijón, Spain.

Planning has been initiated (i) to convene the 3rd PICES Workshop on *Okhotsk Sea and adjacent areas*, in June 2003, in Vladivostok, Russia; (ii) to organize a PICES/SOLAS session on *Iron enhancement experiment in the North Pacific* during the IGBP Congress in June 2003, in Banff, Canada (or a separate workshop in late

2003; and (iii) to co-sponsor an IOC/SCOR Conference on *Quantitative ecosystem indicators for fisheries management*, to be held March 31-April 3, 2003, in Paris, France.

IV. Publications

List of publications produced this year includes:

- PICES 2001 Annual Report was circulated in February;
- Vol. 10 nos. 1 and 2 of PICES Press were circulated in February and July;
- Final Announcement for PICES XI was distributed in April;
- Final Announcement for the 3rd Zooplankton Production Symposium on *The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Oceans*, was distributed in April;
- PICES Scientific Report No. 20: *Climate Change and Carrying Capacity Program / Report of the 2001 BASS/MODEL, MONITOR and REX Workshops, and the 2002 MODEL Workshop*, was published and distributed in August;
- PICES Scientific Report No. 21: *Climate Change and Carrying Capacity Program / Report of the PICES 2002 Voluntary Observing Systems Workshop*, was published and distributed in August;
- PICES Scientific Report No. 22: *PICES Science: The first ten years and a look to the future* (Proceedings of the PICES X Anniversary Symposium), was published in August and distributed in September;
- PICES Scientific Report No. 23: *Harmful algal blooms in the PICES region of the North Pacific*, was published and distributed in September;
- Special issue of *Journal of Oceanography* (Vol. 58, No. 5) on *Physics and biology of eddies, meanders and rings in the PICES region* (selected papers from the 2001 CCCC Topic Session; Guest Editors: William B. Crawford, Alexander S. Bychkov, Stewart M. (Skip) McKinnell and Takashige Sugimoto), was published in September and will be distributed after PICES XI;
- Special issue of *Progress in Oceanography* (Vol. 55, No. 1-2) on *Variability in the Bering Sea ecosystem* (selected papers from the 2001 CCCC Topic Session; Guest Editors: Allen Macklin, Jeffrey M. Napp, Vladimir I. Radchenko, Sei-ichi Saitoh, Phyllis J. Stabeno and Stewart M. McKinnell) was published in September and will be distributed after PICES XI;
- A Book of Abstracts for the Eleventh Annual Meeting was prepared for circulation at PICES XI in October;
- Poster for the PICES Twelfth Annual Meeting was printed in October and distributed at and after PICES XI;
- Special issue of *Deep-Sea Research Part II* (Vol. 49, Nos. 24-25) on *North Pacific Biogeochemical Processes* (Guest Editors: Toshiro Saino, Alexander S. Bychkov, Chen-Tung A. Chen and Paul J. Harrison) will be published in December;
- Special section of *Canadian Journal of Fisheries and Aquatic Sciences* on *Migration of key ecological species* (Selected papers from the 2001 FIS Topic Session; Guest Editor: James Irvine) will be published in December;
- The electronic (CD-ROM and web-based) version of the Oceanographic Atlas of the Okhotsk Sea, Bering Sea and Japan/East Sea prepared by the Pacific Oceanological Institute.

Papers resulting from the 1999 MEQ Practical Workshop on *Environmental assessment of Vancouver Harbour* will constitute a special issue of *Marine Environmental Research* (Guest Editors: Richard F. Addison and John E. Stein). Selected papers from the 2001 PICES/JGOFS Topic Session on *Plankton size classes, functional groups, and ecosystem dynamics: Causes and consequences* will comprise a special issue of *Progress in Oceanography* (Guest editors: Alexander S. Bychkov and Angelica Peña). These special issues are in progress (review stage) and will be published in 2003.

V. Travel and representation at other organization meetings

- Dr. Skip McKinnell (Assistant Executive Secretary), attended the Fourth Annual

Workshop on *Salmon ecology in coastal ecosystem*, in Santa Cruz, U.S.A., in January;

- Travel support was provided to Drs. Richard D. Brodeur (U.S.A.) and Kouichi Kawaguchi (Japan) to attend the workshop of WG 14 on *Effective sampling of micronekton*, in Honolulu, U.S.A., in February;
- Dr. Alexander Bychkov (Executive Secretary) and Ms. Christina Chiu (Administrative Assistant) travelled to China and Japan, in February-March, to discuss preparations for PICES XI with the Local Organizing Committee (Qingdao), and PICES activities and initiatives with Chinese and Japanese Government representatives (Beijing and Tokyo). Dr. Hyung-Tack Huh (PICES Chairman) joined the visit in Beijing, and Dr. Vera Alexander (PICES Vice-Chairman) joined the visit in Tokyo (paid by U.S. Government);
- Dr. Skip McKinnell attended the informational ACCEO (Alliance for California Current Ecosystem Observation) meeting, in Seattle, U.S.A., in March;
- Drs. Douglas E. Hay (FIS Chairman), R. Ian Perry (Science Board Chairman), Skip McKinnell (co-convenor) and Alexander Bychkov attended the Symposium on *Causes of marine mortality of salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea* (co-sponsored by NPAFC, PICES, NASCO, IBSFC and ICES) and the NPAFC RPCM, in Vancouver, Canada, in March;
- Full or partial travel support was provided to 6 scientists (from Japan, U.K. and U.S.A.) to attend the MONITOR Workshop on *Voluntary observing systems*, in Seattle, U.S.A., in April;
- Dr. Harold P. Batchelder (CCCC Co-Chairman) participated in the meeting of the *ICES Cod and Climate Change Program*, in Copenhagen, Denmark, in April;
- Dr. Gordon A. McFarlane (Canada) attended the BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system*, in La Paz, Mexico, in April;
- Full or partial travel support was provided to 6 invited speakers (from Canada, Japan and U.S.A.), Science Board Chairman and staff of the Secretariat to participate in / organize the International Symposium on *North Pacific transitional areas*, in La Paz, Mexico, in April;
- Dr. Alexander Bychkov and Ms. Christina Chiu, attended the International Fisheries Commission Pension Society Meeting in Chicago, U.S.A., in May;
- Dr. Alexander Bychkov participated in the meeting of the Executive Council of the Inter-governmental Oceanographic Commission, in Paris, France, in June;
- Drs. R. Ian Perry and Alexander Bychkov participated in the meeting of the Review Committee, in Seattle, U.S.A., in June;
- Ms. Christina Chiu travelled to San Diego and Honolulu (paid by NMFS, U.S.A.) to assist in site inspections for PICES XIII;
- Full or partial travel support was provided to 7 invited speakers (from Japan, Korea and Russia) to attend the CREAMS/PICES Symposium on *Recent progress in studies of physical processes and their impact to the Japan/East Sea ecosystem* (August 2002, Seoul, Republic of Korea). In addition, by request of PICES, the University of Washington provided partial travel support for 4 Russian scientists to attend the meeting. Dr. McKinnell participated in this meeting as a PICES representative and discussion leader on the development of a chapter on the Japan/East Sea for the North Pacific Ecosystem Status Report;
- Travel support was provided to Drs. Kenneth Denman (Canada) and Nian-Zhi Jiao (China) to attend a JGOFS/PICES Workshop on *Synthesis of JGOFS North Pacific Process Study* (during the Japan Oceanography Society meeting organized in conjunction with the 26th SCOR General Meeting), in Sapporo, Japan, in October; Dr. Alexander Bychkov participated in the 26th SCOR General Meeting and convened the JGOFS North Pacific Synthesis Group meeting held in conjunction with the JGOFS/PICES Workshop;
- Drs. Hyung-Tack Huh and R. Ian Perry represented PICES at the 2002 ICES Annual

Conference and Centenary, in Copenhagen, Denmark, in October;
- Dr. Alexander Bychkov represented PICES at the NPAFC Tenth Annual Meeting, in Vladivostok, Russia, in October;
- Drs. Hyung-Tack Huh and R. Ian Perry traveled to Qingdao, People's Republic of China, in October, for PICES XI;
- Full or partial travel support (paid by PICES and co-sponsoring programs and organizations) was provided to 5 invited speakers for the Science Board Symposium, and 17 invited speakers for scientific sessions at PICES XI, in Qingdao, People's Republic of China, in October;
- Travel support (paid by PICES, WCRP and U.S. CLIVAR) was provided to 7 scientists (invited speakers and co-convenors) to attend the PICES/CLIVAR Workshop on *Climate variability in the Pacific and its impact on the marine ecosystem*, October 20, 2002, Qingdao, People's Republic of China (during PICES XI);
- Partial travel support (paid by the Trust Fund and a SCOR grant) was provided to 1 Canadian, 50 Chinese (mostly in the form of registration fees), 2 Japanese, 5 Korean, 4 Mexican and 14 Russian scientists to attend PICES XI. The majority of these scientists are younger than 35 year of age;
- Dr. Alexander Bychkov and Ms. Christina Chiu visited Seoul, Korea, in late October, to discuss preparations for PICES XII with the Local Organizing Committee;
- Dr. Skip McKinnell attended the meeting of the SCOR-IOC WG 119 on *Quantitative ecosystem indicators for fisheries management*, in Cape Town, South Africa, in December.

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 was initiated on improving IGBP-PICES connections and the role PICES, as a regional organization, can play in implementing marine aspects of the IGBP Phase II.
- GLOBEC and JGOFS are two major IGBP projects working closely with PICES (see below).
- PICES is interested in strengthening interactions with SOLAS (see below), and in the development of OCEANS, a new project on ocean biogeochemistry and ecology, and will send representatives to the OCEANS Open Science Conference (January 2003) where the Science and Implementation Plans for the program will be discussed.

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 CCCC Integration Workshop was held at PICES XI to (i) review and evaluate the progress that was made in the first decade of the CCCC Program, and (ii) provide a framework for future synthesis and integration of CCCC activities. GLOBEC was invited and participated in this discussion at the GLOBEC SSC level.
- The 2nd GLOBEC Open Science Meeting (OSM) and PICES XI were held sequentially in Qingdao, People's Republic of China, on October 15-18 and October 18-26, 2002, respectively. Jointly organized events/actions include:
  - CCCC/GLOBEC session on *ENSO and decadal scale variability in North Pacific ecosystems*;
  - CCCC/GLOBEC session on *Coupled biophysical processes, fisheries and climate variability in coastal and oceanic ecosystems of the North Pacific*;

- Meeting of CCCC MODEL Task Team and GLOBEC Focus 3 Working Group on *Linking biophysical and upper trophic level models*;
- Workshop of CCCC MONITOR Task Team and GLOBEC Focus 1 Working Group on *Requirements and methods for early detection of ocean changes*;
- PICES/GLOBEC Data Management Workshop on *Exchange, inventory and archival of GLOBEC data*;
- PICES/GLOBEC joint newsletter to be printed in January 2003.

- Preparation and arrangements are in progress for the ICES/PICES/GLOBEC Zooplankton Production Symposium on *The role of zooplankton in global ecosystem dynamics: Comparative studies from the World Ocean* to be held May 20-23, 2003, in Gijón, Spain. PICES and GLOBEC encouraged SCOR (letter of June 27, 2002) to make a financial contribution that will be used to support scientists from developing countries and countries with "economies in transition" to attend the Symposium.
- The overall theme for PICES XII (October 10-18, 2003, Seoul, Republic of Korea) is *"Human dimensions of ecosystem variability"*, and a 1-day Science Board Symposium will be convened using this theme. Activities of GLOBEC Focus 4 Working Group on *Feedbacks from the changes in marine ecosystem structure* are highly relevant to the objectives of the Science Board Symposium, and PICES invited GLOBEC to co-sponsor this Symposium and participate in the planning.

IGBP Joint Global Ocean Flux Study (JGOFS)

- JGOFS participated in the planning and co-sponsored a topic session on *Plankton size classes, functional groups and ecosystem dynamics: Causes and consequences* at PICES X, in October 2001. Selected papers from this session comprise a special issue of *Progress in Oceanography* (Guest editors: Alexander S. Bychkov and Angelica Peña) that is at the review stage now and will be published in 2003.
- A 2-day JGOFS/PICES Workshop on *Synthesis of JGOFS North Pacific Process Study* (co-sponsored by the Japan Oceanographic Society and Hydrospheric Atmospheric Research Centre of Nagoya University) was held October 1-2, 2002, in Sapporo, Japan (during the Japan Oceanography Society meeting organized in conjunction with the 26th SCOR General Meeting).
- A collection of contributed papers from JGOFS-related field programs in the North Pacific will be published as a special JGOFS/PICES issue of *Deep-Sea Research II* on *North Pacific Biogeochemical Processes* (Guest Editors: Toshiro Saino, Alexander Bychkov, Chen-Tung A. Chen and Paul J. Harrison) in 2002 (Vol. 49, Nos. 24-25, pp. 5297-5808).
- Plans are in progress for a special issue of *Journal of Oceanography* on *JGOFS North Pacific synthesis* to be published in early 2004.

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. In 2000, the Advisory Panel on *Iron Fertilization Experiment in the Subarctic Pacific Ocean* convened a planning workshop on *Designing the iron fertilization experiment in the subarctic Pacific* in Tsukuba, Japan, in conjunction with PICES IX. Recommendations from this workshop have been 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). Preliminary results from SEEDS were reported at PICES X (Victoria, Canada, 2001) and results from SERIES were presented at PICES XI (Qingdao, China, 2002). Reports on both experiments

are recommended for publication in the PICES Scientific Report Series and/or as a special issue in a primary journal.

- Planning has been initiated to convene a joint SOLAS-PICES workshop on *Implementation of SOLAS in the North Pacific Ocean* and a joint PICES-SOLAS session or workshop on *Iron enhancement experiment in the eastern and western subarctic Pacific*. Potentially these events could be organized either during the IGBP Congress in June 2003 (Banff, Canada), or in conjunction with PICES XII in October 2003 (Seoul, Korea), or as a separate meeting in late 2003.

Scientific Committee on Oceanic Research (SCOR)

The Executive Secretary attended the 26th SCOR General Meeting in October 2002, 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/programs, working groups and activities established/co-sponsored by SCOR are listed below:

- By invitation from PICES, SCOR WG 118 on *New technologies for observing marine life* WG nominated and co-sponsored Dr. Gabriel Gorsky (France) to give an invited talk at the PICES XI Science Board Symposium on *Technological advances in marine scientific research*, and to demonstrate new methods for treatment of net samples and underwater imaging of zooplankton at the TCODE Electronic Poster Session on *Data systems to support technological advances in observing systems* held in conjunction with the Symposium.
- The overlapping scientific interests of PICES and SCOR-IOC WG 119 on *Quantitative ecosystem indicators for fisheries management* resulted in (i) an invitation for PICES representatives to attend the next WG 119 meetings (December 4-6, 2002, in Cape Town, South Africa), and (ii) an offer from PICES to be a co-sponsor for an IOC-SCOR *Indicator Conference* to be held March 31-April 3, 2003, in Paris, France. PICES could potentially contribute "in-kind" support, *e.g.*, publishing of an announcement/poster, providing its website for registration and abstract submission, etc. PICES will be represented on the Scientific Steering/Organizing Committee for this conference.
- Activities of PICES WG 13 on *CO_2 in the North Pacific* were recognized by the SCOR-IOC Ocean Carbon Advisory Panel as essential for improving the overall quality of oceanic CO_2 measurements, and developing strong collaborations for the integration and synthesis of the large CO_2 data set in the North Pacific. The Panel emphasized the importance of international participation in the design of Ocean Carbon Observation System and supported PICES as an excellent forum for the Pacific region. A new PICES WG 17 on *Biogeochemical data integration and synthesis* will continue to retain a scientific focus on the carbon cycle within PICES, and PICES proposes that WG 17 be established as a joint PICES-SCOR-IOC Working Group.
- SCOR provided a grant of $7,600 to support travel of scientists from countries with "economies in transition" to PICES XI.
- PICES and GLOBEC requested SCOR to make a financial contribution that will be used to support participation of scientists from developing countries and countries with "economies in transition" in the 3rd Zooplankton Production Symposium to be held May 20-23, 2003, in Gijón, Spain.

WCRP International Research Programme on Climate Variability and Predictability (CLIVAR)

- A 1-day PICES/CLIVAR Workshop on *Climate variability in the Pacific and its impact on the marine ecosystem* was convened on October 20, 2002, in Qingdao, People's Republic of China (in conjunction with PICES XI). The purpose was to foster collaboration on implementation of CLIVAR in the North Pacific. Travel support (paid by PICES, WCRP and U.S. CLIVAR) was provided to 7 scientists

(invited speakers and co-convenors) to attend the workshop.

Global Ocean Observing System (GOOS)

- PICES' relations with GOOS are highlighted as particularly important by all Scientific Committees and the CCCC Program. Several PICES *ad hoc* groups, such as MONITOR Task Team, CPR Advisory Panel, North Pacific Data Buoy Advisory Panel and WG 17 on *Biogeochemical data integration and synthesis* focus on activities relevant to GOOS.
- PICES has also initiated a few projects of direct relevance to GOOS: North Pacific Ecosystem Status Report, North Pacific Continuous Plankton Recorder Program, inter-laboratory method comparisons of measurement technique for carbonate parameters in seawater, etc.
- 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 is actively communicating with scientists in the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS) effort and participating in NEAR-GOOS meetings, with the idea of broadening the program to an ecosystem-based effort.

Intergovernmental Oceanographic Commission (IOC)

- PICES has led the way in revealing the linkages between North Pacific climate variations and changes in marine ecosystems. To make further progress in this direction, and ensure that the Organization will continue to serve as a regional focal point for integrating North Pacific climate research, PICES is strengthening ties with the IOC subsidiary body (WESTPAC), and the research programs/projects (CLIVAR, GLOBEC, GOOS, GEOHAB) and groups (Ocean Carbon Advisory Panel, SCOR-IOC WG 119 on *Quantitative ecosystem indicators for fisheries management*) supported by IOC.
- Discussion was initiated on the joint support of capacity building activities in the North Pacific.

International Council for the Exploration of the Sea (ICES)

- Preparation and arrangements are in progress for the ICES/PICES/GLOBEC Zooplankton Production Symposium to be held May 20-23, 2003, in Gijón, Spain;
- In response to an invitation from the ICES *Cod and Climate Change* Program (CCC), Dr. Harold P. Batchelder (CCCC Co-Chairman) participated in the meeting of the Program in Copenhagen, Denmark (April 19-20, 2002). The purpose was to discuss possible formal collaboration between the ICES CCC and PICES CCCC, and begin consultations towards putting together a joint workshop focused on a subject of mutual interest, in 2004 or 2005;
- In accordance with Decision 01/S/6(ii), PICES Science Board has developed proposals on potential areas for cooperation between the two organizations. Four "themes" that might be of interest for enhanced interactions were presented at the 2002 ICES Annual Conference: (i) *teleconnections* - investigations whether there is 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 further discussed at PICES XI.

North Pacific Anadromous Fish Commission (NPAFC)

- 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* (March 14-15, 2002, Vancouver, Canada).

- NPAFC and PICES agreed that co-sponsorship of scientific meetings should be used as a way to strengthen interactions between the two organizations. Future plans include: (i) NPAFC co-sponsorship of the 3rd PICES Workshop on *Okhotsk Sea and adjacent areas* in June 2003; (ii) PICES co-sponsorship of a possible NPAFC symposium in 2004; (iii) joint workshops to consider the response of Pacific salmon to climate change in 2004 and 2005.
- NPAFC did not provide information on salmon stock status for the pilot PICES *North Pacific Ecosystem Status Report*, as it was agreed at the NPAFC Ninth Annual Meeting in October 2001, and at the NPAFC Research Planning and Coordinating Meeting in March 2002. At the NPAFC Tenth Annual Meeting, it was confirmed that NPAFC is still interested in participating in developing the *North Pacific Ecosystem Status Report*, and the Working Group on *Stock Assessment* will prepare and provide a summary on North Pacific salmon stock status before August 2003.

Other international fisheries organizations

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

Census of Marine Life program (CoML)

- A proposal from PICES to produce (by December 31, 2003) a report entitled *Marine life in the North Pacific Ocean: The known, unknown and unknowable* was approved by the CoML Scientific Steering Committee, and awarded a grant of $68,480 (US $45,000) from the Alfred P. Sloan Foundation.

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

- Gulf of Alaska Ecosystem Monitoring and Research Program (GEM) of EVOS (Exxon Valdez Oil Spill Trustee Council, U.S.A.) contributed $15,300 (US $10,000) to finance the production of the pilot PICES *North Pacific Ecosystem Status Report*, and $6,000 (US $3,900) to support a PICES MONITOR Workshop on *Voluntary observing systems*, held April 4-6, 2002, in Seattle, U.S.A.
- GEM allocated a total of $185,000 (US $121,000) to support the PICES Continuous Plankton Recorder (CPR) survey in 2002, and to install a thermosalinograph and fluorometer system on the tankers that are towing the CPR.

Alliance for California Current Ecosystem Observation (ACCEO)

- Activities and potential products of ACCEO (a new partnership to build an integrated monitoring program for observing the entire California Current pelagic ecosystem, from Mexico to Canada) are very relevant to the ecosystem status initiative of PICES. To facilitate collaboration between the two organizations, Dr. Skip McKinnell attended the ACCEO informational meeting in Seattle on March 1, 2002, and Drs. David Mackas (Co-Chairman of CCCC MONITOR TT) and Ian Perry (Science Board Chairman) participated by teleconference. Dr. Mackas also attended the first ACCEO Annual Meeting held September 23-24, 2002, in Portland, U.S.A.

VII. PICES Intern Program

The PICES Intern Program was approved in 1999 (Decision 99/A/7) and commenced in 2000. In 2000-2002, young scientists from three different countries worked as interns at the Secretariat: Mr. Gong-Ke Tan of the People's Republic of China (May-December 2000), Dr. Jung-Hwa Choi of the Republic of Korea (May 2001-February 2002) and Ms. Natalya Bessmertnaya of Russia (April 2002 – March 2003). At the Ninth and Tenth Annual

Meetings, Council discussed the results from the first two years of the Intern Program, and concluded that PICES and member countries benefit from the Program, and that it should be continued.

The Intern Program was not budgeted for 2000-2002, and was financed solely by voluntary contributions. Following Decision 00/A/8(iii), the Executive Secretary sent letters inviting member countries to make voluntary contributions, but only Canada ($7,500 in 2000, $10,000 in 2001, and $10,000 in 2002), the United States ($7,000 in 2000, $12,000 in 2001, and $15,000 in 2002), and the Russian Federation ($2,300 in 2002) contributed to support the Program. These contributions alone allowed the implementation of the Program.

At last year's meeting, again Council did not reach a consensus on Canada's proposal to gradually build the Intern Program into the annual budget, and decided to use registration fees collected from the Annual Meeting to finance the Program (Decision 01/A/4(iv)). As a result, there is no special allocation for the Intern Program in the proposed *FY 2003* and forecast *FY 2004* budgets. The 2003 expenses for the Intern Program are projected at a level of $27,500. Only by transferring almost all the fees collected for PICES XI (estimated at about $30,000) will this amount be offset, otherwise the continuation of the Program would require new voluntary contributions, or will reduce the Trust Fund support for other activities.

A dialogue with Canadian authorities (Human Resources Development Canada, Citizenship and Immigration Canada, and the Department of Foreign Affairs and International Trade) on proper arrangements for the Program is complete, with kind assistance of Fisheries and Oceans Canada, and now the actual duration of the Intern's term is only limited by the existing funding and not by Canadian visa regulations.

VII. PICES database

The PICES database was constructed after the Tenth Annual Meeting, where several inefficiencies were noted in how the Secretariat managed its contacts and meetings. Prior to the database being built, several smaller, in-house databases were maintained to hold information for individual meetings or for certain member groups; however, data transfer among the smaller databases was difficult and duplication occurred frequently. Construction of the new database began in January 2002 using the existing structure of the older databases, and it is currently in trial use by the Secretariat.

The PICES database holds information of all contacts (people who attended meetings, members of PICES groups, libraries and organizations), and this information can easily be updated via the web site interface or by the Secretariat. People may now register for meetings and submit their abstracts on-line, and this data is transferred directly into the database after verification by the Secretariat. Management of meetings is now easier and more accurate since confirmation letters are sent directly from the database to presenters; potential paper lists are generated in the same mannerand forwarded to the session convenors; and scheduling of sessions is done within the database and schedules may be modified on site if a last minute change occurs. Meeting finances (the tracking of registration fee payments, financial support grants, etc.) are also handled through the database. Other useful functions are lists of papers sorted by session, country or speakers, participation list, the generation of financial reports, mailing list labels, poster session labels, and nametags, etc.

The PICES database has dramatically improved how the Secretariat deals with both contacts and meetings, as previously tedious tasks can now be done efficiently and quickly. New meetings and contacts are all managed through the one central database that may be accessed simultaneously by several Secretariat users at once, along with users on the PICES web site. The real test for the PICES database was PICES XI. By using the database on site, processing of information and updates to contacts or paper presentations was greatly improved and helped to provide a more professional and efficient level of event organization to the Secretariat and participants.

GC Endnote 4

Remarks by Prof. Ji-Lan Su (Chairman of the Intergovernmental Oceanographic Commission)

Dr. Hyung-Tack Huh, the Chairman of PICES, honorable members of the Governing Council, distinguished guests and colleagues:

On behalf of the Intergovernmental Oceanographic Commission of UNESCO (IOC), it is a great honor for me to address you at your Council meeting prior to the PICES Eleventh Annual Meeting. I would like to thank Dr. Hyung-Tack Huh, the Chairman of PICES, for his kind invitation. I would also like to convey the warmest regards of Dr. Patricio Bernal, Assistant Director-General of UNESCO and the Executive Secretary of IOC, who could not be here because of the ongoing UNESCO Executive Board meeting.

At the outset, I would like to re-affirm the importance that IOC places on the role of PICES in scientific research, observations and services related to the preservation and sustainable utilization of marine resources and ecosystems of the North Pacific. It is our firm belief that the cooperation between IOC and active and competent regional organizations will greatly benefit programmes on both sides. This is why we are eager to cooperate with PICES, and to urge our own regional subsidiary body, WESTPAC (IOC Sub-Committee for the Western Pacific) among others, to interact strongly with your Organization. In this respect, we are in fact much pleased that the Chairman of PICES, Dr. Huh, is now also the Chairman of WESTPAC.

Having said this, let me point out that IOC is much interested in enhancing its cooperation with PICES on several fronts. I am happy to note that recently there has been significant interaction between the Secretariats of PICES and IOC for this purpose. Notably, at its last session, the Steering Committee of Global Ocean Observing System (GOOS) considered the potential for joint scientific and technical developments. Given our mutual interests in ocean monitoring, we are confident that the efforts of the GOOS and PICES communities can be brought together in a constructive way to the mutual benefit of both. IOC is keen to see this development continued. I understand that the representatives from the Steering Committee of both GOOS and NEAR-GOOS intend to pursue this issue during the present meeting.

I also understand that, at this meeting, PICES and IOC will further discuss cooperation on four other fronts, namely, the *North Pacific Ecosystem Status Report*; and activities related to the *ecosystem indicators*; *biogeochemical data integration and synthesis, with focus on carbon cycle*; and *harmful algal blooms*.

As an example, one priority of the IOC Harmful Algal Bloom Programme is the compilation of data documenting trends in the occurrence and impact of harmful algal events. To that end, IOC and ICES have established a Harmful Algal Event Data Base (HAE-DAT), which has already compiled 15 years of data from the Western Atlantic. They are meta-data information on harmful events, not the primary monitoring data. Such meta-data are often not released by the authorities. However, these meta-data allow for recording of events and their impacts, and are important in our ability to follow trends in HAB occurrences and species distribution. IOC and ICES have already invited PICES, through its Working Group on *Ecology of harmful algal blooms in the North Pacific*, to become an equal partner in HAE-DAT. We hope very much that it will be possible to build one single global database on HAB occurrences and impacts.

Finally, I wish you a most successful meeting.

GC Endnote 5

Remarks by Dr. Neville R. Smith, on behalf of Dr. James Baker (Chairman of the Steering Committee for the Global Ocean Observing System)

Dr. Hyung-Tack Huh, Chairman of PICES, members of the Governing Council:

On behalf of Dr James Baker, Chairman of the GOOS (Global Ocean Observing System) Steering Committee, I would like to endorse the remarks of Professor Ji-Lan Su, and to thank PICES for the opportunity to address your Governing Council on issues of common interest. Dr. Baker sends his apologies and wishes PICES well with its Eleventh Annual Meeting. I am no longer directly involved with the work of the GOOS Steering Committee, but I will do my best to represent what I believe are the common interests and opportunities.

In general terms, there are very obvious reasons for PICES and GOOS to examine opportunities for collaboration. The North Pacific represents a significant part of the world's oceans, and GOOS observing networks are already operating in the region. PICES and GOOS share a common need for ocean data and information, though clearly with rather different perspectives and objectives. GOOS places high priority on its systematic approach and Principles, and I believe this approach has several aspects in common with the approach of PICES.

This emphasis on sustained and systematic observations within GOOS means that not all activities of PICES will be of direct relevance, but that is a circumstance PICES shares with other scientific bodies, and is appropriate. The strongest links will come through initiatives of PICES that are seeking to sustain, or contribute to, long-term observational and processing and application facilities.

Within GOOS, there are various levels of action (or implementation), some of them with direct oversight from the GOOS SC, and others with either shared or reduced direct involvement. These include:

1. The creation of a Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) allows GOOS to implement *global observing networks* in an efficient and effective way, with appropriate intergovernmental links and oversight.
2. Other *global implementation mechanisms*, for example through the Oceans Theme for the Integrated Global Observing Strategy and CEOS.
3. *Regional alliances such as NEAR-GOOS*. Such alliances are effective when regional cooperation or regionally specific issues are the prominent characteristics. The approaches still follow the Principles, but the "global" relevance to GOOS shifts more to cross-cutting issues and to things like standards. The role of PICES in fisheries observations and regional seas research makes it an ideal conduit for establishing regional implementation mechanisms for GOOS in the North Pacific, either for the region as a whole or for specific issues.
4. *Pilot projects*. Pilot projects like GODAE and Argo have proved very effective for raising the profile of GOOS and attracting fresh investment in the general area of ocean observation and related applications. PICES has strong links to the Census of Marine Life initiative which is also a "flagship" style effort.

With respect to specific activities of PICES, the MONITOR Task Team and TCODE activities perhaps have the strongest direct relevance to GOOS. I would note that GOOS has developed deep experience in monitoring strategies, with particular emphasis on integration and efficiency and effectiveness. We would be glad to provide input to the MONITOR initiative.

As with ICES, perhaps an area ripe for collaboration is data management. GOOS has promoted a paradigm of broad sharing and distribution of data, as epitomized by the Argo initiative. PICES too is seeking efficient and effective data management strategy, as evidenced by the strong links to the OBIS of CoML.

There would appear to be several areas that offer prospects for immediate collaboration:

- Regular exchange of information on observational campaigns, projects, etc., and the sharing of advocacy for common initiatives. It would seem that communication between the Executives and attendance of GOOS at PICES meetings, and vice versa, is an effective approach.
- GOOS recognizes the considerable strength of PICES as a regional ocean organization, and would welcome its assistance and leadership for regional observational network contributions to GOOS. Open ocean non-physical observations, the CPR program, and carbon measurements seem to be good areas for such cooperation.
- Data management as mentioned above, and as will be highlighted in my presentation at the Science Board Symposium tomorrow, offers an obvious opportunity.

As you are aware, GOOS and ICES have established a Steering Group to examine areas of collaboration, and through a EuroGOOS-ICES Working Group, have recently developed a North Sea Pilot Project. It may be appropriate for PICES to consider a similar joint activity, perhaps through a joint Steering Group with NEAR-GOOS, in part taking the regional leadership role. I would note, however, that neither GOOS nor PICES would want such a Group if it was not clear that it would provide real incremental and mutual benefits to both.

In closing, and given our joint interests in ocean monitoring, we should be confident that the efforts of the GOOS and PICES communities can be brought closer together in a constructive way for the mutual benefit of both. IOC and GOOS are keen to explore opportunities.

GC Endnote 6

Remarks by Dr. Edward Urban (Executive Director of the Scientific Committee for Oceanic Research)

Mr. Chairman of PICES, distinguished members of the Governing Council:

The Scientific Committee on Oceanic Research (SCOR) is an international non-profit organization that promotes international cooperation in ocean sciences. SCOR was formed in 1957, as the first interdisciplinary committee of the International Council for Science (ICSU). Currently, 38 nations provide Nominated Members to SCOR. All nations that are members of PICES contribute Nominated Members to SCOR also. (Unlike PICES, individuals, not governments, are members of SCOR; national academies or government agencies pay SCOR dues.)

PICES has many interests coinciding with SCOR interests, and PICES scientists have been important contributors to certain SCOR activities. The PICES Executive Secretary, Dr. Alexander Bychkov, reported at the recent SCOR General Meeting on existing and potential cooperation between PICES and SCOR in major research projects (*e.g.*, GLOBEC, JGOFS and GEOHAB) and working groups (*e.g.*, WG 118 on *New Technologies for Observing Marine Life* and WG 119 on *Quantitative Ecosystem Indicators for Fisheries Management*). Dr. Bychkov made a compelling case for the positive benefits of interactions between SCOR and PICES.

SCOR asked PICES to recommend a new member from the North Pacific region for the Working Group 115 on *Standards for the Survey and Analysis of Plankton*, preferably with links to the North Pacific Continuous Plankton Recorder activity.

The major limitation of PICES involvement in SCOR activities is the need for SCOR to avoid the appearance of favoritism to the North Pacific region. (SCOR has traditionally not conducted joint activities with regional organizations, including PICES and ICES.) Other limitations are related to the general need to keep the number of cooperating organizations to the

minimum necessary, to minimize the bureaucracy of cooperative activities.

The greatest potential role for PICES is to help contribute a regional perspective to SCOR's global activities. Dr. Bychkov and I will discuss specific means of cooperation between SCOR and PICES, starting with exchanges of relevant reports of our groups and invitations to each other's meetings. We will discuss other PICES proposals on a project-by-project basis and in consultation with the Chaimen of the activities.

GC Endnote 7

Remarks by Dr. Keith Brander, on behalf of Dr. David Griffith (General Secretary of the International Council for the Exploration of the Sea)

Dr. Hyung-Tack Huh, the Chairman of PICES, honorable members of the Governing Council:

The International Council for the Exploration of the Sea (ICES) extends its warmest greetings to you on the Eleventh Annual Meeting of the North Pacific Marine Science Organization, but we prefer to use the short form of your title in recognition of the close connections between us.

We also extend personal greetings to your Chairman, Dr. Hyung-Tack Huh, and the Chairman of your Science Board, Dr. Ian Perry, who addressed the ICES Council during the course of our Centenary Meeting earlier this month. The contributions of Drs. Huh and Perry were welcomed by the ICES Delegates, who recognised the importance of the matters of common scientific interest between ICES and PICES.

The importance to ICES of continuing and extending cooperation with PICES is explicitly recognised in the Action Plan that was adopted by ICES this year (following the establishment of our Strategic Plan in 2001). Under Goal 5, *Enhance collaboration with organisations, scientific programmes, and stakeholders (including the fishing industry) that are relevant to the ICES goals*, the Action Plan includes the commitment to "further develop joint activities with PICES in support of the ICES/PICES Memorandum of Understanding, including co-sponsorship of symposia, joint working groups, and collaboration on projects with marine ecology and environmental processes, and on advancing our capacity to understand marine ecosystem, climate variability and marine ecosystem impacts".

The ICES/PICES/GLOBEC Symposium on *The Role of Zooplankton in Global Ecosystem Dynamics: Comparative studies from World Oceans* will be a major event for the marine ecologist in general, and planktologists in particular, in 2003. Among other things, it will obviously afford an opportunity for ICES and PICES to draw up clear proposals for implementing further joint actions. We therefore look forward to the outcome of the Symposium. The Workshop on "Ways to increase interactions between ICES and PICES" (in conjunction with the Symposium) is particularly relevant in the context of this presentation.

During the interventions by ICES Delegates in Copenhagen three weeks ago, following the presentations by Drs. Huh and Perry, three subject areas were specifically mentioned as affording opportunities for fruitful cooperation:

- Reports on state of the ocean ecosystem, and the development of ecosystem indicators;
- The development of an ecosystem approach to fisheries assessment; and
- The investigation of harmful algal blooms.

These and other related topics have been taken into the 2003 ICES Science Programme, specifically in the tasks given to the Working Group on *Zooplankton Ecology*, the Working Group on *Ecosystem Effects of Fishing Activities*, the ICES/GLOBEC Working Group on *Cod and Climate Change*, the ICES-IOC Steering Group on *Global Ocean Observing System*, the Study Group on *Modelling of Physical/Biological Interactions* and the ICES/IOC Working Group on *Harmful Algal Bloom Dynamics*. The Working Group on

Introductions and Transfers of Marine Organisms, and the ICES/IMO/IOC Study Group on *Ballast and Other Ship Vectors*, will also be of interest to PICES.

These inter-sessional activities are summarised below (the details are provided in the following Annex). ICES invites and encourages PICES to take part in all of them, either by representation through existing ICES members of the groups, or directly by arrangement with the ICES General Secretary, David Griffith.

Annex to remarks by Dr. Keith Brander (ICES)

The **Working Group on *Zooplankton Ecology***, which will meet in Gijón, Spain, from February 24-26, 2003, will address a number of scientific tasks (in addition to assisting the finalisation of the arrangements for the major ICES/PICES/GLOBEC Symposium to be held there in May). The Working Group's terms of reference include "evaluate possible biological indices of ecological significance for the fisheries and environmental assessment groups, taking into account the evaluation framework adopted by the Advisory Committee on *Ecosystems* in 2000 and described by the Working Group on *Ecosystem Effects of Fishing Activities* in 2000 and 2001". Incorporating environmental information for the fisheries and environmental assessment groups is an important task that the Working Group on *Zooplankton Ecology* initiated in 1999. In 2003, the group will continue its discussion on the selection, interpretation and validation of the list of indices. The list of indices produced during 2001 and 2002 will be reviewed, refined and supported with scientific literature.

The **Working Group on *Ecosystem Effects of Fishing Activities*** will meet at the ICES headquarters in Copenhagen, Denmark, from April 1-8, 2003, with a long list of tasks, mainly in response to requests from the ICES Client Commissions for Scientific Advice. The terms of reference include two more general items, however, which are intended to further develop the ecosystem approach in an ICES context:

- continue development of a framework for the provision of integrated ecosystem advice within ICES and consider how this could be operationalised in the near future;
- continue the exploration of the effects of fishing activities on fish assemblages and marine ecosystems with particular focus on (i) the exploration of spatial analysis methods for assessing ecosystem properties, and (ii) further investigation of the suitability of the metrics examined in 2002 for use in the support of scientific advice in the context of an ecosystem approach to management.

The **ICES/GLOBEC Working Group on *Cod and Climate Change*** will meet in New Bedford, U.S.A., from May 7-9, 2003, preceded by the Workshop on *Synthesis of Cod and Climate Change*. The Working Group's terms of reference are to:

- review and evaluate the outcome of the Workshop on *Synthesis of Cod and Climate Change* and determine follow-up activities;
- update data and information on the life history of the various North Atlantic cod stocks as part of the synthesis work of the *Cod and Climate Change* Programme;
- review plans for the theme session on *Transport of Eggs and Larvae to Cod Stocks of the North Atlantic*, for the 2003 ICES Annual Science Conference; and for the 2004 ICES Symposium on *Influence of Climate Change on North Atlantic Fish Stocks*;
- discuss the future directions of the *Cod and Climate Change* Programme.

The **ICES-IOC Steering Group on *Global Ocean Observing System***, which will meet in Nantes, France, from April 9–10, 2003, concerns another area where closer collaboration with PICES should be productive. It should be particularly beneficial if we could discuss how ICES and PICES might move towards a common approach on two particular products, our North Atlantic Climate Status Report and your North Pacific Ecosystem Status Report.

The **Study Group on *Modelling of Physical/Biological Interactions*** will meet in Chapel Hill, U.S.A., from March 10–12, 2003. The group is concerned with the evaluation and development of tools, methods and models required to increase the understanding of the interaction between the living resources of the sea and the physical environment, and thus directly addresses two of the three subjects highlighted above as affording special opportunities for fruitful cooperation between ICES and PICES.

The **ICES/IOC Working Group on *Harmful Algal Bloom Dynamics***, which will meet in Aberdeen, Scotland, from March 17-20, 2003, will address a number of important issues. These include the consideration of the analysis of shellfish toxicity, and the significance of eutrophication, in regard to harmful algal bloom (HAB) dynamics. The question of resolving problems in the use of molecular probe technology, and information about emerging new methods, will also be discussed, as will new techniques for estimating abundance and biovolume of HAB species. Information concerning fish kills by HABs will be examined in order to study the effect on fish fecundity and egg survival. The Working Group will also explore the possible role of phycotoxins in HAB dynamics and food chain effects. The group is also interested in the potential for joint research which should be afforded by the joint EU-US programme, which will come from an ECOHAB-EUROHAB Workshop on *Harmful Algal Blooms*. This information will be brought to the Working Group by our IOC partners, as the Workshop is being organised under the aegis of the IOC Intergovernmental Panel on *Harmful Algal Blooms* (IPHAB).

The **Working Group on *Introductions and Transfers of Marine Organisms***, which will meet in Vancouver, Canada, from March 26-28, 2003, would like to avail of the opportunity to hold discussions with PICES on this globally important topic. The meeting will be held immediately after the meeting of the **ICES/IMO/IOC Study Group on *Ballast and Other Ship Vectors***, also in Vancouver, on March 24-25, 2003.

GC Endnote 8

Remarks by Dr. Roger Harris, on behalf of Dr. Will Steffen (Executive Director of the International Geosphere-Biosphere Program)

Dr. Hyung-Tack Huh, the Chairman of PICES, honorable members of the Governing Council:

Today, I would like to review various IGBP projects where collaboration with PICES is ongoing and invited. Most of IGBP's projects are currently undergoing synthesis. In addition, an overall IGBP synthesis is underway and is progressing rapidly. A final draft was sent out for external review in October 2002. As the synthesis moved towards completion, more attention within IGBP has been focused on the new questions arising from the synthesis and other global change work, and on the integration with the three other global change research programmes - IHDP (International Human Dimensions Programme on Global Environmental Change), WCRP (World Climate Research Programme) and DIVERSITAS (an international programme of biodiversity science). IGBP is planning for a second decade of international global change research, building on the successes of the first decade, and IGBP Phase II is due to be launched in early 2003.

IGBP is now evolving towards a new structure: from the current suite of eight core projects (BAHC, GCTE, GLOBEC, IGAC, JGOFS, LOICZ, LUCC, PAGES) and three framework activities (DIS, GAIM, START) to a more Earth System-oriented structure built around three large domains - *land*, *atmosphere*, *ocean* - and the three interfaces between them. GAIM and PAGES will continue as Earth System-level integrative activities. Given the various timeframes of the current suite of IGBP elements, the move to a new structure will be an evolutionary one over a period of years.

PICES is mostly concerned about one domain (*ocean*) and two interfaces (*ocean-atmosphere* and *land-ocean*). The basic research themes of the new elements of IGBP related to PICES activities are as follows:

Ocean-atmosphere

An important feature of planetary functioning is the movement of materials and energy between the oceans and the atmosphere. However, these processes are still relatively poorly understood or quantified. IGBP, SCOR, CACGP and WCRP are initiating the new project SOLAS (Surface Ocean - Lower Atmosphere Study) which aims to quantify the key chemical and physical interactions and feedbacks between the ocean and the atmosphere, and how this interaction affects, and is affected by, global change. How do ocean and atmosphere mutually influence each other? How do physical, chemical and biological processes in the upper ocean affect the ocean-atmosphere fluxes of important trace gases such as carbon dioxide? SOLAS was approved by the SC-IGBP in February 2001, as the first new project in IGBP II. A Scientific Steering Committee has been appointed and the first phase of implementation is now under intensive planning.

Ocean

The ocean constitutes the largest portion of the Earth's surface and is inextricably involved in the physical, chemical, and biological processes that regulate the Earth System. What are the feedbacks from changes in the ocean to the global environment? What are the implications for fisheries? How are materials, especially carbon compounds, transported to and stored in the deep ocean? What are the key physical, chemical and biological processes that link the oceans to the continental margins? A new oceans effort in IGBP will consist of two elements, GLOBEC and OCEANS. The GLOBEC project continues in its implementation phase. GLOBEC has excellent links with PICES, particularly through the CCCC Programme. JGOFS has now moved into its synthesis and integration phase and will complete its work by the end of 2003. Planning for a new Ocean Biogeochemistry and Ecosystems Analysis activity (OCEANS), in collaboration with SCOR, is actively underway and a project based on this process will work very closely with GLOBEC to form the ocean compartment of the IGBP II structure.

Land-ocean

A rapidly growing proportion of the world's population lives in the coastal zone, with enormous impacts on this narrow but valuable strip. What do the accelerating changes to the coastal zone mean for its ability to transmit, filter and store materials from land areas upstream? How will systemic changes in the Earth System impact the coastal zone, especially the most vulnerable areas? What are the implications of a changing Earth for management strategies in the coastal zone? To tackle these questions, the LOICZ core project will continue into Phase II. LOICZ is currently embarking on a synthesis project to pull together what it has learned from its first phase and to provide a sound scientific basis on which to develop approaches to the questions of the next decade.

PAGES (Past Global Changes)

Many features of the Earth tell a story of past environmental changes. By studying gas trapped in ancient ice, the layers in marine sediments, annual growth bands in trees and long-lived corals, it is possible to see what the Earth was like in the past and how it has changed over time. The PAGES research community works toward improving our understanding of current and future global change by placing it within a long-term perspective. Knowing how the environment fluctuated in the past before humans were a significant force helps us to distinguish natural from human-induced change. The PAGES-CLIVAR intersection is a model for the increasing collaborative nature of PAGES research. The project has broadened from focusing primarily on paleo-climate in its early stages to becoming a paleo-environmental effort that is reaching out to other parts of IGBP as well as to IHDP.

GAIM (Global Analysis, Interpretation and Modelling)

It is important, but not enough, to understand parts of the Earth System and how they are changing over time. This information must be integrated in order to build a more complete understanding of our planet as a whole, and to project the evolution of global conditions into the future. Analytical tools such as numerical models provide the best approach for understanding the many interactions that make up the whole Earth System. The role of the GAIM Task Force is to integrate the "pieces of the puzzle", often using global models, to achieve a better understanding of the planet's metabolism and an increased capacity to describe and predict human influences on it. Thus, GAIM's focus has now turned to Earth System Science more broadly, and is developing new approaches to integrate research across the programme. GAIM has drafted a set of overarching Earth System questions that will guide its work over the coming years and is promoting a suite of modelling techniques to explore Earth System dynamics. Collaboration with WCRP and IHDP on Earth System analysis and modelling is a key feature of the new GAIM.

Earth System Science Partnership

The three Global Environmental Change (GEC) research programmes, IGBP, IHDP and WCRP, decided at their 2000 Scientific Committee meetings to initiate an integrated study of the Earth System as a whole, in its full functional and geographical complexity over time, while at the same time pursuing the more applied scientific understanding required to help human societies develop in ways that sustain the global life support system. The challenge to the Earth System Science Partnership is to build on their existing foundation an international programme of Earth System Science, driven by a common mission and common questions, employing visionary and creative scientific approaches, and based on an ever closer collaboration across disciplines, research themes, programmes, nations and regions. More recently, with the re-launch of DIVERSITAS, the Earth System Science Partnership has been expanded to include this programme as the fourth member.

Driving the work of the ESS Partnership are two critical messages that have arisen out of the past decade of global change research. First, the Earth functions as a system, with properties and behaviour that are characteristic of the system as a whole. These include critical thresholds, "switch" or "control" points, strong nonlinearities, teleconnections, and unresolvable uncertainties. Understanding components of the Earth System is critically important, but is insufficient on its own to understand the functioning of the Earth System as a whole. Second, humans are now a significant force in the Earth System, altering key process rates and absorbing the impacts of global environmental changes. In fact, the environmental significance of human activities is now so profound that the current geological era can be called the "Anthropocene".

Objectives of the Earth System Science Partnership research effort include:

- Answers to fundamental questions about the Earth System (*e.g.*, how stable is the coupled system in the face of major perturbations?);
- New approaches to designing research that integrate paradigms and questions from the beginning;
- Innovative and integrative simulation tools of varying complexity that can tackle systemic questions;
- Harmonisation of social and biophysical information and data, where appropriate;
- Vigorous effort to communicate Earth System Science to a number of target audiences: broader scientific community, policymakers, resource/environment managers, public;
- Proactive measures to make scientifically-based contributions to governance for the 'sustainable management' of our global environment.

In addition to core research on Earth System Science, the ESS Partnership is launching new joint projects on critical issues of global sustainability - the *Global Carbon Project*,

Global Environmental Change and Food Systems and the *Joint Water Project*. The joint projects are cross-cutting in nature in that much of the required research is already being undertaken or is planned in IGBP, IHDP, WCRP and DIVERSITAS core projects. Considerable coordination is needed, however, to bring these elements into a more integrated framework, and some new work will need to be initiated where gaps are identified. Strategic partnerships are being developed with other research institutions outside the three programmes, and with policy and management institutions, to ensure that the work is designed and implemented in ways that facilitate its application.

The *Global Carbon Project* is of particular interest to PICES. The reality of climate change has focused attention on greenhouse gases in the atmosphere, especially carbon dioxide. Carbon does not stay in the atmosphere, however, but cycles through numerous forms in the oceans and on land, in some cases remaining in storage for many years or decades. Thus, effective policy debate and action must be built on a scientific understanding of the entire carbon cycle. Officially launched in July 2001, the *Global Carbon Project* provides an integrated framework across disciplines as well as national boundaries. The framework (see http://gaim.sr.unh.edu/cjp/GCP_FRAMEWORK.html) is organised around three overarching questions:

- What are the current geographical and temporal patterns of carbon sources and sinks?
- What are the controls and feedbacks that determine the dynamics of the carbon cycle on scales of years to millennia?
- What are the likely dynamics of the global carbon cycle into the future?

GC Endnote 9

Statement on the naming of the Sea in dispute by Dr. Tokimasa Kobayashi (Japanese delegate)

I would like to talk about the name of the Sea of Japan. In this Annual Meeting, for example, in the title of the FIS Topic Session (S5), the name "Japan/East Sea" was used.

I know well that PICES is a purely scientific organization, and diplomatic issues should not be discussed by Council. However, according to the instructions of my government, as a Japanese delegate, I would like to state Japan's position on the name of this Sea.

In the international arena, only the name "Sea of Japan" was used in the recent edition of the International Hydrographic Organization's "Limits of Oceans and Seas 1953". Furthermore, at the 8th United Nations Conference on the *Standardization of Geographical Names*, held in the late summer of 2002, the countries concerned about this issue were encouraged to continue their efforts to find a solution acceptable to all of them. Also at the Conference, the Chairman stated in his summary that individual countries cannot impose specific names on the international community, and standardization can only be promoted when a consensus exists.

So, this is Japan's stance that the name of the Sea in the international arena is "Sea of Japan" because this name has been used to date.

Statement on the naming of the Sea in dispute by Dr. Hee-Dong Jeong (Korean alternate delegate)

I would like to request representatives of member countries and the PICES Secretariat to pay special attention to the name of the Sea between the Korean Peninsula and the Japanese Archipelago, which is currently in dispute between the countries concerned.

Korea's basic position on this issue is that the names "East Sea" and "Japan Sea (Sea of Japan)" should be used simultaneously in the classification of the Sea area concerned, until a final resolution is agreed upon by the relevant countries, as recommended in the Resolution

No. III/20 of the United Nation Conference on *the Standardization of Geographical Names*, in 1997.

I would like to add that any document or material from PICES should not use just the one name “Sea of Japan (Japan Sea)”, and that the Republic of Korea will not accept or approve such a document or material in any event. I request that my comments be put on record in the report of this Council meeting.

REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE

The Finance and Administration Committee (F&A) met from 08:30-12:30 hours on October 22, from 08:30-12:30 on October 24, and from 10:00-11:30 on October 25, under the chairmanship of Dr. Richard J. Marasco. Dr. Alexander S. Bychkov acted as rapporteur.

Agenda Item 1. Opening by the Chairman

The Chairman called the meeting to order, welcomed participants and requested an introduction of members for each delegation (see *F&A Endnote 1* for list of participants).

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 2001

The Auditor's Report for 2001 (*F&A Endnote 3*) was circulated to all Contracting Parties in March 2002. In the auditor's opinion, the financial statements are an accurate representation of the financial position of the organization as of December 31, 2001.

The Report was reviewed and adopted by the Committee. The Committee recommends that Council approve the Report and retain the accounting firm of *Flader & Greene* as auditor for another year.

Agenda Item 4. Annual contributions

According to Financial Regulation 5(ii), all national contributions to PICES are payable by the first day of the financial year (January 1) to which they relate. The Executive Secretary reviewed historical statistics on the payment schedule of annual fees to the Organization (*F&A Endnote 4*), and reported on the 2002 annual fees payment dates. Dues for 2002 were paid as follows:

Japan - November 27, 2001
U.S.A. - December 24, 2001
Canada - January 21, 2002
Russia - June 10, 2002 (72%) and October 10, 2002 (28%)
Republic of Korea - August 26, 2002
People's Republic of China - October 8, 2002 (95.7%) (remittance of the remaining $4,000 will be delayed until 2003)

The Chairman noted that late payments create problems for day-to-day operations of the Secretariat, and reminded the Committee that this issue has been reviewed at previous Annual Meetings. He indicated that there has been an overall improvement in the timeliness of payment, and thanked Japan, Canada and U.S.A. for their performance. He also asked members to advise on problems they are facing in remitting the annual contribution on time.

The discussion led to the following recommendations:

i. The Council should instruct the Executive Secretary to send a letter to member countries commending them for improved performance in submitting annual contributions in 2002, and advising on the benefits of paying contributions by the first day of the PICES financial year (January 1), as required by Financial Regulation 5(ii).

ii. To assist countries in preparing their funding requests to cover annual contributions, and the Executive Secretary in developing future budgets:

   - 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 in Canada (currently about 3%). Calculations will be made using the total Consumer Price Index (CPI) as of August of the current financial year;

- Starting from the Twelfth Annual Meeting (2003), Council should consider and adopt the budget for the ensuing and subsequent financial years. This action will require changes in the Rules of Procedure (Rule 15) and the Financial Regulations (Regulation 3(v)). The Executive Secretary should be requested to develop the appropriate wording changes for consideration at the next Annual Meeting.

The Chairman introduced an analysis of inflation-adjusted contributions since 1992. Adjusted contributions have actually decreased for Canada, China, Japan and the United States; remained about constant for Russia and increased slightly for Korea. It was agreed that members would be prepared to discuss the analysis at the next Annual Meeting.

Agenda Item 5. Fund-raising

The Executive Secretary reported on fund-raising efforts in 2002. External and additional funding received for various activities initiated by PICES is reflected in the Report on Administration (*GC Endnote 3*). The Committee commended the Science Board Chairman and the Secretariat for their efforts.

Fund-raising activities are facilitated by the development of project proposals. The Committee suggests that the Science Board has to be tasked with the responsibility of providing the proposals.

Agenda Item 6. Budget

a. Estimated accounts for fiscal year 2002

The Committee reviewed and discussed the estimated accounts for *FY* 2002. There is a projected surplus of $10,000. The Committee recommends that Council accept the estimated expenditures for *FY* 2002.

b. Budget for fiscal year 2003

The Committee reviewed the proposed *FY* 2003 budget of $692,500 (*F&A Endnote 5*) and recommends its approval by Council. This amount includes a grant of $69,500 provided by the Sloan Foundation for the preparation of the report for the Census of Marine Life (entitled "Marine life in the North Pacific Ocean: The known, unknown and unknowable") by December 31, 2003. Without this grant, the amount $623,000 is exactly the same as the *FY 2002* budget.

An additional transfer of $41,000 from the Working Capital Fund is recommended to reduce the total annual contribution to $582,000, setting the 2003 fees at $97,000 per Contracting Party. A modest increase of about 3% over the previous year is consistent with the guideline accepted at the PICES Eighth Annual Meeting (Decision 99/A/2(ii), 1999 Annual Report, p. 30). The Executive Secretary noted that the total Consumer Price Index (CPI) was 2.6% in August 2002, as published by Statistics Canada on behalf of the Bank of Canada.

The Japanese delegation requested that consideration be given to the harmonization of PICES activities with available funds. Further, the Japanese Government is requesting many international organizations to keep their nominal budget increase equal to zero, and PICES cannot be an exception.

The Chinese delegation suggested that the budget increases should be controlled to a consistent level with the rate of inflation in Canada.

c. Forecast budget for fiscal year 2004

The *FY* 2004 forecast budget of $660,000 was examined by the Committee and is submitted to Council for information only. Consistency with guidelines adopted by Council in 1999 (Decision 99/A/2(ii)) would set the 2004 fee at $100,000 per Contracting Party and requires a transfer of about $60,000 from the Working Capital Fund. The Committee believes that the practice of transferring surpluses from the Working Capital

Fund to the General Fund is a viable approach to balance accounts. However, it was noted that the projected 2003 "guaranteed" miscellaneous income of about $40,000 is lower than the required transfer.

The *FY 2004* budget will be considered further at PICES XII.

d. 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 in 2002 is estimated to be about $94,200, but the "guaranteed" miscellaneous income (tax rebates, income tax levies from foreign staff and bank interest) will be only about $45,700. The Committee noted significant voluntary contributions ($65,800) and outside funding ($83,100) for various activities initiated by PICES.

e. Working Capital Fund

The balance in the Working Capital Fund is forecast to be about $271,500 at the end of 2002. The Committee recommends that the amount of $110,500 be transferred to the General Fund for 2003. This amount includes a grant of $69,500 from the Sloan Foundation for the preparation of the report for the Census of Marine Life, and $41,000 to support high priority PICES projects.

The Committee recommends that $19,900 be transferred to the Trust Fund to recover the 2002 expenditures, and restore the Trust Fund to the level of $100,000. An additional transfer of $27,500 from the Working Capital Fund to the Trust Fund is recommended to finance the 2003 Intern Program.

After these transfers, the Working Capital Fund will total approximately $113,600.

f. Home Leave Relocation Fund

The status of the Home Leave Relocation Fund was reviewed. It was noted that there were no expenditures in *FY 2002*. The Fund will total about $111,730 by the end of the fiscal year. This amount exceeds the required balance by $1,730, and should be transferred to the Working Capital Fund.

g. Trust Fund

In *FY 2002*, approximately $60,000 from the Trust Fund will be used to finance the Intern Program, to bring young scientists from all PICES member countries and scientists from countries with "economies in transition" to the PICES Eleventh Annual Meeting, and to support activities of Working Groups and Task Teams. These expenditures are compensated partly by the voluntary contributions from Canada, Russia and U.S.A. for the Intern Program, and by a travel grant from the Scientific Committee of Oceanic Research (SCOR). Total income in this Fund is at a level of $35,600. A transfer of $19,900 from the Working Capital Fund to the Trust Fund is recommended to recover the 2002 expenses, and restore the Trust Fund to a level of $100,000. An additional transfer of $27,500 from the Working Capital Fund to the Trust Fund will allow funding of the 2003 Intern Program.

Agenda Item 7. Report of PICES Review Committee

The Chairman presented a draft Review Committee Report. It was indicated that the following items might potentially have budgetary implications:

- Interim Science Board/Governing Council meeting;
- Secretariat staffing; and
- Review of current publication practices of the Organization.

The Committee concluded that the interim meeting would have minimal budgetary implication for the Organization, since member countries will cover travel expenses for Governing Council and Science Board members. Two Secretariat staffing issues were discussed: (1) adding an additional staff member, and (2) re-naming of staff positions. The Committee believes that expanded activities of the Secretariat and development of the North Pacific

Ecosystem Status Report could justify an increase in the Secretariat's size. Further action on the naming of positions will require discussions between the Secretariat and Canada to ensure that the act is budget-neutral.

Publication activities of the Organization have expanded significantly in the last several years. The Committee supports a review of current practices. It is 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 Science Board/Governing Council meeting.

Agenda Item 8. PICES Intern Program

The Committee agreed that PICES and member countries benefit from the Intern Program and that it should be continued.

The Intern Program was not budgeted for in the years 2000-2002, and was financed solely by voluntary contributions. The Committee recommends that Council invite member countries to provide voluntary contributions to support the Intern Program in 2003 and beyond.

Last year, Council decided to use registration fees collected from the Annual Meeting to finance the Program (Decision 01/A/4(iv)). The Committee recommends the continuation of this approach and suggests that the registration fees collected from the Eleventh Annual Meeting be transferred from the Working Capital Fund to the Trust Fund to support the 2003 Intern Program. Expenses for the Intern Program are projected at a level of $27,500.

The Committee discussed whether the current stipend of $2,000 per month is sufficient to cover the cost of living in Canada, and concluded that for *FY 2003* the stipend will remain the same. This issue should be re-visited in the future.

Agenda Item 9. PICES Visiting Scientist Program

No proposals for secondment from national agencies and/or other international science organizations were received by the Secretariat in 2002. Consideration of alternative mechanisms to fund the program was recommended because of the lack of interest.

Agenda Item 10 PICES capacity building

The PICES Review Committee defined capacity building as the enhancement of intellectual capital available to the Organization. It is important that the definition adopted be consistent with the one used by other international organizations. The Committee supports the formation of a Study Group under the direction of the Science Board to develop a capacity building strategy and implementation plan for the Organization.

Agenda Item 11. Schedule and financing of future Annual Meetings

The Secretariat did not receive detailed information on financial requirements and commitments from the Ministry of Marine Affairs and Fishery of Korea, and $40,000 (from $50,000 in the proposed *FY 2003* budget) is available to be transferred to Korea to partially cover meeting costs for PICES XII.

At the Tenth Annual Meeting, Council requested the United States of America to consider the possibility of holding PICES XIII in October 2004 (Decision 01/A/4(iii)). A letter from Dr. Richard Marasco (US Delegate) indicated willingness in hosting the meeting from October 15-23, 2004, in Honolulu, Hawaii. The Committee recommends the acceptance of this proposal.

In keeping with the six-year rotation cycle, the Russian Federation should be invited to explore the feasibility of hosting PICES XIV in October 2005, and inform the Secretariat on this matter by May 31, 2003.

Last year, Council approved charging a registration fee for future PICES Annual Meetings (Decision 01/A/3(iv)). The Committee recommends continuation of this practice. 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. The proposed registration fee structure for 2003 is as follows:

Type	CDN $
Registration fee	150
Early registration fee	100
Students	40

The Committee recommends that national representatives at the Council and F&A meetings be exempted from the registration fee for the PICES Annual Meetings.

Canada proposed, and the Committee supported, the proposal to discontinue the practice of transferring funds from PICES to member countries to partially cover Annual Meeting costs. This action could reduce the need to transfer funds from the Working Capital Fund to the General Fund.

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

Space and certain general administrative services are traditionally 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. According to this agreement, PICES paid an annual sum of $23,000 (in quarterly payments of $5,750 due on the 1st day of April, July, October and January), which included a solid figure for postage ($18,500), phone/fax ($2,500) and janitorial/ maintenance services ($2,000). 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 amendment, PICES is to pay an annual sum of $28,000 (in quarterly payments of $7,000), which includes $23,500 for postage. Figures for phone/fax ($2,500) and janitorial/ maintenance services stay the same.

In June 2001, PICES registered "*pices.int*" as our domain name, and changed our website and e-mail addresses. The old site and e-mail addresses remained valid until the end of 2001. The initial cost of equipment and installation was $2,700. The monthly cost of operation is about $140. This compares with $2,000 annually that was formerly paid to DFO for network services.

Agenda Item 13. Other business

The Science Board Chairman, Dr. R. Ian Perry, explained the current status of the North Pacific Ecosystem Status Report. The Committee commended the efforts of Drs. Perry and McKinnell for developing a strategy for the preparation of the report. This project, in order to be successful, will require the full cooperation of all member countries. The Committee supports the establishment of the proposed Working Group on the North Pacific Ecosystem Status Report under the direction of the Science Board.

Agenda Item 14. Adoption of recommendations to Council

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

F&A Endnote 1

Participation List

Canada
Denis D'Amours (alternate Delegate)
Laura Richards

Japan
Tokimasa Kobayashi
Tokio Wada (advisor)

People's Republic of China
Qian-Fei Liu (alternate Delegate)

Republic of Korea
Hee-Dong Jeong (alternate Delegate)
Won-Seok Yang (alternate Delegate)

Russia
Vladimir A. Belyaev (advisor)
Alexander A. Kurmazov
Igor I. Shevchenko

U.S.A.
Elizabeth J. Tirpak

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

F&A Endnote 2

F&A Committee Meeting Agenda

1. Opening by F&A Chairman
2. Adoption of agenda
3. Audited accounts for fiscal year 2001
4. Annual contributions
5. Fund-raising activities
6. Budget
   a. Estimated accounts for fiscal year 2002
   b. Proposed budget for fiscal year 2003
   c. Forecast budget for fiscal year 2004
   d. Interest and other income
   e. Working Capital Fund
   f. Home Leave and Relocation Fund
   g. Trust Fund
7. Report of PICES Review Committee
8. PICES Intern Program
9. PICES Visiting Scientist Program
10. PICES capacity building
11. Schedule and financing of future Annual Meetings of the Organization
12. Space, facilities and services
13. Other business
14. Adoption of recommendations to Council

F&A Endnote 3

Auditor's report (2001) to the Organization

Flader and Greene
Chartered Accounts
9768 Third Street
Sidney, B.C.,
Canada. V8L 3A4

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, 2001 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, 2001, 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

Sidney, B.C.
March 22, 2002

768 Third Street, Sidney, BC, V8L 3A4 Fax: (250) 656-6486 Telephone: (250)656-3991
E-mail: mail@fladergreene.com

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
STATEMENT OF FINANCIAL POSITION
AS AT DECEMBER 31, 2001

ASSETS

	2001	2000
CURRENT ASSETS		
Cash and short term deposits	$ 559,620	$ 495,200
Accounts receivable	36,240	45,801
Prepaid expenses	2,350	1,460
	$ 598,210	$ 542,461

LIABILITIES

CURRENT LIABILITIES		
Accounts payable	$ 14,401	$ 25,601
Funds held for contracting parties (Note 3)	188,000	91,300
	$ 202,401	$ 116,901

FUND BALANCES

WORKING CAPITAL FUND	$ 180,809	$ 215,392
TRUST FUND	105,000	100,000
HOME LEAVE RELOCATION FUND	110,000	110,168
	$ 395,809	$ 425,560
	$ 598,210	$ 542,461

STATEMENT OF OPERATIONS AND CHANGES IN FUND BALANCES
FOR THE YEAR ENDED DECEMBER 31, 2001

	General Fund	Working Capital Fund	Trust Fund	Home Leave Relocation Fund	2001 Total	2000 Total
FUND BALANCES, beginning of year	-	$ 215,392	$ 100,000	$ 110,168	$ 425,560	$ 357,153
SOURCES OF FUNDS						
Contributions from Contracting Parties	547,800	-	27,000	-	574,800	546,090
Budgeted transfer to General Fund	58,200	(58,200)	-	-	-	-
Contributions and grants	-	86,171	7,701	-	93,872	188,089
Interest and other income (Note 4)	-	55,635	2,924	4,662	63,221	39,550
FUND BALANCES, before expenditures	606,000	298,998	137,625	114,830	1,157,453	1,143,282
EXPENDITURES						
Personnel services	296,000	11,604	-	-	307,604	286,297
Travel	79,213	-	25,300	-	104,513	96,232
Communication	29,879	-	-	-	29,879	29,252
Contractual services	10,490	-	-	-	10,490	15,893
Printing	63,781	-	-	-	63,781	57,030
Supplies	5,720	-	-	-	5,720	6,983
Equipment	5,849	-	-	-	5,849	10,877
Annual Meeting	40,000	73,807	-	-	113,807	43,454
Workshops	63,756	-	2,000	-	65,756	104,910
Relocation	-	-	-	4,830	4,830	4,482
Miscellaneous	2,912	-	-	-	2,912	3,355
PICES X Anniversary	-	33,680	-	-	33,680	27,661
Intern program	-	-	17,512	-	17,512	18,060
Unrealized losses on foreign exchange	(4,689)	-	-	-	(4,689)	1,235
	592,911	119,091	44,812	4,830	761,664	717,721
NET FUNDS AVAILABLE	13,089	179,907	92,813	110,000	395,809	425,560
TRANSFER TO WORKING CAPITAL FUND (Note 5)	(13,089)	13,089	-	-	-	-
INTERFUND TRANSFERS (Note 6)	-	(12,187)	12,187	-	-	-
FUND BALANCES, end of year (Note 7)	-	$ 180,809	$ 105,000	$ 110,000	$ 395,809	$ 425,560

NORTH PACIFIC MARINE SCIENCE ORGANIZATION
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2001

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 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 Regulations.

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 and U.S.A. for their 2002 fees.

4. INTEREST AND OTHER INCOME

	Working Capital Fund	Trust Fund	Home Leave Relocation Fund
Interest income	$ 6,069	$ 2,924	$ 3,574
Income tax levies	28,271	-	1,088
GST, PST and WCB rebates	10,028	-	-
Other Income	1,267	-	-
PICES X Ocean Exhibition	10,000		
	$ 55,635	$ 2,294	$ 4,662

5. 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.

6. INTERFUND TRANSFERS

Pursuant to decision 01/A/2(iii) of the Governing Council, an amount to restore the Trust Fund to the level of $105,000 will be transferred.

7. WORKING CAPITAL FUND SURPLUS

Pursuant to decision 01/A/2(i) of the Governing Council, $59,000 of the funds held in the Working Capital Fund will be transferred to the General Fund to reduce 2002 contributions.

8. COMMITMENTS

General administrative and communication services are provided to the Secretariat of the Organization by the Government of Canada through the Department of Fisheries and Oceans. A new agreement commenced April 1, 2001, and continues until March 31, 2004. The fixed cost for services is $23,000 per year which are paid quarterly.

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	Mar. 23, 92			Apr. 24, 92
1993	Dec. 14, 92	***July 30, 93***	Mar. 12, 93			Jan. 8, 93
1994	Feb. 22, 94	Mar. 14, 94	Jan. 28, 94			Feb. 14, 94
1995	Jan. 5, 95	***May 29, 95***	Mar. 4, 95		***July 18, 95***	Mar. 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	Mar. 27, 97	***Apr. 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***	Mar. 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

* bold italics denote late payments
1 partial year from March 23-December 31, 1992;
2 partial payment in 1998, remainder paid in 1999;
3 partial payment (72%), remainder paid Oct. 10, 2002;
4 partial payment (95.7%)

F&A Endnote 5

Budget for fiscal year 2003

Category	**Allotment**
Personnel Services	$ 330,000
Annual Meeting	50,000
Special Meetings	61,000
Travel	82,000
Printing	90,000
Communication	32,000
Equipment	8,500
Supplies	7,500
Contractual Services	28,000
Miscellaneous	3,500
Total	$ 692,500

Source	**Contribution**
Contributions from six Contracting Parties	582,000
Transfer of Working Capital Fund surplus	41,000
Grant from Alfred P. Sloan Foundation	69,500
Total	$ 692,500

2003 Annual Fee for each Contracting Party **$ 97,000**

REPORT OF SCIENCE BOARD

The Science Board met on October 20, 2002 (12:30-13:30), to develop recommendations to the Governing Council from the initial items on the agenda. The second meeting was held on October 25 (08:30-17:30), to deal with the remainder of the agenda, including items with financial implications for 2003 and beyond. Dr. Stewart M. (Skip) McKinnell served as rapporteur for all meetings. (See *SB Endnote 1* for list of participants).

October 20, 2002

The Science Board Chairman, Dr. Ian Perry, welcomed members and observers and called the meeting to order. The agenda was discussed and adopted as presented (*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 XI, Committee Chairmen would identify potential "young scientists". Science Board decided on a procedure to determine a Best Poster Award. Each Committee would nominate one poster for consideration, and Science Board would meet informally at the Poster Session to determine the winner.

It was reiterated that the Closing Session would consist of Best Presentation Awards to be given by each Committee, the Science Board Chairman describing the theme and possible Topic Sessions for the next 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 XI.

Governing Council decisions and Science Board recommendations from PICES X (Agenda Item 5)

Science Board reviewed and accepted the status report on decisions and recommendations from PICES X, which were of relevance to Science Board (*SB Endnote 4*).

October 25, 2002

Dr. Perry opened the second Science Board meeting and welcomed the newly elected Chairman of FIS, Dr. Yukimasa Ishida.

Science Board extended thanks to the outgoing Chairman of FIS, Dr. Douglas E. Hay, for his much appreciated service to PICES. A certificate was presented to Dr. Hay at the Closing Session of PICES XI in recognition of his service.

Discussion of PICES Review Committee Report (Agenda Item 6)

Science Board prepared a discussion document on the structure of PICES and its ability to serve the Organization over the next decade. This was used as input to the PICES Review Committee established by Governing Council. Science Board had planned to discuss the draft Review Committee report, however, not all members of the Scientific Committees had seen the latest

draft. Committee Chairmen will collect comments from members for use in discussions at the interim meeting of Science Board. Suggestions from the CCCC Program included establishing a position of Vice-Chairman of Science Board, and to consider having biennial PICES science meetings alternating with workshops. The former suggestion was recommended to Governing Council; the latter suggestion was not accepted by Science Board.

Items with financial implications for 2003 and beyond (Agenda Item 7)

Science Board discussed agenda items with financial implications to PICES. The following lists of inter-sessional meetings, publications, travel support requests, and related items were endorsed by Science Board and forwarded to Governing Council for approval.

Inter-sessional workshops, Working Group and CCCC Program meetings (Agenda Item 7a)

Meetings to be convened in 2003:

- A 2-day Fifth Annual Workshop on *Salmon ecology in coastal ecosystem*, hosted by NMFS and co-sponsored by PICES, February 11-12, 2003, Newport, Oregon, U.S.A.;
- A MODEL workshop to *Embed NEMURO and NEMURO.FISH into a 3-D circulation model*, March 2003, Yokohama, Japan;
- An Inter-comparison and Workshop on *Underway and drifting/mooring p(CO_2) measurement systems*, March 10-15, 2003, Tsukuba, Japan;
- A PICES/CoML *Regional marine life expert* Workshop I, spring 2003, place TBD;
- A 3-day Interim Science Board meeting, March-April 2003, Sidney, Canada;
- A Workshop on *Variability and status of the East China Sea and Yellow Sea ecosystems*, in conjunction with the PAMS/JECSS Workshop, April 14-16, 2003, Hangzhou, People's Republic of China;
- A 4-day ICES/PICES/GLOBEC International Symposium on *Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans*, May 20-23, 2003, Gijón, Spain;
- The Third PICES Workshop on *Okhotsk Sea and adjacent areas*, June 2003, Vladivostok, Russia;
- A 3-day *North Pacific Ecosystem Status Report* Workshop, August 2003, Sidney, Canada;
- A 2-day WG15/TCODE Workshop on *Harmonization of HAB data*, October 2003 (immediately prior to PICES XII), Seoul, Korea;
- A 1-day MONITOR Workshop to *Examine and critique a North Pacific Ecosystem Status Report*, October 2003 (immediately prior to PICES XII), Seoul, Korea;
- A 1-day BASS Workshop to *Examine linkages between open and coastal systems*, October 2003 (immediately prior to PICES XII), Seoul, Korea;
- A 1-day MBM Advisory Panel Workshop on *Distribution and diets of marine birds and mammals: Patterns produced by biophysical coupling and lower trophic level dynamics*, October 2003 (immediately prior to PICES XII), Seoul, Korea;
- A PICES/CoML *Regional marine life expert* Workshop II, November 2003, Sidney, Canada;
- An IFEP Workshop on In situ *iron enrichment experiments in the eastern and western subarctic Pacific*, November-December 2003, Sidney, Canada.

Meetings planned or anticipated for 2004 and beyond:

- A 4-day SCOR/IOC/PICES/GLOBEC conference on *Quantitative ecosystem indicators for fisheries management*, March 31-April 3, 2004, Paris, France;
- A BASS/NPAFC Workshop on *Open ocean and coastal systems*, October 2004 (in conjunction with PICES XIII), Honolulu, U.S.A.;
- A PICES/CLIVAR Workshop to further develop interaction with CLIVAR, October 2004 (in conjunction with PICES XIII), Honolulu, U.S.A.;
- A REX Workshop on *The climate shifts of 1977, 1989, and 1999: Differential physical forcing and ecosystem response in the PICES region*, October 2004 (in conjunction with PICES XIII), Honolulu, U.S.A.;

- A major inter-sessional symposium to synthesize the CCCC questions and results, in 2005/6.

Proposed publications (Agenda Item 7b)

PICES Scientific Report Series in 2003:
- Final report of WG 13 on *CO_2 in the North Pacific*;
- Proceedings of the 2002 CCCC Integration Workshop;
- Report of the 2002 MONITOR Workshops;
- Report of BASS and MODEL TTs on *Ecosystem models for the subarctic Pacific gyres*;
- *Marine life in the North Pacific Ocean: The known, unknown and unknowable* (report for the Census of Marine Life).

PICES Scientific Report Series in 2004:
- Final report of WG 14 on *Effective sampling of micronekton*;
- Final report of WG 16 on *Climate change and fisheries management*;
- Report of the 2003 IFEP Workshop in Sidney, Canada;
- Proceedings of the Third PICES Workshop on *Okhotsk Sea and adjacent areas*;
- Guide of best practices for oceanic CO_2 measurements and data reporting (WG 17);
- North Pacific Ecosystem Status Report.

Special issues of primary journals in 2003:
- *Marine Environmental Research* - papers resulting from the 1999 MEQ Practical Workshop.
- *Progress in Oceanography* - selected papers from the 2001 BIO Topic Session on *Plankton size classes, functional groups and ecosystem dynamics*;
- *Journal of Oceanography* - selected papers from the 2002 PICES Symposium on *North Pacific transitional areas*;
- *Fisheries Oceanography* - selected contributions to the GLOBEC Open Science Meeting.

Special issues of primary journals in 2004 and beyond:
- *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*;
- *Journal of Marine Systems* - selected papers from the 2002 POC/FIS Topic Session on *Detection of regime shifts in physics and biology*;
- *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*;
- *Journal of Oceanography* - invited papers on JGOFS North Pacific synthesis (jointly with JGOFS);
- *ICES Journal of Marine Research* - selected papers from the ICES/PICES/GLOBEC International Symposium on *Role of zooplankton in global ecosystem dynamics: Comparative studies from the world oceans*.

Other:
- Book in "Fish and Fisheries" series of Cambridge Press, resulting from the PICES XII session on *Aquaculture within an ocean ecosystem*;
- Book on *History of PICES*.

Science Board endorsed publishing the above items. The Science Board Chairman noted the request by the Secretariat that material from the CCCC Workshops should be submitted to the Secretariat **by February 1, 2003,** to be published in the PICES Scientific Report Series in a timely fashion. Committee Chairmen were reminded to identify Guest Editors and to develop a publication timetable for papers destined for primary journals.

Travel support requests (Agenda Item 7c)

- One invited speaker per Scientific Committee for Topic Sessions at PICES XII. Additional requests for travel support were: TCODE (1), BIO (1), FIS (2), MEQ (2), POC (2), and SB (3) for the SB Symposium;

- Seven scientists to attend CCCC-related meetings: inter-sessional MODEL (1) and IFEP (1) Workshops; BASS (1) and MONITOR (1) Workshops in conjunction

with the PICES Twelfth Annual Meeting; MODEL (1) and REX (1) Topic Sessions at PICES XII, and ICES/IOC Steering Group for GOOS meeting (1);
- Other travel requests include: support for PICES Convenor to attend the Zooplankton Production Symposium (May 2003, Gijón, Spain) and 2-3 scientists to attend the *North Pacific Ecosystem Status Report* Workshop (August 2003, Sidney, Canada);
- Trust Fund travel requests were: 1-2 scientists to attend the Third PICES Workshop on *Okhotsk Sea and adjacent areas*; 1 Russian scientist to attend the meeting of the Marine Birds and Mammals Advisory Panel, and 2 young Chinese scientists to attend FIS sessions at PICES XII;
- Science Board Chairman to attend the IGBP OCEANS Meeting (January 2003, Paris, France), the PICES/ICES/GLOBEC Zooplankton Production Symposium (May 2003, Gijón, Spain), and the ICES Annual Conference (September, 2003, Tallinn, Estonia).

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.

Future of Working Groups and Scientific Programs and proposed membership changes (Agenda Item 8a)

Science Board recommended that:
- WG 14 on *Effective sampling of micronekton* continue its activities and produce a final report in 2003;
- WG 15 on *Ecology of harmful algal blooms in the North Pacific* continue for an additional year to clearly define the terms of reference and items to be addressed in an on-going manner for potential development as an Advisory Panel or "section" under MEQ;
- WG 16 on *Climate change, shifts in fish production and fisheries management* continue its activities and produce a final report in 2003.

Science Board received the following requests for CCCC membership changes, and recommends their acceptance:
- BASS: Dr. Akihiko Yatsu (Japan) to replace Dr. Andrei S. Krovnin (Russia) as Co-Chairman; Dr. Gordon A. McFarlane (Canada) to continue for one additional year;
- MODEL: Dr. Shin-ichi Ito (Japan) to replace Dr. Bernard A. Megrey (U.S.A.) as Co-Chairman; Dr. Francisco E. Werner (U.S.A.) to continue as Co-Chairman;
- REX: Dr. William T. Peterson (U.S.A.) to remain as Co-Chairman for one additional year until a suitable replacement is found; Dr. Yoshiro Watanabe (Japan) to continue as Co-Chairman.

Science Board noted and appreciated the improved participation in several committees by scientists from China. There is a need for national representatives on Governing Council to revise and update the membership lists of all Committees and Task Teams, and where necessary, appoint new members.

Documentation of PICES Science (Agenda Item 8b

Summaries of the sessions held at PICES XI are included elsewhere in this Annual Report.

New PICES groups (Agenda Item 8d)

The following new groups were proposed:
- A Study Group under Science Board on *PICES capacity building* (*SB Endnote 5*);
- A Working Group under Science Board on the *North Pacific Ecosystem Status Report (SB Endnote* 6);
- An Advisory Panel on a *Micronekton sampling inter-calibration experiment* be formed under BIO to develop and oversee the implementation of a project to compare

different micronekton sampling devices at sea (*BIO Endnote 4*);
- An *ad hoc* NEMURO Experimental Planning Team (NEXT) to develop the scientific strategy to use ecosystem models to examine the central CCCC hypotheses. This team would work by electronic communication (*SB Endnote 7*).

Science Board recommended that these new groups be approved.

Relations with other organizations and programs (Agenda Item 8f)

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 8* 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. MEQ is proposing to participate in the ICES Working Group sessions on *Ballast water and other vectors and transfers of marine organisms*, to be held in Vancouver, March 24-28, 2003.

PICES XII Annual Meeting (Agenda Item 9)

The following list of Workshops and Sessions to be convened at (or prior to) PICES XII was endorsed:

Science Board Symposium ($^3/_4$-day)
Human dimensions of ecosystem variability (Committee Chairmen will serve as Convenors) (*SB Endnote 9*)

MEQ Workshop (2 days)
Harmful algal blooms – harmonization of data (Convenors: TBD)

MONITOR Workshop (1-day)
Examine and critique a North Pacific Ecosystem Status Report (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.)

BASS Workshop (1-day)
Linkages between open and coastal systems (Convenors: Vladimir A. Belyaev (Russia), Gordon A. McFarlane (Canada) and Akihiko Yatsu (Japan))

MBM-AP Workshop (1-day)
Combining data sets on distributions and diets of marine birds and mammals (Convenors: Douglas F. Bertram (Canada) and Hidehiro Kato (Japan))

CCCC (REX) Topic Session (½-day)
Influence of fishing and/or invasive species on ecosystem structure in coastal regions around the Pacific Rim (Convenors: REX Co-Chairmen)

CCCC (MODEL) Topic Session (½-day)
Comparison of modeling approaches to describe ecological food webs, marine ecosystem processes, and ecosystem response to climate variability (Convenors: Michio J. Kishi (Japan), Bernard A. Megrey and Francisco E. Werner (U.S.A.))

BIO/POC/CCCC (REX) Topic Session (1-day)
Latitudinal differences in response of productivity and recruitment of marine

organisms to physical variability, from Subarctic to subtropical waters, in the eastern and western sides of the Pacific (Convenors: Yoshiro Watanabe (Japan), BIO and POC convenors TBD)

BIO/MEQ Topic Session (½-day)
Natural and anthropogenic influences on pelagic-benthic coupling in coastal systems. (Convenors: TBD)

MEQ/BIO Topic Session (½-day)
Aquaculture within an ocean ecosystem (Convenors: Julia K. Parrish (U.S.A.) and Ik-Kyo Chung (Korea))

MEQ/BIO/FIS Topic Session (1-day)
Ecosystem-based management (to include aspects of carrying capacity and fishing impacts) (Convenors: Glen Jamieson (Canada), BIO and FIS convenors TBD)

POC/BIO Topic Session (1-day)
Physical process impacts on biological and fish populations with variability in freshwater inputs to the ocean (Convenors: Yuri I. Zuenko (Russia), BIO convenor TBD)

FIS Topic Session (½-day)
Management of eel resources (jointly with EASEC) (Convenors: Tae-Won Lee (Korea) and Katsumi Tsukamoto (Japan))

FIS Topic Session (½-day)
Biology of predatory impacts on and by coastal sharks (Convenor: Gordon H. Kruse (U.S.A.))

FIS contributed paper session (½-day)
(Convenors: Yukimasa Ishida (Japan) and Chang-Ik Zhang (Korea))

POC contributed paper session (½-day)
(Convenor: Kuh Kim (Korea))

TCODE Electronic Poster Session
GIS/Geographic-based applications to marine sciences (Convenors: Bernard A. Megrey (U.S.A.), others TBD)

It was also recommended to consider having all Committee meetings the day after the workshops and just before the official opening of PICES XII. Task Team meetings would be held in the morning, Scientific Committee meetings in the afternoon, and the CCCC-IP/EC meeting in the evening. In addition, consideration should be given to keeping one evening available during the meeting for Committees to meet to finalize their reports and/or to confer with other committees. It is expected that Marine Birds and Mammals, Continuous Plankton Recorder, Iron Fertilization Experiment and North Pacific Data Buoy Advisory Panels will also meet during PICES XII.

CCCC Integration Workshop (Agenda Item 10)

Science Board noted that the CCCC Integration Workshop provided needed re-focusing of the Program and congratulated the convenors. Science Board approved the tasks proposed in the Integration Workshop report, in particular the proposal to host a major synthesis symposium in 2005/6. Science Board noted that better communication among the Scientific Committees and the CCCC Program is needed.

North Pacific Ecosystem Status Report (Agenda Item 11)

A "Draft for Discussion" North Pacific Ecosystem Status Report was tabled. It was intended to be a sample of what a final report might look like, to initiate discussions on content and format as well as the process for creating such a report. Formal responses from the Committees were mixed, with some strongly supportive whereas others felt they could not judge the draft report until a summary/synthesis was included. Science Board recommended establishment of a Working Group to proceed with developing the report (*SB Endnote 6*). Science Board also noted that successful completion of the report will require the assistance of all members of PICES.

Theme for PICES XIII (Agenda Item 12)

Science Board decided that, in consideration of the meeting being held in Hawaii, the proposed

theme for PICES XII should be *Beyond the continental slope – complexity and variability in the open North Pacific Ocean* (*SB Endnote 10*).

Strategic Plans (Agenda Item 13)

Updates to the Science Board Strategic Plan were deferred to the interim Science Board meeting, when the future directions and activities of PICES are to be discussed.

Inter-sessional Science Board meeting (Agenda Item 14)

An interim Science Board meeting was proposed for late March 2003, to discuss items arising from the PICES Review Committee Report, including new long-term directions for PICES, the Review Committee report itself, capacity building, progress on the North Pacific Ecosystem Status report, TCODE, and progress reports from Scientific Committees.

Other business (Agenda Item 15)

Science Board noted the successful PICES/GLOBEC workshop on *GLOBEC data management: Exchange, inventory and archival of GLOBEC data*. Science Board requested that PICES Scientific Committees and Programs assist TCODE with refining metadata keywords, identifying sources of GLOBEC metadata, and updating real-time data sources for the North Pacific.

Best Paper and Poster Awards

Ms. Sukyung Kang (Republic of Korea) was awarded the Best Paper Award in the Science Board Symposium for her presentation entitled "*The analysis of trace elements in chum salmon otoliths using laser-ablation technology: Habitat characteristics and stock identification*", authored by Kang, Kim, Welch, Telmer and Lee.

The Best Poster Award went to Mr. Olav Ormseth (U.S.A.) for his poster titled "*Interannual variability in the distribution of spawning Pacific cod in Alaska: Tthe influence of ocean temperature*", authored by Ormseth and Norcross.

SB Endnote 1

Participation List

Members

R. Ian Perry (Chairman, Science Board)
Vladimir I. Radchenko (Chairman, BIO)
Douglas E. Hay (Chairman, FIS)
John E. Stein (Chairman, MEQ)
Kuh Kim (Chairman, POC)
Makoto Kashiwai (Co-Chairman, CCCC)
William T. Peterson (for Harold P. Batchelder; Co-Chairman, CCCC)
Igor I. Shevchenko (Chairman, TCODE)

Invited Observers

Jinping Zhao (invited, China) (October 25 only)
Yukimasa Ishida (Chairman-elect, FIS) (October 25 only)
Stewart (Skip) M. McKinnell (Assistant Executive Secretary, PICES, rapporteur)

SB Endnote 2

Science Board Agenda

October 20, 2002 (1230 - 1330)

1. Welcome and opening remarks
2. Adoption of agenda
3. Review of procedures for Best Presentation Awards and Closing Ceremony
4. Review of procedures to enhance documentation of PICES scientific sessions

5. Completion of PICES X decisions and recommendations by Governing Council and Science Board

October 25, 2002 (0830 – 1730)

6. Discussion of PICES Review Committee and Science Board review reports
7. Reports of the Science Board, Scientific and Technical Committees, CCCC IP, Working and Study Groups with regard to items having financial implications for 2002 and beyond:
    a. Inter-sessional meetings proposed for 2003 and beyond (workshops, Working Group and CCCC Program meetings)
    b. Proposed publications (PICES Scientific Report series and primary journals) for 2002 and beyond
    c. Travel support requests
    d. Other items with financial implications
8. Reports of Science Board, Scientific and Technical Committees, CCCC IP, Working and Study Groups with regard to other items:
    a. Brief summary report of the group's activities in the past year (including progress with regard to Strategic Plan and "Vision" for the next 5 years), including membership changes
    b. Tabling of summaries from the PICES XI Scientific Sessions
    c. Proposed titles for Topic Sessions and Symposia for the next Annual Meeting, including draft session descriptions and proposed Convenors
    d. Proposed list of any future groups along with Terms of Reference and a list of potential members
    e. High Priority Projects - Ecosystem Status Report
    f. Relations with other international programs/organizations
    g. Proposed recommendations and draft text on other items that would be included in the Science Board report to Council (e.g. recommendations for letters of support to various research efforts)
    h. Other items
9. PICES XII Annual Meeting
    a. PICES XII theme and Science Board Symposium
    b. Topic Sessions and draft schedule
10. CCCC Integration Plan discussion
11. Ecosystem Status Report discussion
12. Selection of PICES XIII theme
13. Updating of Science Board Strategic Plan
14. Possible inter-sessional Science Board meeting
15. Other business
16. Adoption of the Science Board report and recommendations to Council

SB Endnote 3

Review of procedures to enhance documentation of PICES scientific sessions

The last few years, PICES has only included the proposed Topic Sessions for the upcoming year in its Annual Report, and has not provided details regarding the scientific meeting 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 2002 Annual Meeting. 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.

(From: PICES Annual Review 2001, SB Endnote 11, p. 52)

SB Endnote 4

Completion of PICES X decisions and recommendations

01/S/1: Inter-sessional meetings, Working Group and CCCC Program workshops

The following inter-sessional meetings were convened:

- A 4-day MODEL/REX Workshop on *Improvements to the PICES NEMURO Model: To build a nutrient-phytoplankton-zooplankton-fish version of the model* (co-sponsored by Nakajima Foundation and Nemuro-city), January 24-27, 2002, Nemuro/Yokohama, Japan;
- A 2-day meeting of WG 14 on *Effective sampling of micronekton*, February 16-17, 2002, Honolulu, Hawaii, U.S.A. (in conjunction with the Ocean Sciences Meeting);
- A 2-day NPAFC/NASCO/IBSFC/PICES/ ICES Symposium on *Causes of marine mortality of salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea*, March 14-15, 2002, Vancouver, Canada;
- A 3-day MONITOR Workshop on *Voluntary observing ships* (co-sponsored by EVOS), April 5-7, 2002, Seattle, Washington, U.S.A.;
- A 2-day BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system*, April 21-22, 2002, La Paz, Mexico;
- A 3-day International Symposium on *North Pacific transitional areas* (co-sponsored by CIBNOR and CICIMAR), April 23-25, 2002, La Paz, Mexico;
- A 3-day meeting of North Pacific Data Buoys Advisory Panel (co-sponsored by WMO and IOC), June 4-6, 2002, Victoria, Canada;
- A 3-day CREAMS/PICES Workshop on *Recent progress in studies of physical processes and their impact to the Japan/East Sea ecosystem*, August 22-24, 2002, Seoul, Republic of Korea;
- Joint meeting of PICES CCCC-MODEL Task Team and GLOBEC F3WG on *Linking biophysical and upper trophic level models*, October 18, Qingdao, People's Republic of

China (in conjunction with PICES XI and GLOBEC OSM);
- A ½-day Workshop of PICES CCCC-MONITOR Task Team and GLOBEC F1WG on *Requirements and methods for early detection of ocean change*, October 19, 2002, Qingdao, People's Republic of China (in conjunction with PICES XI);
- A 1-day PICES/GLOBEC Data Management Workshop on *Exchange, inventory and archival of GLOBEC data*, October 19, 2002, Qingdao, People's Republic of China (in conjunction with PICES XI);
- A 1-day CCCC Integration Workshop, October 20, 2002, Qingdao, People's Republic of China (in conjunction with PICES XI);
- A 1-day PICES/CLIVAR Workshop on *Climate variability in the Pacific and its impact on the marine ecosystem*, October 20, 2002, Qingdao, People's Republic of China (in conjunction with PICES XI);
- A ½-day MONITOR Workshop on *Monitoring from moored and drifting buoys*, October 23, 2002, Qingdao, People's Republic of China (in conjunction with PICES XI);
- A 1-day PICES/CKJORC Workshop on *Regional cooperation and management of the marine environment and resources in the Yellow Sea*, October 25, 2002, Qingdao, People's Republic of China (in conjunction with PICES XI).

01/S/2: Travel Support

Full or partial travel support was provided to:
- Drs. Richard D. Brodeur (U.S.A.) and Kouichi Kawaguchi (Japan) to attend the interim meeting of WG 14 on *Effective sampling of micronekton*, in Honolulu, U.S.A., in February;
- Drs. Douglas E. Hay (FIS Chairman), R. Ian Perry (Science Board Chairman), Skip McKinnell (Convenor) and Alexander Bychkov (Executive Secretary) participated in the Symposium on *Causes of marine mortality of salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea* (con-sponsored by NPAFC, NASCO, IBSFC, PICES and ICES) and the NPAFC Research Planning and Coordinating Meeting, in Vancouver, Canada, in March;
- Full or partial travel support was provided to 6 scientists (from Japan, U.K. and U.S.A.) to attend the Workshop on *Voluntary observing ships*, in Seattle, U.S.A., in April;
- Dr. Harold P. Batchelder (CCCC Co-Chairman) participated in the meeting of the ICES Cod and Climate Change Program, in Copenhagen, Denmark, in April;
- Mr. Gordon A. McFarlane (Canada) attended the BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system*, in La Paz, Mexico, in April;
- Full or partial travel support was provided to 6 invited speakers (from Canada, Japan and U.S.A.), Science Board Chairman and staff of the Secretariat to participate in the International Symposium on *North Pacific transitional areas*, in La Paz, Mexico, in April;
- Full or partial travel support was provided to 7 invited speakers (from Japan, Korea and Russia) to attend the CREAMS/PICES Symposium/Workshop on *Recent progress in studies of physical processes and their impact to the Japan/East Sea ecosystem* (August 2002, Seoul, Republic of Korea). In addition, by request from PICES, the University of Washington allocated partial travel support for 4 Russian scientists to attend the meeting. Dr. McKinnell participated in this meeting as a PICES representative and discussion leader on the status of Japan/East Sea ecosystem;
- Travel support was provided to Drs. Kenneth Denman (Canada) and Nianzhi Jiao (China) to attend a JGOFS/PICES Session on *Synthesis of JGOFS North Pacific Process Study* (during the Japan Oceanography Society meeting organized in conjunction with the 26th SCOR General Meeting), in Sapporo, Japan, in October;
- Drs. Hyung-Tack Huh and R. Ian Perry represented PICES at the 2002 ICES Annual Conference and Centenary, in Copenhagen, Denmark, in October;
- Dr. Alexander Bychkov represented PICES

at the NPAFC Tenth Annual Meeting, in Vladivostok, Russia, in October;
- Dr. Perry attended the 2nd GLOBEC Open Science Meeting held in Qingdao immediately prior to PICES XI;
- Full or partial travel support (paid by PICES and co-sponsoring programs and organizations) was provided to 5 invited speakers for the Science Board Symposium, and 17 invited speakers for scientific sessions at the PICES Eleventh Annual Meeting, in Qingdao, People's Republic of China, in October;
- Travel support (paid by PICES, WCRP and U.S. CLIVAR) was provided to 7 scientists (invited speakers and co-convenors) to attend the PICES/CLIVAR Workshop on *Implementation of CLIVAR in the North Pacific*, October 20, 2002, Qingdao, People's Republic of China (during PICES XI);
- Dr. Stewart M. McKinnell attended the meeting of the SCOR-IOC WG 119 on *Quantitative Ecosystem Indicators for Fisheries Management*, in Cape Town, South Africa, in December.

01/S/3: Publications

List of publications in 2001 includes:
- PICES Scientific Report No. 20: *Climate Change and Carrying Capacity Program / Report of the 2001 BASS/MODEL, MONITOR and REX Workshops, and the 2002 MODEL Workshop*;
- PICES Scientific Report No. 21: *Climate Change and Carrying Capacity Program / Report of the 2002 PICES Workshop on Voluntary Observing Ships*;
- PICES Scientific Report No. 22: *PICES Science: The first ten years and a look to the future* (Proceedings of the PICES X Anniversary Symposium);
- PICES Scientific Report No. 23: *Harmful algal blooms in the PICES region of the North Pacific*;
- Special issue of *Journal of Oceanography* (Vol. 58, No. 5) on *Physics and biology of eddies, meanders and rings in the PICES region* (selected papers from the 2001 POC/BIO/FIS Topic Session; Guest Editors: William B. Crawford, Alexander S. Bychkov, Stewart M. McKinnell and Takashige Sugimoto);
- Special issue of *Progress in Oceanography* (Vol. 55, No. 1-2) on *Variability of Bering Sea ecosystem* (selected papers from the 2001 CCCC Topic Session; Guest Editors: Allen Macklin, Jeffrey M. Napp, Vladimir I. Radchenko, Sei-ichi Saitoh, Phyllis J. Stabeno and Stewart M. McKinnell);
- Special section of *Canadian Journal of Fisheries and Aquatic Sciences* on *Migration of key ecological species* (Selected papers from the 2001 FIS Topic Session; Guest Editor: James Irvine);
- Special issue of Deep-Sea Research Part II (Vol. 49, No. 24-25) on *North Pacific Biogeochemical Processes* (Guest Editors: Toshiro Saino, Alexander S. Bychkov, Chen-Tung A. Chen and Paul J. Harrison);
- The electronic (CD-ROM and web-based) version of the Oceanographic Atlas of the Okhotsk Sea, Bering Sea and Japan/East Sea prepared by the Pacific Oceanological Institute.

01/S/4: Future of current Working Groups and Scientific Programs

- WG 14 on *Effective sampling of micronekton* is continuing its work and is expected to complete its report in 2003.
- WG 15 on *Ecology of Harmful algal blooms (HABs) in the North Pacific* had a split meeting in 2002, and is expected to complete its final report in 2003.
- WG 16 on *Climate change, shifts in fish production, and fisheries management* is expected to complete its final report in 2003.

01/S/5: New PICES Groups

- WG 17 on *North Pacific biogeochemical data integration and synthesis* was formed in 2002 and had its first meeting in October 2002, in conjunction with PICES XI (Qingdao, People's Republic of China).
- *North Pacific Data Buoy* Advisory Panel was formed in 2002 and had its first meeting in June 2002, in Victoria, Canada.

- At their meeting in 2001, FIS proposed that a new WG on *Ecosystem considerations in fisheries management* be established in 2003. At PICES XI, this decision was deferred pending completion of WG 16.

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

- Drs. Ian Perry and Alexander Bychkov attended the **SCOR** Executive Committee meeting in Mar del Plata, Argentina, in October 2001, to present and discuss programs of common interest and increased collaboration;
- PICES co-sponsored with the **International Research Institute for Climate Change Prediction**, and Drs. Ian Perry and Skip McKinnell participated in, a workshop on *Climate and fisheries: Interacting paradigms, scales, and policy approaches*, held November 14-17, 2001, in Honolulu, U.S.A.;
- PICES collaborated closely with **GLOBEC,** and co-sponsored joint sessions between PICES XI and the GLOBEC 2nd Open Science Meeting, October 14-18, 2002, in Qingdao, People's Republic of China;
- PICES and **WCRP/CLIVAR** co-hosted the workshop held in conjunction with PICES XI on developing CLIVAR in the North Pacific;
- PICES and **Census of Marine Life** are co-sponsoring a project affiliated with the North Pacific Ecosystem Status Report titled *Marine life in the North Pacific: The known, unknown, and unknowable*;
- PICES co-sponsored along with **NPAFC** and other organizations, a workshop on *The causes of marine mortality of salmon in the North Pacific and North Atlantic Ocean and in the Baltic Sea*, held in March 2002, in Vancouver, Canada, as well as participated in the NPAFC Annual Meeting and the meeting of the NPAFC/CSRS Committee;
- **IPHC** and **IATTC** collaborated with PICES by providing information to the pilot North Pacific Ecosystem Status Report;
- **EVOS Gulf of Alaska Ecosystem Monitoring and Research Program (GEM)** is collaborating with PICES in development of the North Pacific Ecosystem Status Report;
- PICES and **ICES** continued to work together to hold the Zooplankton Symposium in Gijón, Spain, in May 2003. They also hosted reciprocal visits and discussions to develop closer links and collaborative programs;
- **Alliance for California Current Ecosystem Observations (ACCEO):** PICES participated in discussions to develop this fledgling organization, as a regional component of the North Pacific Ecosystem Status Report;
- PICES and **JGOFS** co-sponsored a Workshop on *Synthesis of JGOFS North Pacific Process Study* (with JOS), held October 1-2, 2002, Sapporo, Japan (during the Japan Oceanography Society meeting in conjunction with the 26th SCOR General Meeting).

SB Endnote 5

Proposal for a Study Group on Capacity building

Proposal: Study Group under Science Board
Title: Study Group on Capacity building
Duration: November 2002 - October 2003

Terms of Reference

1. Identify the capacity building needs of PICES;
2. Develop a proposal to address the capacity building needs of PICES, including consideration of possible collaborations with other organizations;
3. Draft report is due to Science Board at their next meeting (tentatively the inter-sessional meeting in April 2003).

Membership
Chairman: Warren S. Wooster

Members: representatives of the Standing Committees and CCCC Program
Secretariat support: Alexander S. Bychkov.

SB Endnote 6

Working Group on the North Pacific Ecosystem Status Report

A proposal was submitted to, and subsequently approved by, the Census of Marine Life for a collaborative PICES - CoML project titled: "Marine life in the North Pacific Ocean: The known, unknown and unknowable". This is to be a co-operative effort with PICES' North Pacific Ecosystem Status Report, and is described as follows:

The Census of Marine Life (CoML) seeks to offer by 2010 a vastly improved description and explanation of the diversity, distribution, and abundance of marine life. The North Pacific Marine Science Organization (PICES) aims to promote international marine research in the North Pacific Ocean region. In several respects, the Organization's goals overlap those of the CoML. A joint, immediate, speedy effort to assess the status of marine life in the North Pacific Ocean on the basis of current information makes sense. Such a study could help define the pattern for reporting in the CoML, especially as it will employ the framework of evaluating what is known, what is unknown and what is unknowable. Moreover, the cooperative effort could also help set priorities for working in the North Pacific during the CoML and lift the chances that the needed work will be conducted.

To this end, PICES proposes a co-sponsored effort to begin the assessment of what lives in the North Pacific Ocean: a synthesis of what is known about the abundance, biodiversity, distribution and production "hot spots" of marine life from plankton to marine birds and mammals (*Status*). The report will also describe what is known to be unknown about taxonomic groups and geographic regions, either because information has been collected but is not yet available, or where critical information is lacking entirely (*Critical Issues*). The report will discuss what might be considered unknowable about marine life in the North Pacific. Finally, it will identify potential drivers of future changes to marine life in the North Pacific and assess how these drivers of change might impact marine life to forecast future conditions (*Future Trends*).

The major objective of the project is for PICES to produce a report for the CoML that identifies and elaborates on these issues. It will also be a significant contribution to a separate PICES initiative, an Ecosystem Status Report for the North Pacific Ocean. Development of the PICES report to CoML is anticipated to be complete by the end of 2003, if work can begin in mid-2002. Funding of US $45,000 is requested to support the activities of the project. The PICES report to the CoML will stand alone and its completion will not depend on the progress of the other activity. Moreover, the PICES report to CoML will be of value to the Census for planning future activities in the North Pacific, for placing the initial Pacific field projects of the CoML in context, and for identifying subsequent ways that PICES might participate in the CoML.

Considering this PICES - CoML project, and the draft North Pacific Ecosystem Status Report prepared for PICES XI, the following Working Group under Science Board is proposed to continue work on this project:

Proposal: Working Group under Science Board
Title: North Pacific Ecosystem Status Report
Duration: November 2002 - January 2004

Terms of Reference

1. Prepare the full North Pacific Ecosystem Status Report, for review in October 2003 at PICES XII, 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
Chairman: R. Ian Perry
Members: Chairmen of the Standing Scientific Committees and Program, invited experts
Secretariat support: Stewart M. McKinnell

SB Endnote 7

Proposal for a NEMURO Experimental Planning Team (NEXT)

Following recommendations of the CCCC Integration Workshop, the CCCC IP/EC proposed establishment of an *ad hoc* NEMURO Experiment Planning Team (NEXT), which will work through e-mail communications, to develop scientific strategy, based on requirements of ecosystem models to be developed, for the series of hypotheses testing workshops.

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.

Membership
Chairman: Harold P. Batchelder
Members: 2 members from each CCCC Task Team, invited experts

SB Endnote 8

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. 2002 additions to list are the International Whaling Commission (IWC), the new IGBP/OCEANS (Ocean Biogeochemistry and Ecosystems Analysis) program, and the North Pacific Research Board (NPRB). This list will be used in part to assist the Executive Secretary and Science Board in decisions regarding travel to 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)
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
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 9

Science Board Symposium - PICES XII

Title: *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), Makoto Kashiwai and Harold P. Batchelder (CCCC)

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. Physical oceanography, chemistry and climate indices are being examined in relationship to living marine resource production. *What is our understanding of how these indicators are influenced by global climate warming?* Various human activities have the effect either of removing, altering or adding nutrients or species to areas. *How do these changes in nutrient composition and amounts, fishery removals or discards, habitat alteration, introduction of non-native species or pollutants change ecosystem structure and production? What are the effects of ecosystem change on human societies? What are the implications of fisheries management decisions affecting the nature and functions of ecosystems?* This theme seeks to highlight the many ways that humans interact with marine ecosystems and the scientific efforts to quantify and predict human impacts on such dynamic systems.

SB Endnote 10

Proposed 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 consists of the pelagic realm, away from boundary currents and marginal seas. This oceanic region is often perceived as physically homogeneous and stable with low biological productivity. In reality, it is a spatially and temporally dynamic physical environment with high *complexity*. *The open ocean contains horizontal and vertical gradients in physical and biological properties producing ecosystem structure and diversity. In the midst of the oceanic realm seamounts and islands add additional complexity*. In spite of the low primary productivity, the region supports complex ecosystems, high in biodiversity including many endangered species. The marine resources are very important to the people of the region and are fished by fleets from many Pacific Rim nations. This theme will examine how these complex ecosystems are supported, considering the traditional understanding of the sub-tropical and temperate open ocean as being

low in productivity. It will provide opportunities to compare and contrast these areas with those of higher productivity in the subarctic North Pacific. How important are small and meso-scale features such as fronts and eddies to the survival of upper trophic level species? How do ecosystems in the open ocean respond to vertical and horizontal physical and biological structure? How have sub-tropical waters responded to 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? This theme seeks to highlight the *physical and biological* features and dynamic processes of the *oceanic waters far from the influences of the continental shelf with particular emphasis on the subtropical gyre* in the southern parts of the PICES region.

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

The meeting of the Biological Oceanography Committee was held from 13:30-17:30 hours on October 23, 2002. The Chairman, Dr. Vladimir I. Radchenko, called the meeting to order and welcomed members (see *BIO Endnote 1* for attendance). The Committee reviewed the agenda and one addition was made for a brief presentation by Dr. George L. Hunt (*BIO Endnote 2*).

Business arising from last year's meeting (Agenda Item 3)

Status of proposed publications

Dr. David L. Mackas briefly informed the Committee on the publication of a special issue of *Journal of Oceanography* (Vol. 58, No. 5) on *Physics and biology of eddies, meanders and rings* (selected papers from the 2001 POC/BIO/FIS Topic Session) and commented that the journal and Guest Editors (William B. Crawford, Alexander S. Bychkov, Stewart M. McKinnell and Takashige Sugimoto) did an excellent job in processing this issue.

Another special issue of *Progress in Oceanography* (Vol. 55, No. 1-2) on *Variability of Bering Sea ecosystem* was delivered at the meeting. It contains 17 papers presented at last year's CCCC Topic Session. BIO commended Guest Editors (Allen Macklin, Jeffrey M. Napp, Vladimir I. Radchenko, Sei-ichi Saitoh, Phyllis J. Stabeno and Stewart M. McKinnell) for their efforts.

Dr. Paul J. Harrison informed that a special issue of *Deep-Sea Research Part II* (Vol. 49, No. 24-25) on *North Pacific Biogeochemical Processes* (Guest Editors: Toshiro Saino, Alexander S. Bychkov, Chen-Tung A. Chen and Paul J. Harrison) will be published later this year. The new data provided by the Japanese scientists now give more balanced coverage of the east and west sides of the North Pacific.

Dr. Alexander Bychkov reported on the progress with publication of a special issue of *Progress in Oceanography* on *Plankton size classes, functional groups and ecosystem dynamics* (selected papers from the 2001 BIO Topic Session). This issue will contain about 10-12 papers from Canada, Japan, Korea, U.S.A. and Chile. This volume is in the final stages of review, and publication is expected in spring 2003.

Status of proposed inter-sessional meetings

Dr. R. Ian Perry gave an update on the ICES/PICES/GLOBEC Zooplankton Production Symposium. The associated workshop will focus on comparing changes in zooplankton composition and distribution in North Pacific and North Atlantic, and developing suggestion for future cooperative projects.

Dr. Harrison briefly reported on a 2-day JGOFS/PICES Workshop on *Synthesis of JGOFS North Pacific Process Study* held October 1-2, 2002, in Sapporo, Japan, and co-sponsored by the Japan Oceanographic Society and Hydrospheric Atmospheric Research Centre of Nagoya University. Abstracts have been published and a special issue of *Journal Oceanography* on *JGOFS North Pacific Synthesis* is planned for publication in early 2004.

Progress report of Working Group 14 on *Effective Sampling of Micronekton* (Agenda Item 4a)

The Co-Chairman of WG 14, Dr. Richard D. Brodeur, presented a summary of the activities of the Working Group (*BIO Endnote 3*). He gave an overview of the meeting held on October 19, 2002. The Working Group also convened an inter-sessional meeting in conjunction with the AGU/ASLO Ocean Sciences Meeting in Hawaii, in February 2002.

A status report indicated that the WG 14 final report was 70-80% complete. A survey for additional data will be posted on the PICES Home Page and results will be attached to the final report as an appendix. The target date for completion of the report is late 2003. A draft report will be submitted to BIO by September 15, 2003.

There was also discussion of a PICES-supported cruise to compare different micronekton sampling devices. This cruise could be in the area just north of the Hawaiian Islands (Station ALOHA at 22°45'N 158°W - the location of the Hawaii Ocean Time Series), in October 2004, or possibly in the Bering Sea (in conjunction with the BASIS program). Efforts are being made to have ship time provided with no cost to PICES by the United States (NOAA) and by Japan. BIO approved the plan for a sampling comparison experiment by consensus and asked Dr. Brodeur to prepare a draft budget request for this experiment. Preliminary proposal was presented after the Committee meeting (*BIO Endnote 4*).

Report of the Advisory Panel on *Marine Birds and Mammals* (Agenda Item 4b)

The Panel Co-Chairman, Dr. Hidehiro Kato, distributed a written report to BIO members (*BIO Endnote 5*), and an overview of this handout was presented by Co-Chairman, Dr. Douglas F. Bertram. The joint BIO/FIS/CCCC Topic Session at PICES XI was very successful (summary of the session is included elsewhere in this Annual Report).

The Panel requests a full-day workshop at PICES XII to work on combining data sets on distributions and diets of marine birds and mammals. The workshop should be coordinated with the 2-day workshop on *Examine and critique a North Pacific Ecosystem Status Report* requested by MONITOR. Participation at the Panel meeting was low for China, Korea and Russia. Travel support is requested for 1-2 Russian members for the next meeting.

Dr. Kato commented on the interaction of the Panel with IWP and ICES. This interaction would be facilitated by appointing a PICES representative to serve as an observer for these organizations.

Progress report of Advisory Panel on Iron Fertilization Experiment (Agenda item 4c)

Dr. C.S. Wong presented an overview on the completed and planned iron enrichment experiments: SEEDS by the Japanese in the Western North Pacific in 2001 and 2004, and SERIES in the Eastern North Pacific in July 2002. Very significant responses to iron enrichments were observed in both of the completed experiments.

An inter-sessional workshop is planned for December 2003. The workshop cannot be held at the Annual Meeting due to conflicts in the cruise schedule. The Panel requests travel support for 3 scientists (2 from New Zealand and 1 from Mexico) for this meeting to be held at IOS in Sidney, British Columbia, Canada. BIO discussed and approved by consensus the request for an inter-sessional workshop and for travel support.

Review of Topic Sessions supported by BIO at PICES XI (Agenda item 5)

Dr. John F. Dower reviewed the BIO/POC/FIS Topic Session on *The importance of biophysical coupling in concentrating marine organisms around shallow topographies*. The session was very well attended and papers will be published in a special issue of *Journal of Marine Systems*.

Dr. Elizabeth A. Logerwell reviewed the BIO/FIS/CCCC Topic Session on *Responses of upper trophic level predators to variation in prey availability: An examination of trophic level linkages*. The talks ranged from invited lectures, presentations on prey selection and trophic linkages and ecosystem management issues. This session was also very well attended.

Dr. Harrison was assigned to review the BIO/MEQ Topic Session on *Food web dynamics in marginal seas: Natural processes and the influence of human impacts* scheduled for October 24, 2002.

Summaries of the sessions are included elsewhere in this Annual Report.

Proposals for the Topic Sessions at PICES XII (Agenda item 6)

Several topics were listed as potential themes for Topic Sessions at PICES XII:

- Aquaculture
- Gelatinous zooplankton
- Pelagic-benthic coupling
- Latitudinal variations in productivity
- Physical process impacts on biological productivity and fish populations with variability in fresh water inputs to the ocean
- Theory, biological basis and application of fluctuating carrying capacity of the ocean resulting from human impacts (proposed for Science Board Symposium or BIO Topic Session)

Topics were discussed and the following four requests were forwarded to the Science Board:

1. A full-day Science Board Symposium as outlined in *BIO Endnote 6*;
2. Natural and anthropogenic influences on pelagic-benthic coupling in coastal systems (jointly with MEQ);
3. Physical process impacts on biological productivity and fish populations with variability in fresh water inputs to the ocean (jointly with POC);
4. Latitudinal differences in response of productivity and recruitment of marine organisms to climate variability, from subarctic to subtropical waters, in the eastern and western sides of the Pacific (jointly with CCCC).

It was also reiterated that BIO supports the request by the Advisory Panel on *Marine birds and mammals* to convene a full-day workshop on "Distribution and diets of marine birds and mammals: Patterns produced by biophysical coupling and lower trophic level dynamics".

Themes for PICES XII and PICES XIII (Agenda item 7)

The proposed theme for PICES XII (2001 *SB Endnote 10*) to be held in October 2003, in Seoul, Korea, was discussed briefly. It was thought that this theme of "Human dimensions of ecosystem variability" should also include impacts of ecosystem changes on humans, and thus it was recommended that an additional sentence be included into the description. The sentence, "*What are the effects of ecosystem change on human societies?*", will be put forward to the Science Board. Also, BIO recommended that the Science Board consider changing the wording of the title so that it more clearly reflected the intent and extent of the theme.

The theme suggested for PICES XIII to be held in October 2004, in Honolulu, U.S.A., is "The North Pacific Realm: An ocean far from continental boundaries".

North Pacific Ecosystem Status Report (Agenda item 8)

Dr. R. Ian Perry gave a brief overview of the draft document and solicited input from all members and committees of PICES. He described the planned process for generating this report by the Science Board and Committee Chairmen. Some existing regional groups should be key players in generating this report. Dr. Mackas commented that MONITOR is proposing a similar activity, but after discussion it was decided that the two activities are parallel and complementary.

PICES Review Committee Report (Agenda Item 9)

Dr. Perry reported that the Review Committee considered that PICES was doing well but two areas should receive more attention: formulating directions for the next five years and improving communication among Standing Committees. The structure of PICES Committees was also reviewed, in particular the concepts of Advisory Panels changing to Sections within a Standing Committee (*BIO Endnote 7*). These subcommittees would be reviewed periodically (*e.g.* every 3 years). A more flexible duration for Working Groups is suggested. It is proposed that the Science Board convene an inter-sessional meeting every spring.

BIO discussed and decided to continue the MBMAP activity in the existing frames of an Advisory Panel until the completion of its 5-year term.

Review of BIO Strategic Plan (Agenda Item 10)

Dr. Radchenko asked members of BIO to review the draft BIO Strategic Plan (*BIO Endnote 8*) and to submit comments by e-mail before the interim Science Board meeting.

Draft Strategic Plan for TCODE (Agenda item 12)

Mr. Robin Brown gave a report on the draft TCODE Strategic Plan and solicited suggestions for revising the terms of reference for TCODE.

Discussion of the CCCC Integration Workshop (Agenda item 13)

Dr. Makoto Kashiwai reported on results of the CCCC Integration Workshop (workshop summary will be published in PICES Press, Vol. 11, No. 1). Dr. Patricia A. Wheeler commented that some of the slots on Task Teams needed to be filled with new members.

Subarctic seas studies – background and outlooks (Agenda item 14)

Dr. George L. Hunt summarized an NSF-supported workshop on *Ecosystem studies of the subarctic seas* (report is available upon request at glhunt@uci.edu). Plans are underway for an International Symposium to examine the effects of physical forcing and climate on the subarctic ecosystem in 2004. It is anticipated that a new field program would be initiated in 2005-2006.

Relations with other international organizations (Agenda item 15)

The organizations discussed included BASIS and IWC. BIO will cooperate with these agencies regarding issues of mutual concern.

Requests with financial implications (Agenda Item 16)

Publications

- Final report of WG 14 to be published in the PICES Scientific Report Series in 2004;
- A special issue of *Deep-Sea Research Part II* on results from iron enrichment experiments in the eastern and western North Pacific to be published in 2004.

Inter-sessional meetings

- An inter-sessional IFEP Workshop discussing the results from the SERIES and SEEDS experiments to be convened in December 2003, in Sidney, Canada.

Requests for travel funding

- Dr. Tsutomu Ikeda, PICES Co-Convenor, to attend the ICES/PICES/GLOBEC Zooplankton Production Symposium in May 2003, in Gijón, Spain;
- Four invited speakers for the BIO-supported Topic Sessions at PICES XII (Seoul, October 2003): POC/BIO Topic Session - 1 person, BIO/MEQ Topic Session - 1 person, and BIO/POC/CCCC Topic Session - 2 persons;
- 1-2 Russian scientists to attend the MBM Workshop to be held in October 2003, in conjunction with PICES XII;
- 3 scientists (2 from New Zealand and 1 from Mexico) to attend the IFEP Workshop in December 2003, in Sidney, Canada.

Best Presentation Award (Agenda Item 16)

Mr. Kohei Mizobata (Hokkaido University, Japan) was nominated and selected a winner of the BIO Best Presentation Award, for his talk entitled "Impact of the eddy field on phytoplankton distribution along the shelf edge in the southeastern Bering Sea 1998-2000 using SeaWIFS and TOPEX/ Poseidon time series data sets" at the BIO/POC/FIS Topic Session (S3) on *The importance of biophysical coupling in concentrating marine organisms around shallow topographies*.

BIO Endnote 1

Participation List

Members

Richard D. Brodeur (U.S.A.)
Michael J. Dagg (U.S.A.)
Paul J. Harrison (Canada)
Woong-Seo Kim (Korea)
David L. Mackas (Canada)
Vladimir I. Radchenko (Russia, Chairman)
Takashige Sugimoto (for Michio Kishi)
Atsushi Tsuda (Japan)
Patricia A. Wheeler (U.S.A., rapporteur)
Ming-Yuan Zhu (China)

Observers

Douglas F. Bertram (Canada, MBM)
Robin M. Brown (Canada, TCODE)
John F. Dower (Canada, WG 14)
George L. Hunt (U.S.A., MBM)
Makoto Kashiwai (Japan, CCCC IP)
Hidehiro Kato (Japan, MBM)
Elizabeth A. Logerwell (U.S.A.)
Jun Nishioka (Japan)
R. Ian Perry (Canada, SB)
William J. Sydeman (U.S.A., MBM)
Anatoly F. Volkov (Russia, CPR)
C.S. Wong (Canada, IFEP)

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 WG 14
   b. Progress report of Advisory Panel on Marine Birds and Mammals
   c. Progress report of Advisory Panel on Iron Fertilization Experiment
   d. Proposals for new subsidiary bodies
5. Summaries of scientific sessions supported by BIO:
   a. Food web dynamics in marginal seas: Natural processes and the influence of human impacts (BIO/MEQ);
   b. The importance of biophysical coupling in concentrating marine organisms around shallow topographies (BIO/POC/FIS);
   c. Responses of upper trophic level predators in prey availability: An examination of trophic linkages (BIO/FIS/CCCC)
6. Topic session proposals for PICES XII
7. Theme for PICES XIII
8. North Pacific Ecosystem Status Report – general form and content of first draft report; further items to include; sources for Regional summaries and/or data, etc.
9. PICES Review Committee Report
10. Review of BIO Strategic Plan: Discuss a "vision", for BIO and for PICES, for the next 5 years
11. Capacity building: What should be PICES' strategy and components for the implementation plan
12. Discussion of the draft Strategic Plan for TCODE: How BIO and its subsidiary bodies might interact with TCODE on data issues
13. Discussion on results of the CCCC Integration Workshop: How BIO and its subsidiary bodies might interact with CCCC in the future
14. Subarctic seas studies – background and outlooks (George Hunt)
15. Relations with other international organizations/programs.
16. Summary of items with financial implications
17. 2002 BIO Best Presentation Award
18. Other business
19. Preparation of report to Science Board

BIO Endnote 3

Progress report of WG 14 on *Effective sampling of micronekton*

The meeting of Working Group 14 was convened on October 19, 2002, and was attended by 7 members and 1 observer.

Introduction of attendees

Richard D. Brodeur (U.S.A., Co-Chairman)
Kenneth Coyle (U.S.A.)
John F. Dower (Canada)
Naoki Iguchi (Japan)
Vadim F. Savinykh (Russia)
Michael P. Seki (U.S.A.)
Orio Yamamura (Japan, Co-Chairman)
Evgeny Pakhomov (South Africa, observer)

Review of terms of reference

a. Evaluate sampling gear and problems, propose improvements, recommend collaborations among PICES countries for gear inter-comparisons;
b. Obtain and tabulate data on consumption and biomass of micronekton, stratify by region and taxa, quantify level of confidence to guide future research priorities.

Review of past year's activities

a. Organization of the joint BIO/POC/FIS session on *The importance of biophysical coupling in concentrating marine organisms around shallow topographies* for the forthcoming PICES XI in Qingdao, China, was discussed. This session was proposed by WG 14, and Drs. Brodeur, Dower and Yamamura would be serving as Co-Convenors.
b. Dr. Brodeur reported on an inter-sessional meeting in conjunction with the AGU/ASLO Ocean Sciences Meeting in Hawaii, in February 2002.
c. Progress to day on the WG 14 final report was reviewed.

Format and composition of WG report

a. Emphasize dominant species but will include any information available on rare species;
b. Apply geographic zonation (by adaptation of zones used by WG 11 on *Marine birds and mammals*);
c. Include reproduction, early life history, and demographic rates;
d. Discuss prey-predator relationships and rates (diet composition, amount eaten (flux), predators and predation rate);
e. Consider sampling issues (net towing, other sampling, acoustics, visual);
f. Compile existing data inventory for the North Pacific;
g. Provide recommendations for future research.

Activities for upcoming year

a. Send micronekton survey on sampling issues and problems to "experts" inside and outside the PICES community, and make the survey available through the PICES website. Summarize the results of this survey for the WG final report;
b. Modify assignments of writing tasks for the WG final report;
c. Complete and send individual assignments to WG Co-Chairmen by July 1, 2003. Submit a draft report to BIO by September 15, 2003. Discuss getting peer review on sections before or after submission to BIO;
d. Discuss new sampling gear or collection methods (broadband acoustics for species identification, autonomous samplers, vertical tows, simultaneous capture of prey);
e. Continue discussions of potential for PICES-sponsored multi-national evaluation and inter-calibration cruise to compare different micronekton sampling devices (*BIO Endnote 4*). New NOAA ship at Honolulu Laboratory may be available for such a cruise in 2004, and could be timed to occur before or after PICES XIII in October. Discuss possible locations of sampling (Transition versus Tropical region), gear types to be used, availability of other vessels. Endorsement of this cruise as a PICES-sponsored activity is needed. Also discuss possibility of conducting the inter-calibration cruise in the Bering Sea as a part of BASIS study sponsored by NPAFC. Preliminary discussions were held as to cost and logistics of doing such a cruise.

BIO Endnote 4

Proposal for PICES-sponsored micronekton sampling evaluation and inter-calibration cruise

Background

In 1999, BIO formally established a Working Group to address a concern that there was insufficient information on the distribution, biomass and ecology of micronektonic organisms in the North Pacific. Included in the terms of reference was a request to examine the efficacy of available micronekton sampling gears and propose new sampling devices if the available ones were not adequate for the task. One of the recommendations that will be included in the forthcoming WG 14 final report is that although 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. This has hampered efforts to look at inter-decadal or regional comparisons of micronekton composition and biomass since very often, different gears are used. To this end, WG 14 has proposed that PICES sponsor a multinational cruise in 2004 to compare existing sampling techniques including several nets, visual methods, and acoustics. Although WG 14 is planning to finish its formal activities in the coming year and disband, several members of the Working Group recognize the need for such data, and have agreed to continue beyond the term of the Working Group (to assist in the organization and implementation of this cruise).

Sampling plan

At this time, many of the logistic details have not been worked out but several key components of the study have been discussed. It was proposed that one, or preferably two, large research vessels be deployed to a location over deep water where mid-water layers can reliably be found. This location would be sampled throughout the dial period and would involve simultaneous sampling by multiple gear types to the extent possible with the configuration of the vessel(s) involved. It is expected that 5-6 micronekton sampling gears currently utilized in the North Pacific be included in the inter-calibration study. Other new technologies, such as video plankton recorders and acoustics, could also be used to compare biomass estimates obtained by these methods with those of conventional sampling gears such as nets. The species composition and size frequency histograms of different taxa caught by the various gears will then be compared and evaluated.

Choice of study site

A preferred location would be one that is known to contain high densities of all major micronektonic categories (mid-water fishes, cephalopods and crustaceans), and thus it would have to be an area that has been sampled previously to a great extent. It should also be an area that is relatively uniform over various spatial and temporal scales and exhibits a high degree of repeatability among repeat tows taken at the same station, so that the majority of variability between tows could be ascribed to gear differences. It is desirable that the ocean conditions in the study area be relatively calm to facilitate deployment and recovery of complex gear types. Finally, the station should be in relatively deep water but also close to shore to minimize transit time. Although there are several areas within the PICES region that meet these requirements, the one that is recommended by the Working Group is the area off the Hawaiian Islands, perhaps at the location of the Hawaii Ocean Time Series (HOTS). Other areas were considered, including the Japan/East Sea, Bering Sea and Monterey Bay, and these could be alternate sites but none fit the above criteria as well as the Hawaii site. Thus the plan that follows will discuss the Hawaii region but could be modified for a different region if needed.

Cruise details

One of the WG 14 members based in Hawaii has indicated that there is a strong possibility that we could get a week to 10 days ship time on a new NOAA fisheries/oceanographic research vessel

based in Honolulu, Hawaii. This vessel, the *Oscar Elton Sette*, is over 70 m long and has the capability to tow large dual-warp trawls requiring doors as well as large and small single-warp midwater trawls. It has several additional oceanographic winches with conducting cable and sufficient deck space to stage several gear types. It also has advanced acoustic and oceanographic sampling capabilities needed for such a study. It is anticipated that ship time will be provided by NOAA at no cost to PICES. It is also possible that another vessel, such as the Japanese Fisheries Agency research vessel *Kaiyo Maru*, will be working in the general area in 2004, and we would pursue the possibility of doing joint sampling with that vessel as well.

We propose that the cruise be conducted during the period just prior to PICES XIII in Honolulu for several reasons. First is that we can take advantage of the possibility that many of the scientists involved would be coming to the PICES meeting anyway, which would save some of the travel costs. We would also hope that some of the scientists would stay around for the PICES meeting to examine the data and perhaps provide a preliminary report during the meeting. This would showcase these results to both the PICES community and others outside the North Pacific region that may be attending the meeting.

Financial implications to PICES

Conducting major oceanographic cruises is generally not a minor expense. However, we believe that we can leverage support from several different agencies/laboratories to help defray much of the cost of the cruise. We anticipate that the US National Marine Fisheries Service will be able to provide ship time at no cost, which will be the major (> 50% of total) cost involved in running the cruise. We hope that a similar contribution can be made by whichever agency or government that provides the second vessel. Moreover, it is expected that most, if not all, the scientists involved will contribute time (≈ 25%) and perhaps funds for minor expenses from their existing budgets. For example, we anticipate that many of the samples could be identified, counted and processed at sea by the researchers on board, which would substantially decrease post-cruise processing time.

The anticipated costs which we request of PICES are thus minor compared to the costs supplied by the participating agencies or institutions. We have come up with some preliminary costs based on our experiences with other cruises. The major costs to PICES would be shipping of gear and other equipment to and from Hawaii and some travel costs, particularly for those scientists from PICES member countries that may have difficulty finding travel support for such a cruise. Although the proposed research vessel has both electronic and survey technicians that will be able to provide some support, it may be necessary in the case of some specialized scientific gears that a trained specialist be on board to help with these gear types. Finally, funds would be requested for a post-cruise workshop to compare results, and for publication costs to disseminate this information to the scientific community, although these two costs would likely be in the subsequent fiscal year.

Benefits to PICES community

The main benefit of the proposed study is that researchers in the PICES community will finally be able to know what the relative advantages and problems are with the gear types presently in use, both in the North Pacific and elsewhere, so that they may be able to adjust their sampling accordingly. Furthermore, the information provided by the cruise will allow scientists to compare previous micronekton sampling results taken in different regions or in different time periods within the same region when there were multiple gears used. The plankton community has recognized the need for such gear inter-calibration and, in fact, ICES had sponsored a cruise for this purpose. The costs of doing similar comparisons of micronekton gear are so prohibitive that it is unlikely that a single agency or laboratory will undertake such an endeavor. Also, applied but necessary science such as comparison of samplers is often difficult to get funded through peer-review processes, given the present stiff competition for limited resources.

However, although the main purpose of the cruise would be to compare sampling devices, we anticipate that some basic science will result from the data and specimens collected to help us understand more about the distribution, life history, and ecology of this important trophic link in the ocean. The proposed cruise would substantially raise the profile of micronekton in PICES and contribute important data to ecological modeling efforts. Although this cruise is designed to benefit researchers in the PICES study area, we hope to encourage participation from top scientists from other institutes (WHOI, BIO, CSIRO) and organizations (ICES, GLOBEC, SCOR, Tuna commissions, AMLR) with interests in micronekton sampling outside the North Pacific, particularly those with new and promising technologies (trawl, video, and acoustic) not presently available to the PICES community.

Preliminary cost estimates (US dollars)

Air travel to and from Honolulu	
$1.5K per person; for 10 people	*$15K*
Shipping costs of gear and samples	
assume $4K for each gear	*$20K*
Pre- and post-cruise accommodations	
3 days @ $150/day for 10 people	*$4.5K*
Post-cruise workshop	
travel and publication	*$8K*
Total costs to PICES	**$47.5K**

BIO Endnote 5

Report of *Marine Birds and Mammals* Advisory Panel

Opening

The second meeting of the *Marine Birds and Mammasl* Advisory Panel (MBMAP) was held from 08:30 – 13:00 hours on October 19, 2002. The meeting focused on reports from Panel members and associates on regional time series data sets following recommendations from the MBMAP meeting in 2001. The Co-Chairman, Dr. Douglas F. Bertram, called the meeting to order and welcomed the participants (*MBMAP Endnote 1*). The Panel reviewed the terms of reference and recommendations from the 2001 meeting (*MBMAP Endnote 2*), and the draft agenda that was adopted (*MBMAP Endnote 3*) with the addition of a presentation from Dr. Alexander Kitaysky on seabirds on Telan Island, Russia. Co-Chairman, Dr. Hidehiro Kato, joined the discussion after the formal session.

Old business

The Panel co-sponsored and participated in the BIO/FIS/CCCC Topic Session on *Responses of upper trophic level predators to variation in prey availability: An examination of trophic level linkages* (S4), convened by Drs. Hidehiro Kato (Japan), Elizabeth A. Logerwell (U.S.A.), and Gordon A. McFarlane (Canada).

Panel members attended CCCC Task Teams meeting and workshops (MONITOR and REX). Dr. William J. Sydeman reported at the meeting of the CPR Advisory Panel on the successful integration of a seabird and marine mammals observer on ship involved with the CPR survey.

Workshops at future Annual Meeting

The Panel proposed a 1-day workshop at PICES XII (Seoul, Korea) entitled "Distribution and diets of marine birds and mammals: Patterns produced by biophysical coupling and lower trophic level dynamics" (*MBMAP Endnote 4).*

Request for travel funding

MBMAP requests support for Panel members from Russia to join the next Annual Meeting.

Relation with other organizations/programs

In 2000, Panel members were assigned to the following CCCC Task Teams:
BASS - Hidehiro Kato and Thomas Loughlin
MODEL - Peter Ross
MONITOR - Douglas F. Bertram and William J. Sydeman
REX -Yutaka Watanuki

Dr. Sydeman reported on the CPR meeting.

Recommendations to BIO

The following recommendations were discussed and agreed upon by the Panel.

1. Recruitment of Panel members from all PICES nations should be given high priority. Names will be sought by participants to be discussed, and selected candidates will be forwarded to the Secretariat.
2. National funding for MBMAP members to attend Annual Meetings should be sought.
3. Member countries should be encouraged to compile up-to-date time series information on selected key species of marine birds and mammals for contribution to the North Pacific Ecosystem Status Report.
4. The Panel recognizes that there are data gaps in the final report of WG 11 on *Consumption of marine resources by marine birds and mammals in the PICES region*, and where feasible, it would be valuable to assemble new information to update the report.
5. The Panel recommends a 1-day workshop entitled "*Distribution and diets of marine birds and mammals: Patterns produced by biophysical coupling and lower trophic level dynamics*" to be held at PICES XII in 2003. The results of the workshop will be published in the primary literature and perhaps also as a PICES Scientific Report.

MBMAP Endnote 1

Participation List

Members

Douglas F. Bertram (Canada, Co-Chairman)
Hidehiro Kato (Japan, Co-Chairman)
Susan E. Moore (for Thomas Loughlin, U.S.A.)
William J. Sydeman (U.S.A.)
Yutaka Watanuki (Japan)

Observers

Norihisa Baba (Japan)
John F. Dower (Canada)
George L. Hunt (U.S.A.)
Alexander Kitaysky (U.S.A.)
Elizabeth A. Logerwell (U.S.A.)
Tsutomu Tamura (Japan)
Andrew W. Trites (Canada)

MBMAP Endnote 2

Terms of Reference

1. Provide information and scientific expertise to BIO, CCCC Program, and, when necessary, to other Standing 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 seabirds and disseminate it to the PICES community through scientific reports and symposia;
4. Develop strategies to improve collaborative, interdisciplinary research with marine mammal and birds researchers and the PICES scientific community.

MBMAP Endnote 3

MBMAP Meeting Agenda

08:30 Opening remarks (D.F. Bertram)
08:45 Marine mammals/Japan (Y. Watanuki for H. Kato)
09:15 Marine birds/Japan (Y. Watanuki)
09:45 Marine mammals/U.S.A. (S.E. Moore for T. Loughlin)

10:30 Marine birds and report on the CPR program/U.S.A. (W.J. Sydeman)
11:15 Marine birds/Canada (D.F. Bertram)
11:45 Marine birds/Russia (A. Kitaysky)
12:15 Discussion
- Recruiting members from PICES nations
- Plans for 2003

MBMAP Endnote 4

Proposal for a workshop at PICES XII on *Distribution and diets of marine birds and mammals: Patterns produced by biophysical coupling and lower trophic level dynamics*

Convenors: Hidehiro Kato (Japan) and Douglas F. Bertram (Canada)

This workshop will explore 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 will focus our efforts on two species of bird and mammals that, ideally, have representations on both sides of the North Pacific Ocean and sufficient time series information to facilitate meaningful comparison, either within or between regions. The workshop will build on the previous efforts to examine bird and mammal prey consumption within the PICES region (PICES Scientific Report No. 12, 2001), and will facilitate direct comparisons of data sets which have been examined in isolation in the past. We hope that the comparative approach will facilitate 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. The workshop will provide a forum for directed discussions with physical, biological and fisheries oceanographers, and will serve to launch future collaborations within the PICES community.

Our plan is to select the key species and conduct comparative diet analyses during the next 10 months. Further details will be finalized by correspondence among convenors and MBMAP members. The result of those analyses will be forwarded to a broad range of selected scientists by the end of August 2003, with a list of potential discussion topics.

At the workshop there will be 4 presentations (one for each selected species) each followed by open discussion with invited commentators. Participants will be encouraged to bring information from their discipline that can be used to help explain observed patterns of regional differences in the distribution and diets of the selected marine birds and mammals.

We propose to allocate the regular half-day meeting of the MBMAP to the workshop and request that an additional half-day be granted to allow for a full-day program. If possible the workshop could be merged with activities of the MONITOR Task Team and upcoming discussion for the North Pacific Ecosystem Status Report.

BIO Endnote 6

Proposed BIO Topic Session or Science Board Symposium in 2003

Theory, biological basis and application of fluctuating carrying capacity of the ocean resulting from human impacts

Example of topics and tentative speakers:
- Total allowable catch and artificial release in fisheries
- Nutrient concentration in relation to change in size/species composition and biodiversity
- Density effect of salmon growth and carrying capacity under climate change (Masahide Kaeriyama, William Pearcy)
- Abundance under the ecosystem regime shift

- Numerical models to evaluate carrying capacity for nutrient load and aquaculture focusing on biological basis (Michio Kishi)
- Biological basis of various methods of restoration (Akira Taniguchi)

Tentative convenors:
Takashige Sugimoto (BIO), Chang-Ik Zhang (FIS), Hideaki Nakata (MEQ), Makoto Kashiwai (CCCC).

BIO Endnote 7

Discussion of PICES Review Committee Report

At last year's Annual Meeting, Science Board discussed PICES re-structuring, and agreed "to review the current organizational structure of PICES and to develop a discussion document on that structure and its ability to serve PICES over the next decade" (PICES Annual Report 2001, p. 37). Following this decision, Science Board developed and circulated a discussion document in mid-September 2002. From the document, an excerpt containing the issues related to the BIO activity was prepared (see below) and discussed at the Committee meeting of October 23, 2002.

Changing/new requirements for scientific information

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.

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

Scientific mandates

- The disciplinary names of the Scientific Committees may suggest their mandates are narrow and restricted to within their discipline. An alternative may be to rename these committees using more integrating or issue-based terminology (*e.g.* Upper Trophic Levels).

- BIO has an enormous mandate: from microbes to mammals and birds. BIO has dealt with this problem by establishing an Advisory Panel.

Issues/problems arising from current practices

- The duration of these Advisory Panels (BIO established an Advisory Panel on *Marine birds and mammals*) can be unclear, as well as agreement on the number of such panels in existence at any time. The required activities and oversight of these specific activities are perhaps too detailed for direct supervision by the parent committee, or that the membership of the parent committee is not the most appropriate for the specific task.

- Many Scientific Committees would like to extend the duration of Working Groups (BIO established a Working Group on *Effective sampling of micronekton*) beyond 3 years. Three years is often 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 felt that they were just getting going with the interesting questions when their 3-year term was completed.

BIO Endnote 8

Scientific issues and research directions for BIO Committee

General issues

Holistic approach to ecosystem understanding

To model ecosystem function we must include climate as a forcing mechanism and the role of predation in regulating abundance, which is also controlled to some extent by fisheries (Parsons 2001). Changes in physical forcing mechanisms due to climatic changes will alter the patterns of community structure and energy flows (rates and pathways) between ecosystem components. There are critical (nodal) species that react to change by switching the dominant pathways by which energy goes to the top predators. Thus, it is essential to examine the pelagic and benthic components of the ecosystem to identify those species, or species groups, that play important roles in the transfer of energy. The implication is that some appropriate simplification of ecosystem complexity that would allow predictions of trends in the system, without requiring an exhaustive list of physical variables and species for study (Hunt 2002).

The nature and frequencies of ecosystem changes can be revealed through an investigative approach that requires synchronous data collection, processing and analysis on all species inhabiting a region. The biomass of planktonic and nektonic organisms (especially nodal species), diet rations of high trophic level animals, their metabolic and growth rates, and life history parameters must be estimated from the data. This allows the trophic structure of ecosystems to be described and models of these systems to be constructed. There are key elements of the ecosystem studies (Shuntov, 1999):

- Long-term variability in the ecosystems;
- Quantitative estimation of biological resources, calculations of fish productivity and total biological productivity, and clarification of trends in their dynamics;
- Structure of pelagic and bottom communities, dynamics of bio-diversity parameters;
- Carrying capacities of marginal seas and the Pacific Ocean.

How to project small scale studies into large scale studies to give us some understanding of how whole ocean systems can change

Gathering new kinds of data over large areas and long time scales can be important for that aim (Parsons 2001). Are the impacts of changes in forcing factors most pronounced at lower or higher trophic levels? Are the upper trophic level organisms more buffered from change than those at lower trophic levels)? Are the effects amplified as they cascade through the ecosystem (the ecosystem as a transistor model)? (Hunt 2002). Higher trophic communities should be monitored with other ecosystem elements and parameters. The regulation of fish and squid stock abundance must be considered within the physical conditions determined by new climatic and oceanographic regimes. It is a way to develop an understanding of the evolution of common species and the whole nekton community in the variable environment. In some cases, more sophisticated models incorporating genetic changes in populations due to fishing or climate change may be necessary (Parsons 2001).

Ability of early prediction of a regime shift

This is a critical issue for biological oceanography. Comparative analysis is necessary to clarify the similarities and differences between the 1950-1960s and present climatic and oceanographic epochs in the North Pacific. It is critical to develop studies that compare ecosystem function among the regions. The likelihood and possible duration of the next large-scale change must be predicted. Science must provide mechanisms for sharing both basic science information and the means to incorporate this basic knowledge into the decision making of fisheries management.

Methodological issues

- During the last few years, phytoplankton and photosynthesis studies using the new techniques always over-estimated the gross primary production (Shuntov 2001). It is

important to define how much the present understanding reflects the true values.

- Research on the dynamics of plankton species needs to be continued. Optical and satellite (mostly for phytoplankton) estimates of plankton abundance have been developed in the last decade or so. Inter-calibration studies are essential for these developing plankton sampling technologies, both in the ocean surface layer and in the water column. At the present time, marine ecology deals more with the products of calculations than with true plankton abundance values. Verified assessments will be a basis for lower trophic level modeling and connection of these models to the existing higher trophic level models.
- Collection methods must be applied routinely using the least expensive means possible to build a data bank of biological observations in the North Pacific, over time and space.

Most important issues

- The teleconnections between LMEs in the North Pacific and Arctic have to be actively studied in the near future, as well as sea ice influences on the temperature and salinity of the water column, its hydrographic structure, the availability of light for photosynthesis, and the spatial distribution of fish and their predators (Hunt 2002, Schumacher *et al.* 2002).
- An important area for further studies is the nutrient and organic compound cycles in the North Pacific ecosystems; their inter-annual and long-term dynamics. Contaminant cycles have become significant in recent years.
- The recycling of photosynthetic products now appears to be very important in some environments where the whole ecosystem may depend on the recycling. In summer, a significant part of the "new" primary production is created by recycled nutrients in the Far-Eastern Seas (Sapozhnikov *et al.* 1997).

- Factors affecting zooplankton reproduction success are poorly studied. Further research must include both the monitoring of planktonic community characteristics, and the collection of surrounding physical data series. Only preliminary estimates exist for the contribution of planktonic infusoria, nano- and picoplankton in primary production and organic matter destruction. Further quantification of the bacterial loop is needed.
- The quantity of phytoplankton sinking out of the water column versus that which remains suspended is a point that divides primary production between the pelagic and benthic ecosystems (Parsons 2001).
- Almost nothing is known about the microbenthos and meiobenthos organisms composition, distribution, abundance and dynamics. Their role in the food supply formation for the higher trophic level can be essential and it needs an integrated research project.
- In formulating equations for trophodynamic studies, it is necessary to research the values used for biological coefficients in various relationships. One very important number to study is ecological efficiency (Parsons 2001).
- Mesopelagic macroplankton and micronekton (fish, squids, jellies, etc.) could be critical for the pelagic ecosystem functioning due to their significant biomass and wide distribution.

Preliminary conclusion

We should avoid the promulgation of any ecological theories or models if they are not based on factual relationships which can be tested with subsequently collected data (Parsons 2001).

References

Hunt, G.L. 2002. Ecosystem studies of sub-arctic seas: Results of a Workshop held in Laguna Beach, California, September 4-6, 2002. Department of Ecology and Evolutionary Biology, University of California, Irvine, 13 pp.

Parsons, T.R. 2002. Future needs for biological oceanographic studies in the Pacific Ocean. PICES Scientific Report, No. 22, 35-42.

Schumacher, J. D., Bond, N. A., Brodeur, R. D., Livingston, P. A., Napp, J. M., and Stabeno, P.J. (In Press). Climate change in the southeastern Bering Sea and some consequences for biota. *In*: G. Hempel and K. Sherman (Eds) Large Marine Ecosystems of the World: Trends in Exploitation, Protection, and Research. Amsterdam: Elsevier Science.

Shuntov, V.P. 1999. Review of research into macroecosystems of the Far Eastern seas: results, objectives, doubts. Keynote lecture at the PICES Eight Annual Meeting. PICES 1999 Annual Report, 15-23.

Shuntov, V.P. 2001. Biology of the far-eastern seas of Russia (Vol. 1). Vladivostok: TINRO-Center. 580 pp. (In Russian).

REPORT OF FISHERY SCIENCE COMMITTEE

The meeting of the Fishery Science Committee (FIS) was held from 13:30-17:30 hours on October 23, 2002. The Chairman, Dr. Douglas E. Hay, called the meeting to order and welcomed the participants. The meeting was attended by 14 FIS members and 20 observers representing all PICES member countries (*FIS Endnote 1*). The Chairman reviewed the original agenda and noted several modifications as follows. Decisions on agenda item 9 (PICES Review Committee Report) and agenda item 11 (North Pacific Ecosystem Status Report) were deferred to allow Committee members to read and comment on these reports. Also agenda item 5 was expended to include discussion of the theme for PICES XIII in 2004.

Nominations and election of a new FIS Chairman (Agenda Item 3)

Dr. Yukimasa Ishida (Japan) was nominated and elected as the incoming FIS Chairman with the term of his appointment to begin immediately after this year's PICES Annual Meeting. The Committee thanked Dr. Hay for his leadership and valuable contribution to FIS activities over the past three years.

Implementation of PICES X decisions (Agenda Item 4)

The Working Group 12 on *Crabs and shrimps* completed a report on "Commercially important crabs, shrimps and lobsters of the North Pacific Ocean" that was published in December 2001 as PICES Scientific Report No. 19.

A 2-day Symposium on *Causes of marine mortality of salmon in the North Pacific and North Atlantic Oceans and in the Baltic Sea*, co-sponsored by NPAFC, NASCO, IBSFC, PICES and ICES, was held March 14-15, 2002, in Vancouver, Canada.

Three joint Topic Sessions and two FIS Topic Sessions were held at PICES XI in October 2002 (see session summaries elsewhere in this report).

Proposed FIS Topic Sessions and joint Topic Sessions for PICES XII and Annual Meeting theme for 2004 (Agenda Item 5)

PICES XIII theme

The Committee endorsed the possible theme proposed by Dr. Jeffrey J. Polovina (U.S.A.) for PICES XIII in 2004 (Honolulu, Hawaii): "The North Pacific pelagic realm - an ocean far from continental boundaries".

Topic Sessions at PICES XII

FIS received ten proposals for sessions at PICES XII in 2003 (Seoul, Republic of Korea). Most proposals were for full-day sessions and each was presented by one of the potential convenors or representative. The Committee discussed and selected proposals that best matched the stated theme of PICES XII, as well as FIS objectives. In general, FIS approved all of the proposals but indicated that some could be improved with more focus. In the discussion, FIS clarified whether some could be combined, or if one or more could be convened as half-day sessions (rather than full-day sessions), and if one or more could be held at PICES XIII. Following these discussions FIS developed a prioritized list of recommended FIS Topic Sessions and joint Topic Sessions with other Committees for PICES XII, including approximate titles, duration and potential convenors:

- A ½-day MEQ/FIS Topic Session on *Ecosystem-based management in the North Pacific*; Convenors: Glen Jamieson (Canada), others TBD

- A ½-day FIS Topic Session (jointly with EASEC) on *Management of eel resources*; Co-convenors: Tae Won Lee (Korea) and Katsumi Tsukamoto (Japan)

FIS notes that, if necessary, this session could be held on a Sunday, prior to the main meeting. As this topic was requested by the host country, their views should be solicited prior to the finalization of the schedule.

- A ½-day FIS Topic Session on *Biology of predatory impacts on and by coastal sharks*; Convenor: Gordon H. Kruse (U.S.A.)

- A ½-day FIS Paper Session; Convenor: Chang Ik Zhang (Korea)

It was noted that there was no FIS Paper Session at PICES XI, and pointed out that convening such session at PICES XII would enhance fisheries science activities in PICES and allow participation by more fisheries scientists with different interests.

FIS felt that the remaining proposals were worthy but for various reasons, including the limitations of available time, could not be convened at PICES XII:

- *Biodiversity and fisheries*. This topic could be considered for PICES XIII as a full day session.

- *Sablefish fishery and ecology*. This topic could be deferred until PICES XIII.

- *Latitudinal responses in productivity and recruitment* (proposed as a joint REX/FIS Topic Session). FIS felt this topic was very broad and required more focus.

- *Theory and application of fluctuating carrying capacity* (proposed as a joint BIO/FIS/MEQ/CCCC Topic Session).

- *Physical processes impact on biological productivity and fish population with special attention to variability in fresh water input* (proposed as a joint POC/BIO/FIS Topic Session).

- *Early life history of small pelagic fishes in the North Pacific*.

Progress report of WG 16 on *Climate change and fisheries management* (Agenda Item 6)

The Working Group 16 met on October 19, 2002, just prior to PICES XI (*FIS Endnote 3*). The meeting was well attended with 21 participants representing all member countries. The Working Group reviewed the results of Phase II, which was the compilation of templates that described the biology and population dynamics of the major species. Using the templates provided by Japan, there was a substantive discussion on how to use existing information to estimate how climate change will affect the dynamics of the populations in the future. Participants realized that "projections" are going to result from informed speculation and discussion amongst WG 16 members. Representatives from each country agreed to consult other experts within their country when preparing reports.

For each country the 10 most important species would be included, plus other species of interest. This information will be used to complete an assessment of the impacts of climate and climate change on the 10 most important species in the North Pacific Ocean. Drs. Richard J. Beamish and Akihiko Yatsu agreed to synthesize and integrate that assessment into a summary report using the information provided by individual countries. A first draft of the report will be available for Working Group discussion by May 30, 2003, with the final draft of the report completed by the end of August 2003.

Proposals with financial implications (Agenda Item 7)

<u>Inter-sessional meetings</u>

- No inter-sessional meetings are proposed between PICES XI and PICES XII. FIS suggests that any cost savings be applied to supporting invited speakers for FIS-supported Topic Sessions at PICES XII.

<u>Requests for travel funding</u>

- FIS expects that funds (~CDN $5,000) will be available for invited speakers for FIS-supported Topic Sessions at PICES XII.

Publications

- The final report of WG 16 will be published as a PICES Scientific Report in 2004.
- The number of copies of each PICES Scientific Report in print should be reduced in order to save money. Instead, an electronic version of the report should be considered with paper copies for libraries and similar institutions.
- FIS also discussed and tentatively supported the concept that PICES Scientific Reports could be sold to recover printing costs.

Co-sponsored meetings and relationships with other organizations (Agenda Item 9)

There are no specific plans for co-sponsored meetings or other collaboration identified at the Committee meeting, but it was suggested that requests for co-operative meetings or collaboration with other organizations, such as ICES, could arise within the next year, before PICES XII. In such instances FIS notes that the PICES proposals for cooperation should be authorized by the Science Board, before PICES presents them to other organizations. FIS realizes that some issues need rapid action so FIS should be consulted on PICES-related issues by e-mail if decisions are required inter-sessionally.

Review of the PICES Review Committee Report (Agenda Item 9)

FIS members requested access to the latest revision of the report as soon as possible, and suggested that a draft be posted on the PICES web site. Members agreed to send their comments to Dr. Ishida (FIS Chairman-elect) who will collate and summarize the response of the Committee. Dr. Hay agreed to assist Dr. Ishida with the completion of this task.

New Working Groups (Agenda Item 10)

The Working Group 16 is still active and expects to complete its work in 2003. FIS noted that the idea discussed at PICES X for a new Working Group on *Ecosystem consideration in fisheries management* is very similar to a new proposal received at PICES XI for a Working Group on *Ecosystem-based management*. Both proposals could be combined and considered for implementation in 2003. Prior to that, however, the terms of references for a new Working Group should be considered and drafted through a joint MEQ/FIS Topic Session at PICES XII.

Review of the North Pacific Ecosystem Status Report (Agenda Item 11)

At the time of the meeting most FIS members had not read or did not have access to this report. A few members who had seen the report commented that downloading this graphic-intensive report may be difficult for some recipients. No review comments from FIS were possible at the time of the meeting. FIS requests clarification from the Secretariat about how PICES Committee members should make their views known to the Science Board and PICES.

Discussion/recommendations for a vision and future directions for FIS (Agenda Item 12)

Because of time restraints, this topic received only a brief discussion at the meeting. FIS expects that in future years PICES should put much more weight on fishery science activities. FIS noted that there are many elements of fishery science that are poorly represented in PICES and we should strive to improve this.

Improved interactions with/role for TCODE (Agenda Item 13)

Again, because of time restraints, this topic received only a brief discussion at the meeting. FIS reconfirmed that TCODE could assist by compiling meta-databases relevant to fisheries, fish and invertebrates.

Capacity building within PICES and its member nations (Agenda Item 14)

This topic was added to the agenda at the request of the Science Board, as was intended to be a discussion of comments in the PICES Review Committee Report. The report, however, was not available to most of the FIS members at the time of the meeting. Therefore such a discussion was deferred pending the distribution

of the Review Committee Report. FIS commented, though, that capacity building within PICES is working well but stressed that scientific exchanges should be enhanced.

Improved communication (Agenda Item 15)

This topic was also added to the agenda at the request of the Science Board. Press releases could be a mechanism for highlighting newsworthy items from the Annual Meeting. Session convenors, or others in PICES, should be consulted to determine if specific sessions will have items worthy of press releases. If appropriate, PICES should invite and inform the press about important scientific information that will be presented at the meeting. This process would be assisted by the submission and distribution of extended abstracts prior to the Annual Meeting.

Best Presentation Award

As the FIS meeting occurred before the completion of scientific sessions, it was not possible to discuss nominations for the Best Presentation Award during the October 23 meeting. Following practices of previous years, the convenors of the FIS-sponsored sessions were asked to make the selection.

The 2002 FIS Best Presentation Award went to Alexey Baitalyuk (TINRO-Centre, Vladivostok, Russia) for his paper entitled "Contemporary stock status, distribution, place and role of Pacific saury in the Japan Sea/East Sea".

Honourable mention was also presented to Kyung-Mi Jung (Pukyong National University, Pusan, Republic of Korea) for her paper entitled "Ecological characteristics of walleye pollock eggs in the south-eastern Bering Sea during the 1970s regime shift period".

FIS Endnote 1

Participation List

Members

Richard J. Beamish (Canada)
George W. Boehlert (U.S.A.)
Elena P. Dulepova (Russia)
Douglas E. Hay (Canada, Chairman)
Anne B. Hollowed (U.S.A.)
Yukimasa Ishida (Japan)
Gordon H. Kruse (U.S.A.)
Takashi Minami (Japan)
Toshikuni Nakatani (Japan)
Laura Richards (Canada)
Mikhail Stepanenko (Russia)
Qingyin Wang (China)
Chang-Ik Zhang (Korea)

Observers

Kenji Asano (Japan)
Vladimir Belyaev (Russia)
Alexander I. Glubokov (Russia)
Yeong Gong (Korea)
James R. Irvine (Canada)
Vladimir I. Karpenko (NPAFC)
Jacquelynne R. King (Canada)
Tokimasa Kobayashi (Japan)
Jae-Bong Lee (Korea)
Tae Won Lee (Korea)
Gordon A. McFarlane (Canada)
Igor V. Melnikov (Russia)
Yeong Chull Park (Korea)
Yasunori Sakurai (Japan)
Michael J. Schirripa (USA)
Yasuhiro Ueno (Japan)
Tokio Wada (Japan)
Won Seok Yang (Korea)
Akihiko Yatsu (Japan)
Xian-Yong Zhao (China)

FIS Endnote 2

FIS Meeting Agenda

1. Welcome and introduction of new members
2. Discussion and approval or revision of agenda
3. Nominations and election of a new FIS Chairman
4. Review and discussion of the implementation of PICES X decisions
5. Proposals/topics/issues for the session topic for PICES XII (October 2003)
6. Review and progress report of WG 16 on *Climate change and fisheries management*
7. Proposals with financial implications
   a. Inter-sessional meetings
   b. Travel support and cost implications for supporting travel to PICES meetings
   c. Publications of reports and cost implications
8. Co-sponsored meetings and relations with other organizations, fisheries organizations or commissions - review and discussion.
9. Review of the PICES Review Committee Report
10. Formation of a new Working Group
11 Review North Pacific Ecosystem Status Report
12. Discussion/recommendations for a vision and future directions for FIS
13. Improved interactions with/role of TCODE
14. Capacity building within PICES and its member nations
15. Improved communications
16. Draft of report and summary of FIS recommendations to Science Board

FIS Endnote 3

Interim Report of Working Group 16
on *Climate change, shifts in fish production, and fisheries management*

The Working Group 16 met on October 19, 2002, just prior to PICES XI. The meeting was well attended with 21 participants representing all member countries. Dr. Gordon A. McFarlane was appointed rapporteur. Opening remarks were given by the Co-Chairmen. Dr. Richard J. Beamish observed that the objectives of WG 16 represent one of the principle objectives of the founders of PICES. For 10 years we have studied the impacts of climate and climate change on the marine ecosystems of the North Pacific. It is now time to use this knowledge to provide advice on the potential impacts on our major fisheries with the impacts of human induced climate change on our doorstep. Thus the WG 16 report is both timely and important. Dr. Akihiko Yatsu concurred that this is the final year for the Working Group, that it must complete the report.

Developing a Working Group report

WG 16 is now beginning Phase III, the synthesis phase, where speculation on climate impacts on fisheries in the future will be developed and the final report will be written. The points of contact to facilitate Phase III were agreed to be Drs. Yatsu (Japan), Beamish (Canada), Suam Kim (Korea), Xian-Shi Jin (China) and Elena P. Dulepova (Russia). The United States will identify their point of contact after the Annual Meeting[1].

Dr. Yatsu discussed the templates that he had distributed by e-mail and presented the completed templates for Japan's contribution. As an example for progression to Phase III, Dr. Yatsu presented environmental indices and relationships to productivity (specifically recruitment). There was general discussion of the results presented and participants agreed it was a good first step to initiating Phase III. However, not all species of importance will have productivity information, and providing relationships to environmental indices will be difficult. The lack of productivity information should not be seen as an impediment to

[1] Dr. Steven J. Bograd (PFEL) was appointed as the US point of contact

completing sections of the report for all species. It was agreed that, where available, productivity information will be included and analyzed in relation to climate variables. Speculation will be provided on future trends for all species discussed even if historical productivity information is not available.

Discussion focused on a standardized approach to providing speculation on the future trends of populations in relation to climate change and selecting a future reference point. Dr. James R. Irvine expressed concern that the speculation will be qualitative and not quantitative. Dr. Beamish noted that he has been involved with several international committees on climate change impacts, such as IPCC, and that qualitative speculation is universal. Typically, reports similar to the WG 16 final report provide predictions of trends for the years 2050 and 2100. These two years tend to encompass years in which climate models predict a doubling of atmospheric CO_2. There are several General Circulation Models (GCM) that provide predictions of various climate variables under several greenhouse gas emission scenarios. Dr. Beamish pointed out that the climate models are not yet successful in incorporating Pacific decadal-scale variability that has been observed to be important for fish in the North Pacific. He suggested that authors will be required to deal with these complexities by considering several scenarios. Several Working Group members expressed their need for summary information on the GCM climate variable predictions for 2050 and 2100. Dr. Beamish indicated that he had distributed this information when he sent each member the extensive background material. There was discussion on the appropriate year to use as a reference point. Dr. Beamish advised using 2050 and 2100 to be consistent with primary literature and international committees. Dr. Yatsu suggested using the year in which a doubling of CO_2 is predicted by a specific GCM. Dr. George W. Boehlert recommended that selecting a time frame closest to the present would be the least speculative and perhaps the best selection. It was agreed to use the year 2050 as the reference point for speculation of future trends of climate change impacts on fish populations.

Dr. Yatsu suggested that a representative of NPAFC be asked to join the Working Group to provide input into the salmon sections. Dr. Beamish noted that he is a member of NPAFC. It was agreed that a representative is not required and selection of one could complicate the preparation of the final report. Additionally there would be delay for completion if the approval of the final report by NPAFC was required. It was concluded that FIS should request NPAFC to provide commentary (not approval) on the completed salmon portions of the Working Group's final report.

Dr. Beamish presented information on a proposal for a "Pink salmon watch" program in the North Pacific. He suggested that pink salmon may be the best indicator of climate change because of their short life span, their distinct generations (odd and even years), and their wide distribution. He reported that NPAFC is interested in setting up a monitoring program and will be collating historical pink salmon data for all regions of the North Pacific. It was suggested that a joint PICES-NPAFC pink salmon monitoring program would be an appropriate way to ensure the efforts of WG 16 be continued into the future.

Dr. Boehlert observed that there was a lot of information to distribute among the Working Group members and that e-mail is an ineffective method of distribution. Canada agreed to provide a website for members to download documents and information.

Dr. Beamish asked if the impacts of climate change on aquaculture and sea ranching be included in the final report. He noted that for western Pacific countries, sea ranching is an important fishery. It was agreed that countries can include speculation on the impacts of climate change on aquaculture and sea ranching in their reports if they would like to.

The Working Group discussed the timeframe of deliverables for the upcoming Phase III preparation of the final report. Each country is to prepare their report for each species of interest using the following format:

- Catch data (figures, tables and text).
- Productivity data. Where available, include productivity data (*e.g.* recruitment, abundance) with an explanation of estimation and definition.
- Species biology
- Important environmental variables
- Fishing effects. If possible, separate fishing effects from natural variability.
- Potential species response to climate change scenarios, with 2050 as a reference point.
- Relevant literature (not literature cited, but useful literature for further reading).

Timetable for preparing a report

Dr. Yatsu asked if an interim meeting would be required. WG 16 members reported that it was not financially feasible for them. Dr. Yatsu reported that he would be able to travel to Canada to coordinate the completion of the final report.

For each country the 10 most important species would be included, plus other species of interest. This information will be used to complete an assessment of the impacts of climate and climate change on the 10 most important species in the North Pacific Ocean. Dr. Beamish agreed to try and finish the Canadian draft by the end of February 2003, and provide a copy to the other countries for their information. The two Co-Chairmen will collate the submission by each country on the species of importance. It was agreed that a draft report for Working Group discussion will be completed by the end of May 2003. A final report will be submitted to FIS at the end of August 2003.

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

The meeting of the Marine Environmental Quality Committee (MEQ) was held from 13:30-17:30 hours on October 23, 2002. The Chairman, Dr. John E. Stein, called the meeting to order and welcomed the participants (*MEQ Endnote 1*). The Committee reviewed the draft agenda and it was adopted after revision (*MEQ Endnote 2*).

Business from last year's meeting (Agenda Item 3)

The special issue of *Marine Environmental Research* will contain seven technical papers based on the results of the 1999 MEQ Practical Workshop. All papers have been reviewed, and all of the authors have returned revised manuscripts to Dr. Richard F. Addison, who is serving as the Guest Editor for this volume. A set of papers, together with an introductory paper, will be submitted to the journal in the next three months.

New members of MEQ (Agenda Item 4)

Dr. Stein welcomed two new members to MEQ: Dr. Glen Jamison, Fisheries and Oceans Canada, replaces Dr. Richard F. Addison and Dr. Julia K. Parrish, University of Washington, fills a vacancy in the U.S.A. membership on MEQ.

The Committee expressed its concern that there was no participation in MEQ from China this year, nor has there been for the last few years. Russia was also not represented at PICES XI, but there are current representatives who participate in PICES, and except for extenuating circumstances there would have been participation this year. There is an overall issue of recruiting full participation in MEQ by all member countries.

There was a secondary issue of a competing meeting on harmful algal blooms concurrently taking place in St. Petersburg, Florida, U.S.A.; however, arrangements were made for WG 15 members to meet in Florida and timely transmit results of their deliberations to Qingdao.

The Committee resolved to request all member nations to confirm the participation of its MEQ committee members.

Review of MEQ Strategic Plan (Agenda Item 5)

The Science Board requested consideration of the following question: "*What are the problems in the North Pacific in the next 5-10 years, and how can PICES position itself to understand and be prepared to offer advice on these problems*". The following is a summary of the Committee's discussion of this question. Changes are proposed to the MEQ Strategic Plan and these proposed revisions will be considered further inter-sessionally.

MEQ has had a contaminant/chemical focus in the past. However, there are other issues within the realm of marine environmental quality and ecosystem health that could be considered by the Committee.

MEQ is best positioned to examine human development issues in the coastal zone. It is recognized that many of the human impacts are at the coastal scale and not basin scale. The degree of emphasis on regional vs. basin scale needs further discussion within PICES.

The Committee discussed the definition for "marine environmental quality", as a means to explore a broader view of the MEQ mandate. It was generally recognized that MEQ has not been well integrated with the other Scientific Committees, and careful analysis of the MEQ Strategic Plan may allow for identification of how to improve this situation.

Physical/chemical quality as related to toxic contaminants has been the focal point. It was accepted that the Committee's focus should be expanded to: structure, process, and function of the marine system that sustains both ecosystem and human health or well being. Ecosystem health will ultimately affect human health. Rather than focusing on physical drivers of ecosystem change, MEQ is concentrating on anthropogenic drivers of marine ecosystem vitality and viability.

There are no current international guidelines and standards for ecosystem health, whereas, there are national guidelines and standards for human health. Japan has begun the process of examining environmental health - designing standards and guidelines. Furthermore, each nation has a different situation, each culture and society has a different view of what quality represents. It is important to make sure that the efforts of MEQ, and of PICES, include and are useful to each member country.

Ecological health issues might include:

- Disease, biological pollution, bacteria, HABs;
- Biodiversity and productivity, species introductions, such as ballast water;
- Sustainability of the ecosystem; future use of resources;
- Integrated coastal zone management, ecosystem-based management;
- Predictive models, ecological forecasting;
- Assessment and monitoring – with a clear framework for why the data is being collected and how it will be used to assess the threats to ecosystems of the North Pacific and in particular coastal ecosystems.

Given the above expansion of the Committee's mission, the Committee made the following revisions to the list of issues in the current MEQ Strategic Plan:

Issues deleted because the focus is too narrow or they are the purview of another PICES Scientific Committee:

- Impacts of climate change on coastal ecosystems.
- Biogeochemical processes regulating contaminant dynamics in sediments;
- Harmonization of existing methods used in PICES countries;
- Scientific criteria for protection of marine ecosystems from contaminants.

Issues remaining unchanged, altered to broaden focus, or included *de novo* are as follows:

- Mariculture;
- Biological and physical transport of anthropogenic substances in the marine environment;
- Anthropogenic impacts on benthic habitat (formerly in the Plan as "trawling effects on benthic habitat");
- Identification and assessment of emerging chemical and biological pollutants (including exotic species), and their impacts on marine ecosystems (formerly in the Plan as "identification of emerging chemicals");
- Defining indicators or biological markers of marine ecosystem health, with relevance to human health and welfare or perhaps use the human condition in place of human health and welfare;
- Needing further clarification is a topic addressing: anthropogenic impacts on trophic dynamics and biodiversity that impact system sustainability.

Additional review and revision of the Strategic Plan will occur inter-sessionally.

Summaries of MEQ scientific sessions at PICES XI (Agenda Item 6)

Summaries of the scientific sessions held at PICES XI are presented elsewhere in this Annual Report.

Progress report of WG 15 on *Ecology of harmful algal blooms in the North Pacific* (Agenda Item 7)

Because of a conflict with the Tenth International Conference on Harmful Algal Blooms, a portion of WG 15 met in Qingdao, People's Republic of China, on October 18, 2002, while the remainder of the Working Group met in St. Petersburg, Florida, U.S.A., on

October 21, 2002. The report of WG 15 (*MEQ Endnote 3*) is a combined report of these two meetings.

Proposal for a new Working Group (Agenda Item 8)

MEQ does not propose any new Working Groups for the coming year. However, the Committee agreed to propose a Working Group on *Ecosystem-based management* at PICES XII. A draft description and Terms of Reference are provided in *MEQ Endnote 4*. The Committee agreed to first hold a scientific session on "Ecosystem-based management" and re-examine a Working Group. The Committee also is considering proposing a joint Working Group between MEQ and FIS on this topic.

The Committee agreed that WG 15 should be extended for a fourth year. In addition, because the broad regional interest in HABs will likely continue into the foreseeable future, MEQ requests WG 15 to develop a proposal on whether PICES should form a "Section" (under MEQ) on the ecology and oceanography of HABs. WG 15 is also requested to draft terms of reference for this "Section".

Proposed Topic Sessions for PICES XII (Agenda Item 9)

The Committee proposes two sessions for PICES XII:

1. *Ecosystem-based management* (jointly with FIS); recommended MEQ Convenor: Glen Jamieson (Canada). If Science Board does not approve this session, MEQ is prepared to use the MEQ Paper Session as the forum for this topic. The latter would be the Committee's choice for a ½-day session, if the *Ecosystem-based management* Topic Session is not approved as a full-day session.

2. *Aquaculture within the ocean ecosystem: Concepts for the future*. The Committee proposes a full-day session. The tentative conveners are: Ik Kyo Chung (Korea), Julia K. Parrish and John E. Stein (U.S.A.). At the end of the meeting, BIO representative, Dr. Patricia Wheeler, extended an offer from BIO to jointly sponsor this session. MEQ agreed with this suggestion.

The Committee also noted that at PICES XIII a possible timely topic would be "Oil and gas development". This Topic Session will be considered inter-sessionally.

Theme for PICES XIII (Agenda Item 10)

The Committee proposes the following theme: *Tropical-temperate linkages*. In view of the location (Honolulu) of the meeting, Committee members felt that there should be serious effort to consider issues related to the tropical system.

PICES Review Committee Report (Agenda Item 11)

MEQ concluded that the Review Committee Report is evolutionary rather than revolutionary, and that there was merit to many of the proposals. However, most members had not had sufficient time to review the report in detail. Nonetheless, the Committee endorsed serious consideration of the proposal for "Sections" within the Scientific Committee structure. For MEQ, as noted above, a Section on the issue of HABs has merit.

North Pacific Ecosystem Status Report (Agenda Item 12)

MEQ continues its support for the Ecosystem Status Report and resolved to do the following to synthesize information on the MEQ relevant topics and issues:

- Produce a list of MEQ issues relevant to ecosystem status;
- Solicit rank-ordered response (1 = not an issue to 5 = serious issue) from MEQ members in each region;
- Identify knowledge gaps;
- Include final matrix in Status Report.

The Chairman will solicit additional assistance in writing MEQ-relevant sections for the regional reports.

TCODE Strategic Plan (Agenda Item 13)

The Committee had little time available to discuss the Strategic Plan, except to note that WG 15 had engaged on exchanging and collating data on the occurrence of HAB events in the North Pacific. It was evident from this attempt that continued efforts to facilitate the exchange and easy access to data for the PICES region is warranted.

Best Presentation Award

Dr. C. Michael Watson agreed to assess the presentations and recommended that the MEQ Best Presentation Award be given to Sheng Liu (People's Republic of China) for presentation of the paper entitled "Feeding and reproductive responses of marine copepods in South China Sea to toxic and nontoxic phytoplankton", co-authored by W.-X. Wang.

PICES capacity building initiatives (Agenda Item 14)

The Committee was not able to discuss this agenda item, however, agrees that it is an important topic for PICES to address.

MEQ Endnote 1

Participation List

Members

Glen Jamieson (Canada)
Hideaki Nakata (Japan)
Julia K. Parrish (U.S.A.)
Steve C. Samis (Canada)
John E. Stein (U.S.A., Chairman)
C. Michael Watson (U.S.A.)
Dong Beom Yang (Korea)

Observers

Ik Kyo Chung (Korea)
Ludmila S. Dolmatova (Russia)
Yonghwa Lee (Korea)
Sook Yang Kim (Korea)

MEQ Endnote 2

MEQ Meeting Agenda

1. Welcome
2. Approval of agenda
3. Business from last year's meeting: Status of Practical Workshop special issue (*Marine Environmental Research)*
4. Membership changes
5. Review of Strategic Plan. Discuss "Vision", for MEQ and for PICES, for the next 5 years
6. Summaries of scientific sessions supported by MEQ:
   a. Food Web Dynamics in Marginal Seas: Natural Processes and the influence of human impacts (S2, BIO/MEQ)
   b. Eutrophication, Harmful Algal Blooms and Nutrients (S7, MEQ)
   c. MEQ Paper Session
7. Progress report from WG 15
8. Proposals for new Working Groups
9. Topic session proposals for PICES XII
10. Suggestions for the theme of PICES XIII
11. PICES Review Committee report
12. Ecosystem Status report - general form and content of first draft report; further items to include; sources for regional summaries and/or data; etc.
13. Discussion of the draft Strategic Plan for TCODE, and how MEQ might interact with TCODE on data issues
14. PICES capacity building initiatives
15. Preparation of report to Science Board (recommendations, funding requests, topic sessions for PICES XII)

MEQ Endnote 3

Report of Working Group 15 on *Ecology of Harmful Algal Blooms (HABs) in the North Pacific*

Preamble

This year, the WG 15 meeting was held in two parts. The first was held October 18, 2002, in conjunction with PICES XI (Qingdao, People's Republic of China), and immediately followed the MEQ Topic Session on "Eutrophication, harmful algal blooms and nutrients" (S7). This was for members who could not attend the Tenth International Conference on Harmful Algal Blooms, in St. Petersburg, Florida, U.S.A., that overlapped PICES XI and at which the majority of the WG 15 members were present. The results and recommendations of the preliminary meeting in Qingdao were forwarded to Florida, in time for inclusion in the discussion at the WG 15 meeting in Florida on October 21, 2002. This report combines the results and recommendations of both meetings. The summary of the S7 MEQ Topic Session, which was a recommendation of WG 15 in 2001-2002, is included elsewhere in this Annual Report.

At the Qingdao meeting, chaired by Dr. Paul J. Harrison, three WG 15 members and four observers were present. At the Florida meeting, chaired by the WG 15 Co-Chairmen, Dr. Max Taylor and Dr. Tatiana Orlova, there were nine WG-15 members, including Prof. Ming-Jiang Zhou who attended both meetings, and twelve observers.

Accomplishments in 2001 – 2002

1. Accomplishments include a PICES Scientific Report (No. 23) edited by Drs. Max Taylor and Vera Trainer, titled "Harmful algal blooms in the PICES region of the North Pacific" (152 pages), with complete and uniform country reports from China, Japan, Korea, Russia, western U.S.A. and western Canada. Mexico was also invited to contribute their report to this publication. The report contains an introduction/background, country reports (types of HAB events, seasonality, earliest dates recorded, highest toxin levels, general environmental information, comprehensive literature, causative organisms, bloom reports including maps, unanswered questions, and hopes for future work), summary, and appendices (including images, scanning electron micrographs, and maps). This publication appeared in print in October 2002, shortly before the WG meetings began. Items arising from this report were discussed later at the meeting.

2. In accordance with our recommendations of last year, two international collaborations were initiated:

- A project between the United States and Canada, in the Juan de Fuca eddy region, was begun with the invitation of NOAA National Marine Fisheries Service (Northwest Fisheries Science Center, Seattle) to University of British Columbia scientists. This resulted in joint cruises, exchange of research methods, and laboratory visitations. The Juan de Fuca eddy crosses the border to U.S.A. and Canada, which provides a unique opportunity for international collaboration.
- A Russian scientist was invited to work in the Woods Hole, U.S.A., laboratory of Dr. Donald Anderson to learn new methods and establish baseline data for eastern Russia's harmful algal blooms. This included the analysis of sediment samples from the Bering Sea.

3. In addition, the database that was established as part of the WG-15 recommendation now combines shellfish toxicity data from the west coast of North America, including both the United States and Canada. The uses of these data are included in the report and were discussed at the meeting. Portions of the data are available online as a HAB Data Management System (HAB-DMS), which is now accessible through the National Oceanographic Data Center (NODC, U.S.A,) at http://www.nodc.noaa.gov/cgi-bin/hab/hab.pl.
A Pacific Region website has been created and can be found at http://www.nodc.noaa.gov/col/projects/habs/pacindex.html. The FGDC record for the Washington State Department of Health PSP and Domoic Acid 1998-2000 (NODC

#0000559) has been completed. The online linkage can be found at http://www.doh.wa.gov/ehp/sf/.

In collaboration with Michelle Tomlinson, the NWFSC has developed a web-based form to facilitate the acquisition of information regarding Harmful Algal Bloom reports in Pacific Rim countries. These will be linked to the HAB database as another source of HAB data and information. A statement of work is being written to describe additional enhancements to the system, as well as requirements for linking these HAB reports, as well as other sources of coastal data sets which reside within NODC, to the system. Nick Adams from NOAA Northwest Fisheries Science Center, who was instrumental in digitizing harmful algal bloom data, gave a brief overview of the results.

Country reports

The next item was the presentation of brief annual HAB event summaries by each PICES country. HABs occurred in all member countries, including both human health risks (for example, nine PSP illnesses in Alaska in 2002 and domoic acid poisoning) and marine faunal mortalities (fish and shellfish). There were 100 red tide cases in Japan, and 77 occurrences in China (1 billion Chinese yuan lost). The most numerous HAB occurrences in China were in the East China Sea. In Korea, HAB-related fish kills resulted in a 3.4 million dollar loss. In the latter case, clay was used successfully as a mitigating agent. Cultures from cysts isolated from Russian coastal sediments all proved to be toxic. In British Columbia, shellfish poisoning occurrence was high, and an unprecedented fish kill due to *Chattonella* was reported. In the United States, there were widespread shellfish closures due to PSP toxins, but domoic acid caused widespread closures of coastlines to shellfishing in Washington, Oregon, and California. Nine people suffered from PSP symptoms from eating mussels in Alaska. An unusual *Heterosigma* bloom was observed in San Francisco Bay. Mexico updated the information provided in the published PICES Scientific Report No. 23.

Interactions with other Organizations

Strong interest has been expressed in greater interaction between the HAB WG of ICES and PICES. This was a specific line item recommendation in the most recent ICES report. WG 15 strongly endorses this. Typically, the ICES HAB WG meets for one week separately from the main ICES Annual Meeting and often convenes a workshop addressing a specific topic. Dr. Yasuwo Fukuyo also summarized the activities of IOC WESTPAC which, at present, consists mostly of training in the PICES and other areas. Dr. Patricia Glibert (at Qingdao meeting) reported on international GEOHAB studies. PICES Scientific Report No. 23 should assist GEOHAB in establishing a global assessment of HAB events.

General discussion

Matters arising from the published report were discussed. They included a serious concern about the methods used by the member countries for reporting HABs, which make comparisons between countries sometimes difficult. Also, the benefits of international collaboration were emphasized.

Future directions for activities by the Working Group were discussed with a possible change of focus and membership. The following recommendations were made:

Recommendations

1. Continue WG 15 activities for another year (with the current Co-Chairmen), during which time countries are requested to submit ideas for future areas of focus and suggestions for changes in membership. The extension was endorsed by both the Qingdao and the Florida meetings.
2. Convene a workshop (2-3 days) on *Harmonization of HAB data* immediately prior to PICES XII. Specific items of discussion should include:
   a. which data from current monitoring programs and other programs could be included in a digitized HAB database;

b. whether there should be access restrictions to the database;
c. what assistance each country could contribute to database generation and data digitization.

3. Strengthen ties between the PICES and ICES HAB Working Groups (in accordance with recommendations by both groups) by attendance of representatives at one another's WG meetings.

Requests for funding

Travel support for 3-4 scientists to attend a workshop (2 days) on *Harmonization of HAB Data* to be held prior to PICES XII in addition to interested WG members.

MEQ Endnote 4

Proposal for a joint MEQ-FIS Working Group on
Ecosystem-based management science in the North Pacific

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 biodiversity, productivity and 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 a real danger of overall negative ecosystem change to the detriment of human society. This Working Group will develop a synthesis of how PICES countries are currently addressing the issue of EBM, and provide recommendations on how PICES could improve the state of the science that provides the framework for EBM initiatives in PICES countries. Such study 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 (MEQ) has largely focused on contaminant issues. This proposal would address MEQ's existing mandate more completely, namely to promote and co-ordinate marine environmental quality and interdisciplinary research in the North Pacific. However, since fishing activities are one of the major impacts on marine ecosystems, co-sponsorship of this Working Group by the Fisheries Science Committee (FIS) would be appropriate and desirable.

In 2001, a Working Group was proposed by FIS, titled "Ecosystem considerations in fisheries management" (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 human activity.

The proposed deliverables are:

1. A summary of initiatives to address EBM that PICES member countries have

underway, including their identified conceptual objectives; what process is being investigated to convert these over-arching goals into operational management objectives; what pilot areas, if any, are such studies being undertaken in; and the progress that has been achieved in these initiatives to date.

2. Consideration of the EBM initiatives being undertaken by PICES member countries in the context of both their research programs, and the initiatives being undertaken elsewhere in the world, and in particular in the North Atlantic and around Australia and the Antarctic.

3. Provision of recommendations on the needed science to enable EBM initiatives to be more fully engaged by PICES member countries. The recommendations might address, for example, the scientific merits of potential sites for pilot studies; opportunities on how adjacent countries might explore common initiatives in trans-boundary areas; and the organization of topic sessions or workshops to broaden discussion around this complex topic.

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting of the Physical Oceanography and Climate Committee was held from 13:30-17:30 hours on October 23, 2002. The Chairman, Dr. Kuh Kim, called the meeting to order and welcomed new members Drs. Michael G. Foreman and Jinping Zhao (*POC Endnote 1*). Congratulations were extended to Dr. Yutaka Nagata on his Wooster Award. Dr. Susan E. Allen served as rapporteur. The Committee reviewed the draft agenda and it was adopted with the addition of an item on NEAR-GOOS (*POC Endnote 2*).

Business arising from PICES X (Agenda Item 2)

- Dr. William R. Crawford, as one of Guest Editors, was congratulated on the timely publication of the special issue in *Journal of Oceanography* (Vol. 58, No. 5) on "Physics and biology of eddies, meanders and rings in the PICES region".
- The electronic (CD-ROM and web-based) version of the *Oceanographic Atlas of the Okhotsk Sea, Bering Sea and Japan/East Sea* was prepared by the Pacific Oceanological Institute and translated into English without the financial help of PICES. It is a first edition containing maps, sections and descriptions (see www.pacificinfo.ru). Comments are welcome.
- The 3-day CREAMS/PICES Workshop held August 22-24, 2002, in Seoul, was attended by 69 scientists from 7 countries. Funding was provided from U.S.A., the Republic of Korea and PICES. Selected papers will be submitted to a special issue of a primary journal. *Progress in Oceanography* will be approached as soon as new editors officially start.
- A 2-day JGOFS/PICES Workshop on *Synthesis of JGOFS North Pacific Process Study*, sponsored by PICES, Japanese Oceanographic Society and Nagoya University, was held October 1-2, 2002, in Sapporo, Japan. Abstracts have been published and a special issue in *Journal of Oceanography* is planned.
- Dr. Vyacheslav B. Lobanov attended the NEAR-GOOS meeting as a PICES representative. Regional (near) Real-Time and Delayed Mode Databases have been operated by JMA and JODC, and each participating country (Japan, People's Republic of China, Republic of Korea and Russia) has a website with data and meta-data, but limited mostly to physical parameters. It is hoped that D.P.R. Korea will join the project. After completion of the first phase, the progress of NEAR-GOOS has been slow. A new strategic plan is now under development, and in order to broaden the program to an ecosystem-based effort, NEAR-GOOS is requesting the assistance of PICES scientists.

Progress report of North Pacific Data Buoy Advisory Panel (Agenda Item 3)

The Co-Chairmen, Brian O'Donnell, and the Technical Coordinator, Ron McLaren, reported that the Panel met in June 2002, in Victoria, Canada, and presented current activities of the Panel to POC (see *POC Endnote 3* for details).

Final report of WG 13 on *CO2 in the North Pacific* (Agenda Item 3)

The final report of WG 13 will be submitted by the end of November.

Progress report of WG 17 on *Biogeochemical data integration and synthesis* (Agenda Item 3)

The Co-Chairman of WG 17, Dr. Yukihiro Nojiri, presented the Working Group activities since PICES X and future plans (see *POC Endnote 4* for details).

Science Board issues (Agenda Items 4 and 5)

The Chairman of Science Board, Dr. Ian Perry, reported that a draft of the North Pacific Ecosystem Status Report was completed and is ready for comments. POC strongly supports this initiative and suggests that a junior support scientist be hired to join the PICES Secretariat and assist with this endeavor. Dr. Perry also presented the PICES Review Committee Report. He mentioned the need for (i) a stronger sense of direction, (ii) developing a strategy for capacity building, and (iii) adding an additional staff member to the Secretariat.

Convenors' report on POC Sessions at PICES XI (Agenda Item 6)

- Dr. David L. Musgrave, as one of convenors, was congratulated on the excellent BIO/POC/FIS Topic Session on "The importance of biophysical coupling in concentrating marine organisms around shallow topographies". He reported that convenors were pleased with the diversity of the talks.
- Dr. James E. Overland, co-convenor of the POC/FIS Topic Session on *Detection of regime shifts in physics and biology*, reported that he was disappointed with the small number of abstracts submitted to the session, but was pleased with the large Asian contribution and the geographical distribution of talks.
- Dr. Kuh Kim reported that the turn out at the POC Paper Session was poor and that two speakers did not attend. The number of abstracts submitted was also low. Although no decision was reached it was suggested that perhaps Topic Sessions are preferable to Paper Sessions.
- The PICES/CLIVAR workshop on "Climate variability in the Pacific and its impact on the marine ecosystem" was well attended. Many excellent presentations were given (partially due to large number of invited speakers funded by WCRP, NSF, NOAA, NASA and PICES). Dr. Kelvin Richards, co-convenor of the workshop, reported that one of the impressions that came out of the workshop was the need to work towards mechanistic linkages between variations in the climate and the marine ecosystem, rather than statistical correlations between climate indices and abundance of species. POC considers this workshop as the first step in establishing a strategic consortium between the PICES and CLIVAR communities in the future, and recommends to have a PICES/CLIVAR session/workshop again in 2004, in conjunction with PICES XIII, focusing on the mechanisms of climate induced decadal variability of the marine ecosystem.
- It was noted that some presentations were repeated at PICES/GLOBEC workshop and PICES/CLIVAR workshop and PICES sessions. It was recommended that the Science Board take measures to reduce the duplication of papers between sessions/workshops.

POC Strategic Plan (Agenda Item 7)

- POC felt strongly that the future direction of POC and PICES should be generally towards mechanistic understanding of the linkages between the physical climate and fisheries and ecosystems.
- Dr. Makoto Kashiwai reported on the CCCC Integration Workshop. POC thinks that more direct connection with CCCC would be preferable. Perhaps a POC representative on the CCCC Implementation Panel would be appropriate.
- Mr. Robin M. Brown reported on TCODE activities and congratulated POC's WG13 on its data coordination. TCODE requested early consultation on data handling by Working Groups.

Topic Sessions at PICES XII (Agenda Item 8)

Two Topic Sessions were proposed for PICES XII:

1. *Application of global observation systems to physics, fisheries and ecosystems* (jointly with BIO, FIS and MEQ); recommended convenor: Michael G. Foreman (Canada)
2. *Impact of physical processes on biological productivity and fish populations with*

special attention to the effects of variability in fresh water input to the ocean (jointly with BIO and FIS); recommended convenor: Yury I. Zuenko (Russia)

PICES XIII theme (Agenda Item 9)

POC recommends that the theme for PICES XIII be "Mechanism of climate impacts on fisheries and ecosystems".

Relations with international organizations and programs (Agenda Item 10)

- The 12th PAMS/JECSS (Pacific Asian Marginal Seas/Japan (East) and East China Seas Study) workshop will be held April 14-16, 2003, in Hangzhou, People's Republic of China. PICES is interested in co-sponsoring the workshop for the purpose of collecting information on variability and status of the East China Sea and Yellow Sea ecosystems for the North Pacific Ecosystem Status Report.
- CAOS (Coastal Alaskan Observing System) plans to meet in spring 2003, and may be a source of information for the North Pacific Ecosystem Status Report in the northern Gulf of Alaska and the Bering Sea.
- EPOC (Eastern Pacific Ocean Conference) meets in the fall of every year. It was suggested that a joint meeting of PICES and EPOC could be planned (perhaps in Honolulu). A potential problem in the difference of style (PICES - formal, EPOC - very informal) was raised.

Proposals with financial implications (Agenda Item 11)

Publications

- A special issue on the Japan/East Sea ecosystem, resulting from the CREAMS/PICES workshop in August 2002, be published in a primary journal in 2004;
- Final report of WG 13 should be completed and published in PICES Scientific Report Series in 2003.

Inter-sessional meetings

- POC recommends co-sponsoring the 12th PAMS/JECSS workshop, if necessary.

Requests for travel funding

- 1-2 scientists to attend the Third PICES Workshop on *Okhotsk Sea and adjacent areas* to be held June 1-3, 2003, in Vladivostok, Russia;
- 1-2 (Japanese or Russian) scientists from the MONITOR Task Team to attend the CAOS meeting in spring 2003.

POC Best Presentation Award

Dr. Shuhei Masuda (Frontier Research System for Global Change, Japan) won the POC Best Presentation Award for his paper entitled "A model of regime transitions in the North Pacific".

Other business (Agenda Item 13)

POC recommended that the PICES website be improved.

POC Endnote 1

Participation List

Members

Susan E. Allen (Canada, rapporteur)
Michael G. Foreman (Canada)
Dun-Xin Hu (China)
Kuh Kim (Korea, Chairman)
Vyacheslav B. Lobanov (Russia)
David L. Musgrave (U.S.A.)
James E. Overland (U.S.A.)
Stephen C. Riser (U.S.A.)
Jinping Zhao (China)
Yury I. Zuenko (Russia)

Observers

Jack A. Barth (U.S.A.)
Alexander S. Bychkov (PICES)
William R. Crawford (Canada)
Denis D'Amours (Canada)
Stewart M. McKinnell (PICES)
Ron McLaren (Canada)
Leonid Mitnik (Russia)
Yutaka Nagata (Japan)
Yukihiro Nojiri (Japan)
Brian O'Donnell (Canada)
Kelvin Richards (U.S.A.)

POC Endnote 2

POC Meeting Agenda

1. Adoption of agenda
2. Completion of PICES X decisions
3. Reports of existing subsidiary bodies and proposals for new subsidiary bodies
4. North Pacific Ecosystem Status Report
5. PICES Review Committee Report
6. Summaries of scientific sessions and workshops supported by POC
7. Review of POC Strategic Plan
8. Topic Session proposal for PICES XII
9. PICES XIII theme
10. Relations with international organizations and programs
11. Items with financial implications
12. 2002 POC Best Presentation Award
13. Other business
14. Adoption of POC report and recommendation to Science Board

POC Endnote 3

Report of *North Pacific Data Buoy* Advisory Panel

Overview

Two years ago, at the request of the Data Buoy Co-operation Panel (DBCP), Canada was invited to explore the possibility of facilitating the formation of a DBCP Action Group for the North Pacific Ocean, similar to other successful groups, which have been formed for other major ocean areas. The main objective of the group would be to increase the amount of operational meteorological and oceanographic data available in the North Pacific Ocean.

PICES was considered as a logical partner in this initiative, due to its pre-existing and well-established structure of scientific representatives and member countries in the Pacific Rim area. The concept of working with PICES was discussed at the DBCP meeting in Perth, Australia, in the fall of 2001, and was approved. At the PICES Tenth Annual Meeting, the Governing Council approved the formation of the *North Pacific Data Buoy* Advisory Panel, reporting jointly to the Physical Oceanography and Climate Committee (POC) of PICES and the Data Buoy Co-operation Panel.

In late 2001, expressions of interest were obtained from representatives of PICES member countries and the final selection of the initial members of the Panel was approved by the Governing Council.

The first meeting of the group was held June 5-7, 2002, in Victoria (Canada). During the meeting, the Terms of Reference, consistent with DBCP and PICES objectives, was finalized and a set of Operating Principles was agreed to. Some time was spent discussing the number of buoys that would be required to completely meet the objective of 1 Sea Surface Temperature (SST) and 8 Mean Sea Level pressure (MSL) observations per day in every 500 x 500 km square area. As far as practical, buoys will be deployed to achieve and maintain this density over the operational area. As a minimum, approximately 120 data buoys would be required.

The Panel discussed the urgent items for the coming year, including a strategy to involve all the PICES member countries in the work of the Panel. To be effective in this goal, attendance of a Panel representative at the PICES Eleventh Annual Meeting (October 18 - 26, 2002, Qingdao, People's Republic of China) was recognized as desirable. The annual DBCP meeting was to be held October 14-18, 2002, in Martinique. It was recommended that following the DBCP meeting, Brian O'Donnell and Ron McLaren attend the PICES meeting to make presentations to various PICES groups, including a workshop on "Monitoring from moored and drifting buoys".

Buoy deployments for 2002/2003

Eight SVP/B buoys purchased by Canada were deployed by NAVO in September 2002, in the Gulf of Alaska. Additional 4 buoys will be deployed later in the year.

Web Page

Paul Moersdorf offered to host the NPDBAP web site at the NDBC facilities at Stennis Space Centre. Ron McLaren, with the help of Estelle Couture, agreed to start building the web site.

Selection of Co-Chairmen and Technical Coordinator

The Panel considered the selection of officers and, in accordance with the Operating Principles, "Members will elect two Co-Chairmen and appoint a Coordinator. The Co-Chairmen will be selected to balance representation from Asia and North America and from PICES and the DBCP." Dr. Moersdorf nominated Mr. Brian O'Donnell as the North American Co-Chairman, which was unanimously accepted by the members in attendance. Mr. O'Donnell advised that he would be pleased to accept the nomination and continue with the formative work of the Panel, with the caveat that he could only commit to a 1-year term due to future career obligations.

The position of the second Co-Chairman was reserved as vacant, pending facilitation by the PICES Secretariat to secure the appointment of a suitable representative from Asia.

The Panel proceeded to consider the position of Technical Coordinator. Mr. O'Donnell asked Mr. Ron McLaren if he would be willing to serve as the Technical Coordinator. Mr. McLaren replied in the affirmative, and the Panel expressed agreement with the appointment.

Time and place of next meeting

After some discussion, the time and place of the next meeting of the Panel remains under consideration. To encourage participation by western Pacific countries, a location in Asia was recommended. The possibilities include:

- Prior to, or in conjunction with PICES XI to be held October 18 - 26, 2002, in Qingdao, People's Republic of China. As mentioned earlier, there is a conflict with the annual DBCP meetings to be held October 14-18, 2002, in Martinique.
- Prior to, or in conjunction with PICES XII to be held October 10 - 18, 2003, in Seoul, Republic of Korea.

NPDB activities following PICES XI and DBCP meetings

- Appoint Co-Chairman from Western Pacific member country;
- Hold annual meeting of NPDB in October 2003, immediately prior to PICES XII in

Seoul, Korea. (To some extent depends on success of #1 above. Alternately meeting could be held prior to/during DBCP sessions in Brazil);
- Deploy 11 wind speed, direction and SST buoys west of the date line in co-operation with the Global Drifter Program (January – February 2003);
- Establish NPDB web page in co-operation with PICES, MEDS and NDBC (February 2003);
- Work with researchers (SIO, PMEL etc.) and participate in working groups as appropriate to promote the deployment of buoys in the North Pacific.

NPDBAP Endnote 1

Participation List

Estelle Couture	Member	Marine Env. Data Service, Canada (MEDS)
Elizabeth Horton	Member	Naval Oceanographic Office, USA (NAVO)
Ron McLaren, Ron	Member, Technical Coord.	Meteorological Service of Canada (MSC)
Paul Moersdorf	Member	National Data Buoy Centre, USA (NDBC)
Brian O'Donnell	Co-Chairmen	Meteorological Service of Canada (MSC)
Natalia Bessmertnaya	Observer	Intern, PICES
Etienne Charpentier	Observer	Data Buoy Co-operation Panel (DBCP)
Yvonne Cook	Observer	Meteorological Service of Canada (MSC)
Howard J. Freeland	Observer/Presenter	Department of Fisheries and Oceans (DFO)
Owen Lange	Observer/Presenter	Meteorological Service of Canada (MSC)
David L. Mackas	Observer/Presenter	Department of Fisheries and Oceans (DFO)
Stewart M. McKinnell	Observer	Assistant Executive Secretary, PICES
Dave Watson	Observer	Meteorological Service of Canada (MSC)

POC Endnote 4

Progress report of WG 17 on *Biogeochemical data integration and synthesis*

Meeting summary

The meeting of the Working Group 17 was held from 08:30 – 17:30 hours on October 18, 2002. After a brief welcome by the Co-Chairmen, Drs. Andrew Dickson and Yukihiro Nojiri (see WG 17 Endnote 1 for attendance), and a review of the terms of reference for the Working Group (*WG 17 Endnote 2*), the meeting continued with a series of status reports and technical presentations (see *WG 17 Endnote 3* for meeting agenda).

Dr. Christopher L. Sabine provided a brief overview of the WOCE Hydrographic Program/JGOFS CO_2 survey that had been carried out in the 1990s, and the information that was being gleaned from this data about the distribution of "anthropogenic" CO_2 in the Pacific Ocean. He then went on to outline U. S. plans for a more limited "repeat survey" that will start in 2003, and is expected to continue for a number of years as well as for a planned cooperative atmosphere and ocean CO_2 observing network. Dr. Sabine advocated for close cooperation between Working Group 17 and the Ocean Carbon Coordination Project of the Global Carbon Project (a joint project of IGBP/IHDP/WCRP) that he chairs. In particular, he asked that the two groups work together to:

- Collate historical, present day and future CO_2, carbon isotope and hydrographic data into an internationally accessible database.
- Collate underway pCO_2 data into an internationally accessible database.
- Foster international efforts to determine changes in the ocean carbon system as a result of climate change and global change by supporting synthesis efforts, planning meetings, scientific symposia, and PICES-supported publications.

- Co-sponsor scientific meetings with GCP, SCOR-IOC CO_2 Advisory Committee, CLIVAR and International SOLAS.
- Sponsor research and inter-comparison studies to support international consistency of analytical methods and reference materials for carbon and carbon-related species among PICES countries.

The Working Group noted that many of these points overlapped directly with their Terms of Reference (*WG 17 Endnote 2*) and agreed that such collaboration would be desirable.

Dr. Shuichi Watanabe provided a brief overview of the goals and cruise plans of the JAMSTEC Ocean Observation and Research Department. In particular their goals are to understand: (i) the role of the ocean in climate change, and (ii) the anthropogenic changes in, and the natural variability of the climate. To accomplish this, JAMSTEC is undertaking several research projects including a number explicitly aimed at the study of the biogeochemistry of the North Pacific (including repeat surveys in some areas) as well as a round-the-world cruise of their research vessel *Mirai* in 2003–2004.

Dr. C. S. Wong briefly reported on Canadian activities relevant to the Working Group's interests. In particular, he mentioned that work was still continuing at Ocean Station P (2-3 times per year), as well as collaboration on VOS lines with NIES. Future Canadian plans will focus on SOLAS-related activities and more active involvement with research into CO_2 disposal options.

Dr. Alexander Bychkov gave a brief presentation (on behalf of Dr. Pavel Tishchenko) describing recent CO_2-related work at the Pacific Oceanological Institute. This involved participation in 3 recent cruises in the Japan Sea (with Republic of Korea), the Sea of Okhotsk (with Germany), and the Bering and Chukchi Seas (with other Russian institutes).

Dr. Tongsup Lee briefly reviewed the status of relevant Korean activities. In particular, he described the two CREAMS projects studying processes in the marginal seas around the Republic of Korea.

Dr. Yukihiro Nojiri presented the NIES VOS observing projects in the Pacific Ocean. He reiterated the difficulty of obtaining a consistent time-series from a commercial vessel whose route and schedule is independent of the scientific goals. He described the data sets that had been obtained using the M/S *Skaugran*, and the M/S *Alligator Hope*, and indicated that the M/S *Pyxis* was now being used to study the North Pacific. The data from these projects is all made available over the Internet in a timely fashion.

In addition, to the above mentioned status reports on North Pacific CO_2 measurement activities, there were three presentations from individuals involved with database activities.

Mr. Todd D. O'Brien provided an overview of the work done at the US NODC (National Ocean Data Center) and, in particular, of the work involved in preparing the World Ocean Database (1994, 1998, 2001) - an integrated database that has been compiled in a selective fashion from the larger NODC holdings.

Mr. Alexander Kozyr reviewed the work at CDIAC (Carbon Dioxide Information and Analysis Center) in support of ocean CO_2 measurements. In particular, he provided a guided tour of the GLODAP (Global Ocean Data Analysis Project) web site and indicated the role that CDIAC had played in this project.

Dr. Toru Suzuki provided an overview of a new project PICNIC (PICES CO_2 Related Data Integration for the North Pacific) and the work done at MIRC to prepare an inventory of Japanese CO_2 data in the North Pacific. This web site (http://picnic.pices.jp) incorporates the extensive information about Japanese cruises and information about Canadian (IOS) and U. S. cruises (linked to CDIAC holdings). At present, the inventory is linked where practical to the original data sets (at other locations on the Internet), however work is in progress to host some datasets at MIRC. The work planned for the coming year includes the implementation of LAS 6 (Live Access Server) to enable more straightforward data visualization over the Internet.

Finally, there was an interesting technical presentation by Dr. Yutaka Watanabe who showed that there were clear changes in the levels of some biogeochemical variables in the North Pacific (1970–2000), and that it seemed that these changes could be related to variations in the NPI (North Pacific Index).

For the last half of the afternoon, the Working Group Members focused their discussion on how best to achieve the goals set forth in the Terms of Reference, and how to prioritize the necessary activities. The decisions reached are outlined below.

Plans for Future Activities

Written Guide of Best Practices

The Working Group agreed that the highest priority for the coming year would be the preparation of a written guide of best practices for oceanic CO_2 measurements and data reporting. This would be based on existing documents: the DOE (1994) *Handbook of methods for the analysis of the various parameters of the carbon dioxide system in sea water* (Dickson, A. G. & Goyet, C., Eds.) and draft protocols for data reporting that were generated by PICES Working Group 13, and discussed further at a NOAA Data Management Workshop held in Seattle, in October 2001.

To ensure that this activity proceeds in a timely fashion, a number of the Working Group members expect to meet to review progress at the forthcoming planning meeting of the oceans group of the IGBP/IHDP/WCRP Global Carbon Project which will be held in Paris, France (January 13-15, 2003), and again in conjunction with the 3rd JGOFS Open Science Meeting in Washington, DC, U.S.A. (May 5-8, 2003). Another benefit of this proposed timetable for meetings is that it will encourage substantial input from non-PICES scientists, thus leading to an improved product that could be of use to a variety of international CO_2 programs.

It is hoped that a complete draft will be available for review by the Working Group at the meeting to be held in conjunction with PICES XII in October 2003, in Seoul, Korea. It is planned that this guide will be published in the PICES Scientific Report Series in 2004.

Measurement inter-comparisons

There are plans for an on-land inter-comparison of underway and drifting/mooring $p(CO_2)$ measurement systems. This is being organized in Japan by Dr. Nojiri in March 10-15, 2003, and will include participants from PICES countries as well as from Europe and Australasia.

There is also an ongoing inter-comparison of C-13 in dissolved inorganic carbon that was initiated by Working Group 13. The results are still coming in from this exercise, and it should be completed in the next six months. There are plans to organize a workshop if needed to discuss the results from this inter-comparison.

Work on Pacific CO_2 database

Another priority of the Working Group is to develop a North Pacific database for ocean CO_2 and related parameters in association with existing Data Centers. This project is going ahead at MIRC (Marine Information Research Center of the Japan Hydrographic Association) with the development of the PICNIC data inventory, now available on line at http://picnic.pices.jp. At present, the strategy is to provide links to original data wherever practical, and to serve various historical data sets as they are digitized. During the coming year, this project will work to update its use of the Live Access Server (LAS) technology so as to provide for improved visualization of the relevant North Pacific data sets.

Co-ordinate planning of future measurement programs

The Working Group agreed to collaborate with the Global Carbon Project's proposal to maintain a web site (as part of their Ocean Carbon Coordination Project). This site will display information about current and future research projects involving ocean CO_2 measurements. PICES member nations will be

encouraged to contribute information to this web site in a timely fashion.

Meeting planning

The Working Group is hoping to establish a PICES focus area among the posters presented at the forthcoming international 3rd JGOFS Open Science Conference "*A Sea of Change: JGOFS Accomplishments and the Future of Ocean Biogeochemistry*" to be held May 5-8, 2003, in Washington DC, U.S.A. Members of the Working Group will encourage their colleagues to submit abstracts for this meeting.

In addition, it was agreed that the Working Group would plan to convene a Topic Session at PICES XIII (October 2004, Honolulu, U.S.A.) on "The impacts of climate change on the carbon cycle in the North Pacific".

Recommendations to PICES

- Support a meeting of the Working Group in conjunction with PICES XII in Korea, in October 2003.
- Publish the proposed "Guide to best practices for oceanic CO_2 measurements and data reporting" in the PICES Scientific Report Series, in early 2004.
- Support a 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.

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)
Yukihiro Nojiri (Japan, Co-Chairman)
Todd D. O'Brien (U.S.A.)
Christopher L. Sabine (U.S.A.)
Toru Suzuki (Japan)
Shuichi Watanabe (Japan)
Yutaka Watanabe (Japan)
C. S. Wong (Canada)

Observers

Norio Baba (Japan)
Alexander Bychkov (PICES)
Sachiko Oguma (Japan)
Daniela Turk (Canada)
Masahide Wakita (Japan)
Emmy Wong (Canada)

WG 17 Endnote 2

Terms of Reference

1. Develop a North Pacific database for ocean CO_2 and related parameters in association with existing data centers. Advise data centers which of the available historical data sets should be assigned a high priority for acquisition and conversion to an electronically readable form.
2. Prepare a written guide of best practices for oceanic CO_2 measurements and data reporting. Carry out, as needed, inter-laboratory method comparisons to assure future measurement quality. Encourage the availability of suitable reference materials.
3. Develop a strategy to co-ordinate the planning of future North Pacific measurement programs to ensure optimal use of resources to obtain appropriate temporal and spatial coverage as well as maximum comparability with historical data. Efforts should be made to encourage timely availability of the "new" data.
4. Organize a symposium or an Annual Meeting Topic Session on the impacts of climate change on the carbon cycle in the North Pacific.

WG 17 Endnote 3

WG 17 Meeting Agenda

1. Welcome by Co-Chairmen and review of Terms of Reference
2. Status reports and technical presentations
   - U. S. and international plans for carbon cycle research: ties to PICES WG 17 (*Christopher Sabine, PMEL/ University of Washington, U.S.A.)*
   - JAMSTEC: Ocean observations for understanding earth environment change (*Shuichi Watanabe, JAMSTEC, Japan)*
   - Status report of the IOS CO_2-related programs in the Pacific Ocean (*C. S. Wong, IOS, Canada)*
   - Korean national status report (*Tongsup Lee, Pusan National University, Korea)*
   - NIES VOS observation and database (*Yukihiro Nojiri, NIES, Japan)*
   - Russian national status report (*Pavel Tischenko, POI, Russia; presented by Alexander Bychkov)*
   - World Ocean Database 2001 (*Todd O'Brien, NODC/NOAA, U.S.A.)*
   - The Global Ocean Data Analysis (GLODAP) Project (*Alexander Kozyr, CDIAC, U.S.A.)*
   - PICNIC data inventory web page (*Sachiko Oguma and Toru Suzuki, MIRC, Japan)*
   - Use of modern and historical data for North Pacific biogeochemical change (*Yutaka Watanabe, Hokkaido University, Japan)*
3. Discussion and planning

REPORT OF TECHNICAL COMMITTEE ON DATA EXCHANGE

The meeting of the Technical Committee on Data Exchange was held from 13:30-17:30 hours on October 23, 2002. The Chairman, Dr. Igor I. Shevchenko, called the meeting to order and welcomed the participants (*TCODE Endnote 1*). The Committee reviewed the draft agenda and it was adopted as provided (*TCODE Endnote 2*).

Progress on items in the 2001/2002 TCODE Workplan (Agenda Item 3)

Revise/update TCODE web pages

The Chairman reviewed the TCODE Home Page (http://tcode.tinro.ru). This website contains records of previous TCODE activities and various documents. Dr. Shevchenko demonstrated the opportunities for using this website for exchange of information amongst TCODE members and other interested parties.

PICES/GLOBEC Data Management Workshop

The joint PICES/GLOBEC Workshop on *Exchange, inventory and archival of GLOBEC data* was held on Saturday, October 19, 2002, and was well attended. There was a series of talks on current initiatives that are relevant to the PICES/GLOBEC data management, and an active discussion on the next stages in data management. Dr. Thomas C. Royer suggested that the best contact for the United States would be with the NE Pacific GLOBEC group, rather than US GLOBEC main office. The convenors (Igor Shevchenko - TCODE and Hester Willson - GLOBEC International Programme Office) have prepared a meeting summary and posted it on the TCODE website.

Provisional list of metadata keywords

Dr. Bernard A. Megrey and Mr. Allen Macklin reported on their efforts to define a set of metadata keywords that are relevant to PICES activities. They have extracted an extensive list from the Global Change Master Directory. Dr. Shevchenko demonstrated the opportunities for using a website for collaborative work with these metadata keywords. He will alert all Committee Chairmen of this activity at the Science Board meeting, and circulate the provisional list, along with background material and instructions, to the Scientific Committees and Program for further distribution and comments back to TCODE by March 1, 2003.

POC Working Group 17 on *Biogeochemical data integration and synthesis*

Mr. Robin M. Brown reported on the progress of this Working Group. Through these activities, an extensive inventory of CO_2 (and related parameters) cruise data has been assembled. This inventory has substantial contributions from Japan, Canada and the United States, but no information from Russia, China and Korea. The Working Group has requested the assistance of TCODE members from these countries to identify key contacts for CO_2-related data, in order to complete this inventory. Mr. Toru Suzuki and Ms. Sachiko Oguma (MIRC) presented the resulting on-line data inventory accessible at http://picnic.pices.jp and http://wg17.pices.jp/.

Feedback and recommendations for future electronic poster sessions

Mr. Brown reviewed the feedback and recommendations arising from the Electronic Poster Session on *Regional and national data centers* at PICES X (Victoria, Canada). This report is posted on the TCODE website.

Electronic Poster Session at PICES XI

Mr. Macklin reported on preparations for the E-poster Session. There were 15 presentations. The organizers informed that there was very weak response to the original call for submissions, but many participants responded favourably when they were approached directly by the session convenors. Mr. Brown indicated that the same pattern was observed for the E-poster Session at PICES X. Some concern was expressed about separation between the main Poster Session (on the first floor) and the

proposed location for the E-poster Session (upstairs in the multi-purpose room, where Internet access was available). As few e-posters required Internet access, it was decided to re-locate the E-poster Session to the area adjacent to the main Poster Session.

Review of TCODE activities since its formation
The former TCODE Chairman, Mr. Brown, reviewed TCODE activities since its formation. This report is posted on the TCODE website.

Updates on data management activities in PICES member countries (Agend Item 4)

Several presentations were received on activities in PICES nations.

Japan
Mr. Muneharu Tokimura reported on the re-structuring of the Japanese Fisheries Agency and implications of these changes for data management and archival. He informed that oceanographic data holdings will be transferred to JODC for archival and distribution. In addition, he noted that discussions about the archival and distribution of biological data were underway, but there has been no decision yet. Mr. Norio Baba presented some information on the IODE-WESTPAC Global Oceanographic Data Archaeology and Rescue project.

People's Republic of China
Mr. Ling Tong reported on the National Marine Information and Service System (NMISS) Project. Details can be found at http://www.coi.gov.cn/ (Chinese version) and http://www.coi.gov.cn/eindex.html (English version).

Russia
Dr. Igor D. Rostov reported on several activities underway in Russia to coordinate physical and chemical oceanographic databases and to prepare web sites and CD-ROM under the ESIMO project (http://www.oceaninfo.ru). This website will be available in English in the future (Russian only at this time.)

Dr. Rostov also informed on the successful completion of the electronic version of the *Oceanographic Atlas of the Okhotsk Sea, Bering Sea and Japan/East Sea* by the Pacific Oceanological Institute (Vladivostok). This first edition is available on CD-ROM and at http://www.pacificinfo.ru, and comments are welcome.

United States
Dr. Megrey reported that his proposal (supported by PICES) to expand the Bering Sea Metadata Base to cover all of the North Pacific has been approved and funded. TCODE members will be required to assist in determining key contacts in PICES member countries to provide access to databases and sources of metadata. It was through TCODE discussions that the idea to extend the database to the North Pacific was promoted. Mr. Brown, as TCODE Chairman, and Dr. Alexander Bychkov, as PICES Executive Secretary, wrote letters of support to funding agencies for Dr. Megrey. This is an example of the low-cost, "soft" TCODE approach – convincing others to modify/expand activities to better meet PICES objectives, without actually spending any PICES money. The PICNIC website is a similar example.

Dr. Royer mentioned that there were discussions underway in the United States on a US GOOS observing system and that this included data management/distribution discussions.

Review Committee Report (Agenda Item 5)

The Committee had a brief discussion on the PICES Review Committee Report. It was agreed that the Chairman (assisted by the former Chairman) would provide a draft TCODE Strategic Plan that integrates comments from this report, the TCODE review prepared by the former Chairman, discussions with Science Board Chairman and the Science Board Symposium presentation by Dr. Neville Smith.

North Pacific Ecosystem Status Report (Agenda Item 6)

The Committee had a short discussion on the North Pacific Ecosystem Status Report and reiterated its strong support for this ambitious project.

PICES capacity building (Agenda Item 7)

The Committee was not able to discuss this agenda item in detail, but agreed that it is an important topic for PICES to address.

Items from Science Board (Agenda Item 8)

Topic Session for PICES XI

TCODE proposes an Electronic Poster Session for PICES XII on *GIS/Geographic-based applications applied to marine systems* (*TCODE Endnote 3*); recommended convenors: Bernard A. Megrey (U.S.A.) and Korean convenors to be identified, presumably Sung-Dae Kim (KORDI) and Hee-Dong Jeong (NFRDI).

PICES XIII theme

This item was discussed but there were no recommendations forwarded to the Science Board.

Other items

There is a possibility that TCODE could arrange for ESRI to sponsor some workshop/training courses.

Summary of items with financial implications (Agenda Item 9)

The Chairman will request financial support to ensure participation of data management experts in PICES activities if applicable.

Best Presentation Award

Mr. Andrew Golik (Pacific Oceanological Institute, Vladivostok, Russia) won the Best Presentation Award for his E-Poster entitled "Development of Geographic Information System of Northwestern Pacific based on Internet/Intranet", co-authored by V. Fischenko.

TCODE Workplan for 2002/2003 (Agenda Item 11)

1. TCODE members to gather information and/or identify key national contacts for the 2003 update of the GLOBEC National, Multi-National and Regional Activity Report that will be prepared by the GLOBEC International Programme Office (IPO). The GLOBEC IPO will circulate the previous version as a "starting point" for this exercise. (Action: Shevchenko and Brown)
2. TCODE members to encourage submission of PICES/GLOBEC metadata to the GLOBEC IPO. This will require TCODE representatives to identify key GLOBEC data contacts in each country and work with these individuals to ensure that existing metadata entries are accurate and complete. Where no national GLOBEC program exists, TCODE representatives will identify key contacts for "GLOBEC-like" data. (Action: Shevchenko and Brown)
3. TCODE will communicate regularly with the Data Manager at the GLOBEC IPO and consider GLOBEC Data Manager representation at the PICES Annual Meetings. (Action: Shevchenko)
4. Assist in expansion of the Bering Sea Metadata base to cover the entire North Pacific. This will include updating existing entries to ensure accuracy, identifying key contacts and Data Centers in PICES nations. (Action: Megrey)
5. Complete evaluation of metadata key list with input from the Scientific Committees by March 1, 2003. (Action: Megrey and Shevchenko)
6. Organize Electronic Poster Session for PICES XII in Seoul, Korea. (Action: Megrey and presumably, Sung-Dae Kim and Hee Dong Jeong)
7. Update inventory of real-time data sources for the North Pacific and publish on TCODE web pages (Action: Shevchenko and Brown)
8. Establish/update TCODE web pages for (i) links to real time and quasi-real time data for the North Pacific; (ii) exchange of computer software for the display (visualization) and analysis of data (using the existing inventory of software tools available for marine science); and (iii) description of inter- and intra- data exchange policies in PICES member countries. (Action: Royer and Shevchenko)
9. Develop TCODE Strategic Plan (in consultation with the Science Board Chairman) for presentation at Science Board

Meeting in the spring of 2003. (Action: Shevchenko and Brown)

10. Assist MEQ WG 15 in the Workshop preparation on shellfish toxicity data (see www.nodc.noaa.gov/cgi-bin/hab/hab.pl - portion of data HAB DMS and www.nodc.noaa.gov/col/projects/habs/pacindex.html - Pacific Region website). (Action: seeking volunteer(s))

TCODE Endnote 1

Participation List

Members	Observers
Robin M. Brown (Canada)	Norio Baba (Japan)
Bernard A. Megrey (U.S.A.)	Andrew V. Golik (Russia)
Igor D. Rostov (Russia)	Hee-Dong Jeong (Korea)
Thomas C. Royer (U.S.A.)	Sung-Dae Kim (Korea)
Igor I. Shevchenko (Russia, Chairman)	Allen Macklin (U.S.A.)
Ling Tong (China)	Sachiko Oguma (Japan)
Muneharu Tokimura (Japan)	Soo-Yang Park (Korea)
	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 2001/2002 Workplan
   - Revise/update TCODE webpages
   - PICES/GLOBEC Data Management Workshop
   - Provisional list of metadata keywords
   - POC WG 17 on *Biogeochemical data integration and synthesis*
   - Feedback and recommendations for future electronic poster sessions
   - Electronic Poster Session for PICES XI
   - Review of TCODE activities since formation and TCODE Strategic Plan
4. Updates on data management activities in PICES nations
5. Review Committee Report
6. North Pacific Ecosystem Status Report
7. PICES capacity building initiative
8. Items from Science Board
   - Topic session proposals for PICES XII
   - PICES XIII theme
   - Other items
9. Summary of items with financial implications
10. New business (additional items added at the meeting)
11. TCODE Workplan for 2002/2003

TCODE Endnote 3

Proposed TCODE E-Poster Session at PICES XII on
GIS/Geographic-based applications applied to marine systems

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. Geographic Information Systems are becoming invaluable tools for monitoring and managing 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 is 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. Electronic posters on topics such as coastal mapping, land and sea use, coastal observing and forecast systems, real-time catch and/or vessel monitoring systems, classification of surface waters, sea bed mapping, mapping of fisheries production, biological and genetic data, spawning grounds, environmental variation of production, migration corridors, seasonal essential habitats, and applications of GIS to ocean and fisheries resource management are welcome.

REPORT OF THE IMPLEMENTATION PANEL ON THE CCCC PROGRAM

To take advantage of co-holding the Second GLOBEC Open Science Meeting and the PICES Eleventh Annual Meeting in Qingdao, the CCCC Program Implementation Panel (CCCC-IP) convened a series of joint events with GLOBEC International:

- PICES CCCC - GLOBEC joint session on *ENSO and decadal scale variability in North Pacific ecosystems* (October 18, from 11:00-12:30 hours; Convenor: R. Ian Perry);
- PICES CCCC - GLOBEC joint session on *Coupled biophysical processes, fisheries and climate variability in coastal and oceanic ecosystems of the North Pacific* (October 18, from 13:30-17:30 hours; Co-convenors: Harold P. Batchelder [1] and Makoto Kashiwai);
- Joint meeting of CCCC MODEL Task Team and GLOBEC Focus 3 (Prediction and Modelling) Working Group (October 18, from 18:00-20:00 hours);
- Joint workshop of CCCC MONITOR Task Team and GLOBEC Focus 1 (Retrospective Analysis) Working Group on *Requirements and methods for early detection of ocean changes* (October 19, from 08:30-12:30 hours);
- Joint PICES-GLOBEC Workshop on *Exchange, inventory and archival of GLOBEC data* (October 19, from 08:30-17:30 hours).

The CCCC-IP meeting was not held at PICES XI, as the Panel convened the CCCC Program Integration Workshop on October 20, 2002 (08:30 – 17:30 hours). This Workshop was planned and structured to review the achievements of the past 10 years of the CCCC Program and to discuss a future 5-year workplan for CCCC integration and synthesis.

[1] At the last minute Dr. Batchelder was unable to attend the meeting and Dr. William T. Peterson acted as Session Co-convenor on his behalf.

The Executive Committee (EC) of the CCCC-IP met from 18:30-21:30 on October 20, 2002. The CCCC-IP Co-Chairman, Dr. Makoto Kashiwai, welcomed members and informed them that his Co-Chairman Dr. Harold P. Batchelder could not attend this Annual Meeting and he appreciated Dr. Peterson's offer of helping with the Topic Session, the CCCC-IP Executive Committee meeting, and the CCCC Integration Workshop. The CCCC-IP meeting was called to order and the agenda was adopted as presented.

Review of procedures for Best Presentation Awards and Closing Ceremony (Agenda Item 3)

Dr. Kashiwai reported on the results of discussion on this item at the 1st Science Board meeting. The procedure of nomination for the CCCC Best Presentation Award was decided.

The CCCC-IP/EC nomination for the CCCC Best Presentation Award was Dr. Akinori Takasuka (Graduate School of Agriculture and Life Sciences, University of Tokyo, Japan) for his paper entitled "Is a slower growing larval Japanese anchovy actually removed by predation at a given moment in the sea?" (presented at the BIO/FIS/CCCC Topic Session).

Discussion of PICES Review Committee and Science Board Review Reports (Agenda item 6)

Suggested discussion points were prepared by Dr. Kashiwai and circulated with a draft agenda by e-mail before the meeting. Dr. Kashiwai led a discussion of those points. The Panel agreed that the following suggestions needed to be brought forward to the Science Board for further consideration:

- Marine birds and mammals should be included in the scientific scope of PICES,

and specifically should be considered within the scope of the BIO Committee.

- Re-election of Co-Chairmen of the PICES Scientific Program and its sub-structures should be guided by the need to obtain the best scientific leadership and coordination, and not by rigid rule of Co-Chairman tenure.
- Creation of a Vice-Chairman position should be considered to assist the Science Board Chairman in scientific coordination and to provide needed back-up in this important position.
- There is no need to change the position titles within the PICES Secretariat, especially if the scientific coordination function can be strengthened by the creation of a Vice-Chairman position.
- In the PICES budget allocation, the highest priority should be given to creative activities for scientific products, such as practical workshops. The possibility of a bi-annual scientific conference and a bi-annual budget should be considered as a strategy to support increased scientific activities.

Proposals and recommendations on Workplan from the CCCC Integration Workshop (Agenda Item 7)

The CCCC Integration Workshop was held on October 20, 2002, in Qingdao, just after the Second Open Science Meeting of GLOBEC International, and just prior to the Eleventh Annual Meeting of PICES. The Workshop discussed integration of CCCC work that has been conducted by the various Task Teams and developed the following plan:

1. To integrate research activities of the Task Teams toward the following selected topics:
   - Comparison of coastal ecosystems around the North Pacific Rim (and North Atlantic), using zooplankton and small fish as focal species;
   - Latitudinal comparison of North Pacific ecosystems, using multiple focal species;
   - 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.
2. To connect the CCCC Program to past and future ecosystem changes in the North Pacific, MONITOR Task Team will focus its integration activities on two main goals:
   - Improving "timely" detection of changes in ocean ecosystems;
   - Communicating information on changes in the North Pacific ecosystem via "Ecosystem Status Reports" both inside and outside the PICES community.
3. To establish an *ad hoc* **N**EMURO **Ex**periment Planning **T**eam (NEXT), which will evaluate and consider possible scientific directions, hypotheses and experiments that may be examined using the NEMURO model developed by the PICES-CCCC Program. NEXT will develop an outline (strategy) for a series of model experiments that will examine scientifically important and addressable issues in the North Pacific. Work of NEXT will be conducted in virtual meetings (through e-mail communication and teleconference calls).
4. To hold intensive practical workshops that will conduct specific experiments (simulations) using the NEMURO model or its successors to test specific scientific hypotheses.
5. To consider the possibility of combining REX and BASS Task Teams, based on the strategy of experiments designed by the *ad hoc* Experiment Planning Team.
6. To convene in 2005 or 2006, a large 3-day international scientific conference (like the Beyond El Niño conference held in March 2000), having one or several key CCCC scientific questions as session topics. This will provide a high-visibility forum for the presentation and discussion of synthesized and integrated results of the first 10 years of research in the North Pacific following the framework suggested by the PICES-CCCC Program.
7. To establish a CCCC mailing list to provide broad and direct communication with interested PICES scientists.
8. To communicate and collaborate with related international organizations and

programs for inter-ocean and global comparative studies and for global integration/synthesis.

Inter-sessional meetings proposed for 2003 and beyond (Agenda Item 8)

Proposal from MODEL Task Team

***Title*:** Workshop to *Embed NEMURO and NEMURO.FISH into a 3-D circulation model*

Date/Location: 3 days in March 2003, at Frontier Research System for Global Change, Yokohama, Japan

***Conveners*:** Michio J. Kishi (Japan), Bernard A. Megrey and Francisco E. Werner (U.S.A.)

***Objectives*:** In the past year, significant progress has been made on developing NEMURO, the PICES lower trophic level marine ecosystem model. This has mainly been a result of two highly focused international workshops held in January 2000 (Nemuro, Japan) and 2002 (Nemuro/Yokohama, Japan). Interest in the model from other CCCC Task Teams is growing and collaborative projects between MODEL, BASS and REX have been successful. To date, implementation of NEMURO has been primarily in 0-D or 1-D, and mostly used to explore seasonal variability in the eastern and western subarctic gyres. Now there is a need to couple basin-scale models with coastal system models. 3-D circulation models may provide this capability. For these cooperative endeavors to continue to be successful, extending NEMURO to include a circulation model is required. The MODEL Task Team would like to convene a small workshop (8-10 people) to implement a 3-D circulation model with the NEMURO biological model embedded within. The participants would consist of a core group of individuals who have been the driving force behind the design and implementation of NEMURO.

***Publication plan*:** Draft of the paper may (and perhaps should) appear in some form in the PICES Scientific Report Series, but the target is publication in primary journals.

***Travel support request*:** Funding for 1 person to attend.

Proposal from REX Task Team

***Title*:** *The climate shifts of 1977, 1989 and 1998: Differential physical forcing and ecosystem response in the PICES region*

***Date/Location*:** As inter-sessional Symposium or Topic Session at a future Annual Meeting

***Convenors*:** REX Task Team Co-Chairmen

***Objectives*:** Three climate shifts have been observed in the North Pacific Ocean during the past 25 years: in 1977, 1989 and 1998. The physical forcing and biological response for these shifts appears to be different in the eastern and western sides of the Pacific. In this Symposium, we ask the following questions: "*What do these differences tell us about physical forcing and biological response and what are the mechanisms that lead to these differences? Is species diversity different in the eastern and western Pacific? Do changes in dominance of species affect ecosystem structure? What is the relative importance of basin-scale forcing vs. local scale forcing on changes in ecosystem structure? Do differences in diversity at the beginning of a climate shift influence changes in community structure?* (*e.g.*, it was noted that the 1998 shift may have started with a different mix of species than 1989 or 1977)".

***Publication plan*:** Publish the proceedings of the proposed Symposium/Session in a refereed journal, following the same format and rules as from the "*Beyond El Niño*" volume, within 1.5 years of the meeting and using *Progress in Oceanography* if possible.

Proposal from BASS Task Team

***Title*:** Workshop to *Examine linkages between open and coastal systems*

***Date/Location*:** 1-day immediately prior to PICES XII (2003), in Seoul, Republic of Korea

***Convenors*:** Vladimir Belyaev (Russia), Gordon A. McFarlane (Canada) and Akihiko Yatsu (Japan)

***Objectives*:** This meeting will examine the oceanographic and biological linkages between open ocean and coastal systems in the North Pacific Ocean. Papers will be prepared by "teams" of investigators to review existing information on linkages for various physical and biological components. Suggested papers would include reviews of physical oceanography,

phytoplankton, zooplankton, migratory pelagics, mesopelagics, marine birds and mammals. In addition there will be an open session for contributed papers.
***Publication plan*:** TBD

Proposal from BASS Task Team
***Title*:** Joint PICES/NPAFC Workshop on *Open ocean and coastal systems*
***Date/Location*:** 2 days immediately prior to PICES XIII (2004), in Honolulu, U.S.A.
***Convenors*:** Richard J. Beamish (Canada, PICES), Yukimasa Ishida (Japan, PICES) and TBA (NPAFC)
***Objectives*:** The workshop is intended to examine and develop approaches for linking open ocean and coastal systems. A focus of the workshop would be on the role of salmon and associated species in linking these systems. Development of the workshop objectives and key questions to be addressed will occur during early 2003, and final organization will occur at NPAFC and PICES Annual Meetings in 2003.
***Publication plan*:** TBD

Proposal from MONITOR Task Team
***Title*:** Workshop to *Assemble and critique a North Pacific Ecosystem Status Report*
***Date/Location*:** 3 days immediately prior to PICES XII (2003), in Seoul, Republic of Korea
***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)
***Objectives*:** Assemble and critique a North Pacific Ecosystem Status Report
***Publication plan*:** PICES web site as pdf file
***Travel support request*:** Funding for a representative from ICES (*e.g.* K. Drinkwater) and a representative from IHDP, and per diem for two extra days for 25 persons.

Proposal from IFEP Advisory Panel
***Title*:** Workshop on *In situ iron enrichment experiments in the eastern and western subarctic Pacific*
***Date/Location*:** December 4-6, 2003, in Sidney, British Columbia, Canada
***Convenors*:** Shigenobu Takeda (Japan) and C.S. Wong (Canada)
***Objectives*:** The proposed workshop will:

- Synthesize the results from two *in situ* iron enrichment experiments performed in the eastern (SEEDS-2001) and western (SERIES) subarctic Pacific;
- Discuss responses in lower and higher trophic levels, carbon cycles, trace-gas production and ocean-atmosphere flux, and models;
- Determine similarity and differences in biogeochemical and ecosystem responses to iron addition between eastern and western Subarctic Pacific;
- Identify specific scientific questions for the longer-term experiment in the western Subarctic Pacific (SEEDS-2004).

***Publication plan*:** The results of the Workshop will be published as a special issue of *Deep Sea Research II*.
***Travel support request*:** Funding for 3 invited speakers

Publications proposed for 2003 and beyond (Agenda Item 9)

The CCCC-IP/EC recommends the following publications:

PICES Scientific Report Series in 2003:
- CCCC Integration Plan (including proceedings of the 2002 CCCC Integration Workshop and summary of following activities);
- Report of the 2002 MONITOR Workshop on *Monitoring from moored and drifting buoys*;
- Report of the joint Workshop of MONITOR Task Team and GLOBEC Focus 1 Working Group on *Requirements and methods for early detection of ocean change*;
- Report of joint meeting of MODEL Task Team and GLOBEC Focus 3 Working Group on *Linking biophysical and upper trophic level models*;
- Report of 2002 BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific Subarctic gyre system*.

Special issues of primary journals in 2003:
- The results from *in situ* iron enrichment experiments in the western Subarctic Pacific

(SEEDS-2001) will be published as a special issue of *Progress in Oceanography*.

Membership changes and election of new Chairmen (Agenda Item 10)

The CCCC-IP/EC recommends the following changes in chairmanship for Task Teams:

- BASS: Dr. Akihiko Yatsu (Japan) to replace Dr. Andrei S. Krovnin (Russia) as Co-Chairman; Dr. Gordon A. McFarlane (Canada) to continue for one additional year;
- MODEL: Dr. Shin-ichi Ito (Japan) to replace Dr. Bernard A. Megrey (U.S.A.) as Co-Chairman; Dr. Francisco E. Werner (U.S.A.) to continue as Co-Chairman;
- REX: Dr. William T. Peterson (U.S.A.) to remain as Co-Chairman for one additional year until a suitable replacement is found; Dr. Yoshiro Watanabe (Japan) to continue as Co-Chairman.

High priority projects (Agenda Item 13)

The Executive Committee identified the North Pacific Ecosystem Status Report as a high priority project for CCCC-IP.

Proposed recommendations on other items to be included in the Science Board report to Governing Council (Agenda Item 14)

The CCCC-IP/EC recommends that Science Board design a procedure for the development of either a new PICES Program (to follow the CCCC Program) or a 2nd phase of the CCCC Program.

Proposed future groups (Agenda Item 15)

The CCCC-IP/EC proposes to establish an *ad hoc* Experiment Planning Team, which will work through e-mail communication, to develop scientific strategy, based on requirements of ecosystem models to be developed, for a series of hypotheses testing practical workshops.

Background

The NEMURO lower trophic level (LTL) model was developed by the CCCC PICES MODEL Task Team in response to the need within CCCC to use models of the marine ecosystem to address the key scientific questions of the CCCC Program.

Recent collaboration and cooperation among MODEL, BASS and REX successfully linked the NEMRUO LTL model to higher trophic levels (HTL). One recent significant development was linking the LTL to the HTL model by including pelagic fishes, specifically Pacific herring and Pacific saury. This model was named NEMURO.FISH. Since the development of these two tools, many suggestions have been brought forward as the next steps for elaborating the model. Some of these include parameterizing to fish species other than herring and saury (*i.e.* salmon), customizing the model to new regional locations (*i.e.* Sea of Okhotsk), the addition of more physical (*i.e.* 3-D circulation) and biological processes (*i.e.* age structure of fishes or size-dependent predation), or the consideration of alternate formulations of key processes already in the model (*i.e.* light limitation on photosynthesis). Unfortunately there is not enough time to consider all these requests even though many are interesting scientifically.

Name of New Group

NEMURO **Ex**perimental Planning **T**eam (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:
   - Comparison of coastal ecosystems around the North Pacific Rim (and North Atlantic), using zooplankton and small fish as focal species.
   - Latitudinal comparison of North Pacific ecosystems, using multiple focal species.

- 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.

Membership

The team will consist of seven people, a chairman (Harold P. Batchelder was nominated) and 2 members from each of the MODEL, REX, and BASS Task Teams.

Proposed Topic Sessions for PICES XII (Agenda Item 16)

Proposal from MODEL Task Team

***Title*:** 1-day Topic Session on *Comparison of modeling approaches to describe ecological food webs, marine ecosystem processes, and ecosystem response to climate variability*

***Conveners*:** Michio J. Kishi (Japan), Bernard A. Megrey and Francisco E. Werner (U.S.A.)

***Objectives*:** 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 (IBM's) 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. Papers in this session will 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 are invited. Topical issues related to future advancements, useful extensions, validations, and calibrations are also solicited.

***Travel support request*:** Funding for 1 invited speaker.

Proposal from REX Task Team

***Title*:** 1-day Topic Session on *Latitudinal differences in response of productivity and recruitment of marine organisms to climate variability, from Subarctic to subtropical waters, in the eastern and western sides of the Pacific*

***Conveners*:** Yoshiro Watanabe (Japan) and others TBD

***Objectives*:** A scientific result of the La Paz symposium on *North Pacific transitional areas* was that distinct latitudinal differences in the magnitude and variability of distribution, productivity and recruitment of plankton and fish stocks were identified. In the session proposed here, we would further explore latitudinal clines in life history strategies at various temporal scales of variability. We would focus on the north-south clines in environmental variability and life history strategies in the eastern Pacific from Mexico to Alaska, and in the western Pacific from China to Russia. We would encourage presentations on scales of physical variability, and clines in productivity and recruitment of plankton, fish, birds, mammals, the benthos and intertidal invertebrates.

***Travel support request*:** Funding for two invited speakers.

Proposal from REX Task Team

***Title*:** A Workshop on *Influence of fishing and/or invasive species on ecosystem structure in coastal regions around the Pacific Rim*

***Conveners*:** REX Co-Chairmen

***Objectives*:** Given that a focus of PICES XII is on Human dimensions of ecosystem variability, we suggest a workshop on the effects of two types of human activities on the structure of coastal ecosystems: fishing and invasive

species. The workshop would be exploratory in scope and ask 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?* This topic might be of interest to POC, FIS or BIO and a description of this proposal will be given to each Committee Chairman for consideration at their meetings. Should these Committees be interested in collaboration, other convenors would be appointed by them.

***Travel support request*:** Funding for two invited speakers.

CCCC Endnote 1

Participation List

Makoto Kashiwai (CCCC-IP Co-Chairman)
Andrei S. Krovnin (BASS Co-Chairman)
Gordon A. McFarlane (BASS Co-Chairman)
Francisco E. Werner (MODEL Co-Chairman)
Bernard A. Megrey (MODEL Co-Chairman)
William T. Peterson (REX Co-Chairman)
Sei-ichi Saitoh (MONITOR Co-Chairman)
Shigenobu Takeda (IFEP Co-Chairman)

CCCC Endnote 2

CCCC-IP/EC Meeting Agenda

1. Welcome and opening remarks
2. Adoption of agenda
3. Review of procedures for Best Presentation Awards and Closing Session
4. Review of procedures to enhance documentation of PICES scientific sessions
5. Completion of PICES X decisions and recommendations
6. Discussion of PICES Review Committee and Science Board Review Reports
   a. Suggested discussion points on PICES Review Committee and Science Board Review Reports by M. Kashiwai (see attached)
   b. Report of discussion at TT meetings
7. Proposals and recommendations on Work Plan from the CCCC Integration Workshop
8. Inter-sessional meetings proposed for 2003 and beyond
9. Proposed publications (PICES Scientific Report series and primary journals) for 2002 and beyond
10. Membership changes and election of new chairmen
11. Tabling of summaries from the PICES XI Topic Sessions
12. Relations with other international programs/organizations
13. High priority projects
14. Proposed recommendations on other items to be included in the Science Board report to Council (*e.g.* recommendations for letters of support to various research efforts)
15. Proposed list of any future groups along with Terms of Reference and a list of potential members
16. Proposed titles for Topic Sessions and Symposia for PICES XII, including draft session descriptions and recommendations for Convenors
17. PICES XII: theme, Science Board Symposium, Topic Sessions and draft schedule
18. Other business

REPORT OF BASS TASK TEAM

The Basin Scale Studies (BASS) Task Team met on the afternoon of October 19, 2002, to review the past year's activity and plan activities for 2003. The Co-Chairmen, Drs. Andrei S. Krovnin and Gordon A. McFarlane, 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 2002

A 2-day BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system* was convened April 21-22, 2002, in La Paz, Mexico, in conjunction with the International Symposium on *North Pacific transitional areas*. The purpose of the workshop was to provide a "picture" of the two subarctic gyres, and to facilitate our understanding of how these systems respond to natural and anthropogenic change. A number of hypotheses were discussed as appropriate proxies to test the response of the two gyres to various trophic level changes and climate change scenarios. These were further refined into "Perturbation analyses" and "Function fitting and forcing". The results of these analyses will be published as a PICES Scientific Report. It is hoped that the workshop will form the basis of future work, which will attempt to link the subarctic gyres system to coastal systems.

The results from a 1-day BASS/MODEL Workshop on *Ecosystem models for the subarctic Pacific gyres* (held October 5, 2001, immediately preceding Tenth Annual Meeting in Victoria) were published in PICES Scientific Report No. 20.

The Iron Fertilization Experiment Panel (IFFP) met on October 19, 2002, and the report of their meeting is appended as *BASS Endnote 3*. The Panel focused their discussion on the results of the successful Canadian SOLAS iron enrichment experiment in the eastern subarctic, in July-August 2002.

Proposed inter-sessional activities

Participants agreed to complete and publish the results of the successful BASS/MODEL gyre modelling work as a separate volume in the PICES Scientific Report Series. In addition, the model and selected results will be published in primary scientific literature.

Proposed activities at PICES XII

With the successful completion of the gyre modelling work, participants discussed linking open ocean and coastal ecosystems. A 1-day workshop on *Linkages between open ocean and coastal systems* to be held just prior to PICES XII (Seoul, Republic of Korea) was proposed.

This workshop will examine the oceanographic and biological linkages between open ocean and coastal systems in the North Pacific Ocean. Papers will be prepared by "teams" of investigators to review existing information on linkages for various physical and biological components. Suggested papers would include reviews of physical oceanography, phytoplankton, zooplankton, migratory pelagics, mesopelagics, marine birds and marine mammals. In addition there will be an open session for contributed papers. Selected papers will be published. Drs. Vladimir Belyaev (Russia), Gordon A. McFarlane (Canada) and Akihiko Yatsu (Japan) were recommended as convenors.

Proposed activities at PICES XIII

The Task Team also proposed a 2-day joint BASS/NPAFC workshop for 2004, immediately prior to PICES XIII (Honolulu, U.S.A.). A focus of the workshop would be on the role of salmon and associated species in linking open

ocean and coastal systems. Development of the workshop objectives and key questions to be addressed will take place in early 2003, and final organization will occur at NPAFC and PICES Annual Meetings in 2003. Drs. Richard J. Beamish (Canada) and Yukimasa Ishida (Japan) were recommended as PICES convenors.

Requests for travel

BASS requests support for 1 scientist to attend the BASS workshop on *Linkages between open ocean and coastal systems* at PICES XII.

BASS Task Team White Paper

Participants discussed the BASS Task Team White Paper submitted to the CCCC Implementation Panel (CCCC-IP). The main components of this discussion were presented to the CCCC Integration Workshop held October 20, 2002, and are included in the CCCC-IP report. The lack of participation by some countries and members in BASS activities was noted, and BASS recommends that the current membership be reviewed to ensure the Task Team was comprised of appropriate members from each country.

Election of Co-Chairmen

The terms of both Co-Chairmen, Drs. Krovnin (Russia) and McFarlane (Canada), had expired. BASS nominated Dr. Akihiko Yatsu (Japan) to replace Dr. Krovnin. BASS participants noted that the successful cooperative BASS/MODEL gyre modelling work was nearing completion and a new phase of integrated work was about to begin. The need for continuity in this transition phase was strongly suggested, and BASS recommends that Dr. McFarlane remain as Co-Chairman until this was completed.

BASS Endnote 1

Participation List

Members

Gordon A. McFarlane (Canada, Co-Chairman)
Masahide Kaeriyama (Japan)
Andrei S. Krovnin (Russia, Co-Chairman)
Patricia A. Wheeler (U.S.A.)
Akihiko Yatsu (Japan)

Observers

Kerim Y. Aydin (U.S.A.)
Richard J. Beamish (Canada)
Yukimasa Ishida (Japan)
Jacquelynne R. King (Canada)
Shigenobu Takeda (Japan)

BASS Endnote 2

BASS Meeting Agenda

1. Welcome and opening remarks
2. Review accomplishments in 2002
   a. BASS/MODEL Workshop on *Using models to test hypothesis on effects of climate change on the North Pacific subarctic gyre system*
   b. Review of joint sessions of CCCC Task Teams and GLOBEC Working Groups
   c. Report of Iron Fertilization Experiment Panel
3. Discuss plans for 2003 and beyond
   a. Publication of BASS/MODEL gyre modelling work
   b. Joint workshop with REX/MODEL
   c. Theme for a workshop at PICES XII
   d. Joint BASS/NPAFC Workshop in 2004
4. Request for travel to future meetings
5. BASS Task Team White Paper submitted for CCCC integration
6. Election of new Co-Chairmen

BASS Endnote 3

Report of *Iron Fertilization Experiment* Advisory Panel

The meeting was held from 08:30-17:30 hours on October 19, 2002. Co-Chairman Dr. Shigenobu Takeda called the meeting to order and welcomed the participants (*IFEP Endnote 1*). The Advisory Panel reviewed the draft agenda and it was adopted (*IFEP Endnote 2*). The meeting focused mainly on the preliminary results of the successful iron enrichment experiment in the eastern subarctic Pacific in July-August 2002.

Activities in 2002

Eastern subarctic Pacific

An *in situ* iron enrichment experiment in the eastern subarctic Pacific, SERIES (**S**ubarctic **E**cosystem **R**esponse to **I**ron **E**nrichment **S**tudy), was conducted in July-August 2002, as a part of the Canadian-SOLAS project.

SERIES scientific objectives

- Community response to iron addition (comparison with other HNLC regions such as Eq Pac, S Ocean, NW Pacific);
- Natural longitudinal dust/Fe gradient from Western Subarctic Gyre to Alaska Gyre;
- Fe chemistry and complexing agents;
- Carbon export – needs > 30 days to see;
- Trace gas production *e.g.* DMS & organic halides.

SERIES implementation - three ships

- CSS *John P. Tully* (Canada): pre-injection survey, patch mapping, buoy handling, underway sampling, nutrients, sediment traps;
- M/V *El Puma* (Mexico, chartered by Canada): atmospheric and ocean process studies (gas production, DMS, DMSP, grazing, BP, PP, Chl, zooplankton, etc.);
- M/V *Kaiyo Maru* (Japan): mapping, pCO_2, sediment traps, nutrients, BP, PP, Chl, foodwebs, taxonomy.

Experiment and preliminary results

An *in situ* iron enrichment experiment was conducted in the northeast subarctic Pacific near station P26 - Ocean Station Papa (50ºN, 145ºW). Site selection was based on the location of waters with low density, uniform physical characteristics, the predominant direction of the drogued drifter buoys, and matching the HNLC condition. There were evidence of two eddy-like features, the southwest and norteast of P26, that was taken into consideration.

The first iron release was performed from 01:05-18:45 hours on July 7, 2002. The SF_6 and iron solutions were mixed and pumped over the side at rate of 5 and 20 liters/min to a depth of about 7 m as maintained by attachment of the outlet to a Hi-Fin fish. The release track was an expanding square covering 4.75 x 4.74 n miles, with a distance between transects of 0.4 n miles. Some of the initial values for reactive and unfiltered iron were in the 4 nM range, while dissolved iron concentration was as high as 2.5 nM. Values declined very quickly over the first few days in the surface mixed layer of 10 m. Winds and rough seas mixed the iron down uniformly to about 30 m on July 13 to 14.

Re-infusion of iron was performed from 14:45 hour on July 16 to 08:00 hour on July 17, 2002. An expanding rectangle was used for the re-infusion with the SF_6 mapping system used to monitor the release. The second smaller injection brought levels up to 0.6-0.7 nM for dissolved Fe in the 3-10 m depth on July 17. By July 22, dissolved iron concentrations were very close to background.

Rapid and small initial response was observed in phytoplankton. As the experiment progressed, the biological response, such as increases in Fv/Fm, primary productivity and Chl-*a* concentration and decreases in macronutrient concentrations, became apparent. This was also augmented by underway pCO_2.

The phytoplankton bloom peaked physiologically around July 21, primary production peaked on July 24, and Chl-*a* peaked on July 24-26 and reached 8 mg m^{-3}.

Concentration of Chl-*a* then decreased gradually to 1.5 mg m^{-3} on August 4. Most dominant phytoplankton at the Chl-*a* peak was centric diatoms, and many pennate diatoms were also observed. Exhaustion of iron and macronutrient seems to be one of the reasons for the termination of the bloom. Sinking particles gradually increased after July 31.

Western subarctic Pacific

The Panel reviewed the results of the Japanese iron enrichment experiment in the western subarctic Pacific - SEEDS 2001 (**S**ubarctic Pacific Iron **E**xperiment for **E**cosystem **D**ynamics **S**tudy). These results will be published as a special issue of *Progress in Oceanography*. The Panel discussed the plans for the second longer-term (>30 days) experiment in this area in July-August, 2004.

Scientific objectives for SEEDS 2004

- Observe the decline of diatom bloom and elucidate the fate of fixed carbon;
- Measure additional parameters to see the overall biogeochemical responses to iron enrichment;
- Determine the influence of Fe on trace gas production and aerosol formation;
- Measure gas fluxes from ocean surface to atmosphere.

Scientists from U.S.A. are planning to take part in the longer-term experiment in the western gyre, and the proposal submitted to NSF was presented.

Proposed activities in 2003

IFEP proposes a 3-day workshop on *In situ iron enrichment experiments in the eastern and western subarctic Pacific*, to be held December 4-6, 2003, at the Institute of Ocean Sciences in Sidney, British Columbia, Canada.

Specific objectives of the workshop are:

- Synthesize results from two *in situ* iron enrichment experiments performed in the eastern and western subarctic Pacific (SEEDS-2001 and SERIES);
- Discuss responses in lower and higher trophic levels, carbon cycles, trace-gas production and ocean-atmosphere flux, and models;
- Determine similarity and differences in biogeochemcal and ecosystem responses to iron addition between eastern and western subarctic Pacific;
- Identify specific scientific questions for the longer-term experiment in the western subarctic Pacific (SEEDS-2004).

The results of the Workshop will be published as a special issue of *Deep Sea Research II*.

IFEP requests support for three invited speakers (two from New Zealand and one from Mexico) to attend the IFEP Workshop in December 2003 in Sidney, Canada.

It was suggested that IFEP need to work more closely with MODEL Task Team for the improvement of NEMURO model by adding iron limitation to phytoplankton production using the data from two successful iron enrichment experiments performed in the eastern and western subarctic Pacific. Such a model would be useful to see the long-term ecosystem responses as well as the experimental design of SEEDS 2004.

IFEP Endnote 1

Participation List

Members

William Cochlan (U.S.A.)
Paul J. Harrison (Canada)
Isao Kudo (Japan)
Shigenobu Takeda (Japan, Co-Chairman)
Atsushi Tsuda (Japan)
C.S. Wong (Canada, Co-Chairman)

Observers

Fei Chai (U.S.A.)
William R. Crawford (Canada)
John F. Dower (Canada)
Liu Hui (China)
Maurice Levasseur (Canada)
Xiuren Ning (China)
Jun Nishioka (Japan)
Yukihiro Nojiri (Japan)
Sachiko Oguma (Japan)
Kelvin Richards (U.S.A.)
Hiroaki Saito (Japan)
Daniela Turk (Canada)
Nelson D. Sherry (Canada)
Masahide Wakita (Japan)
Shuichi Watanabe (Japan)
Emmy Wong (Canada)

IFEP Endnote 2

IFEP Meeting Agenda

1. Round-table introduction of attendees
2. Adoption of agenda
3. Adoption of the report of the IFEP Panel meeting held at PICES X (Victoria, Canada)
4. Review of time-table of international iron enhancement experiments in the North Pacific
5. Progress report of the Japanese iron enhancement experiment (SEEDS-2001) activities in the western subarctic Pacific
6. Summary of the Canadian iron enhancement experiment (SERIES) in the eastern subarctic Pacific
   - 6.1 Introduction of SOLAS/SERIES
   - 6.2 Overview of logistics and biological responses
   - 6.3 CSS *J.P. Tully* measurements
     Cruise report, SF_6 mapping, iron, DMS, climate gases, pCO_2, carbon, nutrients, sediment trap, and physics
   - 6.4 M/V *El Puma* measurements
     Cruise report, primary production, Chl-*a*, incubation; DMS(P) biology, and aerosol/atmospheric studies
   - 6.5 M/V *Kaiyo-maru* measurements
     Cruise report, mapping, Chl-*a*, FRRF, iron, incubation experiments, pCO_2, nutrients, sediment trap
7. IFEP related activity in other areas
   - 7.1 Overview of SOFeX
   - 7.2 Modeling results of iron enrichment experiments (IronEx-II)
8. Future IFEP related activity plans in the North Pacific
   - 8.1 SERIES/SOLAS
   - 8.2 SEEDS
   - 8.3 US-NSF proposal for post-fertilization long-term study
9. Discuss plans for 2003
   - 9.1 Discuss need for special Symposium /Workshop(s) of SERIES and SEEDS
   - 9.2 Discuss need for PICES Scientific Report(s) of SERIES and SEEDS
   - 9.3 Requests for travel to future meetings
10. Other new business

REPORT OF MODEL TASK TEAM

The meeting of the MODEL Task Team was held from 13:30-17:30 hours on October 19, 2002. The Co-Chairmen, Dr. Bernard A. Megrey and Dr. Francisco E. Werner called the meeting to order and welcomed the participants (*MODEL Endnote 1*). The Task Team reviewed the draft agenda and it was adopted (*MODEL Endnote 2*). During the meeting, participants

- Discussed the achievements of MODEL relative to the goals and terms of reference for the CCCC Program and the MODEL Task Team;
- Developed a new plan of work;
- Generally reviewed the achievements and accomplishments of MODEL over the past year; and
- Discussed the membership of MODEL and selection of a new MODEL Co-Chairman.

MODEL accomplishments in 2002

- Held two successful joint workshops:
  - MODEL/REX Workshop *to Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes* (co-sponsored by Nakajima Foundation and Nemuro-city), January 24-27, 2002, Nemuro/Yokohama, Japan;
  - MODEL/BASS Workshop *on Using models to test hypotheses on affects of climate change on the North Pacific subarctic gyre system*, April 21-22, 2002, La Paz, Mexico.

- Published the results from the MODEL/REX Workshop in PICES Scientific Report No. 21 (2002).

- Following a request made at the 2002 Nemuro MODEL Workshop, Dr. Yury I. Zuenko (Russia) assembled a list of data from the Sea of Okhotsk that might be used to parameterize or validate the NEMURO model for that location (*MODEL Endnote 3*).

- Conducted a successful joint workshop session with the GLOBEC Focus 3 Working Group during the GLOBEC Open Science Meeting, October 18, 2002, Qingdao, People's Republic of China.

MODEL Workplan for 2003

Workshops

- Convene an inter-sessional workshop to *Embed NEMURO and NEMURO.FISH into a 3-D circulation model*;
- Begin to plan for a modeling workshop to be held in cooperation with the GLOBEC Focus 3 Working Group;
- Conduct an inter-sessional workshop with BASS to complete work on linking NEMURO to ECOATH/ECOSIM.

Topic Session at PICES XII

- Plan and convene a half-day Topic Session on *Comparison of modeling approaches to describe ecological food webs, marine ecosystem processes, and ecosystem response to climate variability* (tentative title).

Publications

- Publish the NEMURO model and its results in the primary scientific literature. Targeted outlets include the *Canadian Journal of Fisheries and Aquatic Science*, *Transactions of the American Fisheries Society*, ICES *Journal of Marine Science*, *Ecological Modeling and Progress in Oceanography*.

NEMURO extensions

- Add Fe limitation to phytoplankton production;
- Add microbial food web;
- Split ZL into copepods and euphausiids;
- Add sinking rate of phytoplankton to detritus pool;
- Consider changing model unit from nitrogen to carbon;

- Parameterize NEMURO to a coastal region;
- Continue developing methods to link NEMURO to ECOPATH/ECOSIM and to models of fish growth;
- Work toward embedding NEMURO into larger scale 3-D ocean model;
- Modify NEMURO as required to accommodate BASS and REX needs.

NEMURO diagnostics
- Validate model output against data for station A7 and the Bering Sea;
- Perform side-by-side comparison of NEMURO Box Model and NEMURO MATLAB model to same equations and data.

New group
- Establish an Experimental Design Team, with the objective to help guide and prioritize future advancements, extensions, validations, and calibrations of NEMURO.

Relations with other programs
- Establish links with other programs such as GLOBEC and ICES.

Workshop proposals and requests for travel support

MODEL Workshop in 2003

In the past year, significant progress has been made on developing NEMURO, the PICES lower trophic level marine ecosystem model. This has mainly been a result of two highly focused international workshops held in January 2000 (Nemuro, Japan) and January 2002 (Nemuro/Yokohama). Interest in the model from other CCCC Task Teams is growing and collaborative projects between MODEL, BASS and REX have been successful. To date, implementation of NEMURO has been primarily in 0-D or 1-D, and mostly used to explore seasonal variability in the eastern and western subarctic gyres. Now there is a need to couple basin-scale models with coastal system models. 3-D circulation models may provide this capability. For these cooperative endeavors to continue to be successful, extending NEMURO to include a circulation model is required.

The MODEL Task Team proposes a small workshop (8-10 people) to *Embed NEMURO and NEMURO.FISH into a 3-D circulation model*, to be held in March 2003, at Frontier Research System for Global Change, Yokohama, Japan. The participants would consist of a core group of individuals who have been the driving force behind the design and implementation of NEMURO. Drs. Michio J. Kishi (Japan), Bernard A. Megrey and Francisco E. Werner (U.S.A.) are recommended as convenors. Funding is requested for one scientist from North America to attend.

MODEL/GLOBEC Workshop in 2004

A proposal for a joint workshop on M*ethods to develop models of individuals and populations* will be developed by the MODEL Task Team and GLOBEC Focus 3 Working Group in 2003. The workshop will be conducted in spring 2004, in Europe (location TBD). The plan is to focus on the representation of biological processes and how they differ regionally, to compare model conceptualization, and to perform model inter-comparisons. Possible focal points include functional response (e.g., ingestion), predator-prey relationships, starvation, predation and food condition mortality. Drs. Bernard A. Megrey, Francisco Werner and Bred de Young (Canada) are recommended as convenors. Funding is requested for one scientist to attend.

Membership and selection of MODEL Co-Chairman

The term of MODEL Co-Chairman Dr. Bernard A. Megrey was lapsing and there was discussion as to who might be suggested to take his place. It was mentioned that MODEL needed to maintain the momentum in its activity and it would be advantageous to select someone with a solid background of past model activities, goals, and interactions with other components of the CCCC Program. The Chairman of the Science Board and the Co-Chairman of the CCCC Implementation Panel would approach a few individuals to see if they might be interested[1].

[1] Dr. Shin-ichi Ito (Japan) was recommended by the CCCC-IP and approved by Science Board.

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

1. Convene a MODEL workshop in March 2003, in Yokohama, Japan (hosted by the Frontier Research System for Global Change), to integrate NEMURO and NEMURO.FISH into a 3-D circulation model. Travel support for one North American participant is requested.

2. Formalize working relationships and improve communication between MODEL, GLOBEC Focus 3 Working Group on *Modeling and predictive capabilities* and ICES Study Group on *Modeling of physical/biological interactions*, through the establishment of cross-group liaisons or the exchange of ex-officio members.
   - To encourage cooperative modeling activity and to more effectively integrate across trophic levels and spatial and temporal scales;
   - To work towards identifying methods and techniques to couple biochemical, and mechanistic biological life cycle models, with the aim of including fishes as top predators.

3. Convene a half-day Topic Session at PICES XII (Seoul, Republic of Korea) on a modeling topic with the tentative title *Comparison of modeling approaches to describe ecological food webs, marine ecosystem processes, and ecosystem response to climate variability*. Request travel support for one invited speaker.

4. Work with GLOBEC Focus 2 and Focus 3 Working Groups to organize a workshop (20-30 people) to discuss the development of models for individuals and populations.

5. Re-evaluate the membership of MODEL with respect to appropriate disciplinary and international representation.

6. PICES should consider holding their science meeting in alternating years. In the "off" year, resources typically allocated toward conducting the Annual Meeting would be devoted to assisting the work conducted by Task Teams and Working Groups.

   The synthesis phase of the CCCC Program will require increased activities of Task Teams. Finding the resources to support the work is an ongoing problem. Meeting every other year would accelerate the pace of research progress and provide opportunities for improving participation of junior scientists and under-represented countries (capacity building).

MODEL Endnote 1

Participation List

Members

Shin-ichi Ito (Japan)
Michio J. Kishi (Japan)
Bernard A. Megrey (U.S.A., Co-Chairman)
Hiroaki Saito (Japan)
Francisco E. Werner (U.S.A., Co-Chairman)
Yury I. Zuenko (Russia)

Observers

Ming Ge (China)
Gennady A. Kantakov (Russia)
Vladimir I. Karpenko (NPAFC)
Maki Neguchi-Aita (Japan)
S. Lan Smith (Japan)
Yasuhiro Yamanaka (Japan)

MODEL Endnote 2

MODEL Meeting Agenda

1. Review accomplishments in 2002:
   a. Overview of a MODEL/REX Workshop to *Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes*, January 2002, Nemuro/Yokohama, Japan
   b. Overview of a joint BASS/MODEL Workshop on *Using models to test hypotheses on affects of climate change on the North Pacific subarctic gyre system*, April 2002, La Paz, Mexico
   c. Review of joint GLOBEC-PICES working group sessions, October 2002, Qingdao, People's Republic of China
   d. Discuss MODEL White Paper submitted to the CCCC Integration Workshop
2. MODEL Integration Work Plan:
   a. Main scientific question to be solved by MODEL through integration
   b. Important and competing hypotheses generated to address the question
   c. Methods or types of models to be developed to prove or refute the working hypotheses
   d. Future planned workshops for hypothesis testing
3. Discuss plans for 2003:
   a. Workshop to build a 3-D NEMURO model (Yokohama, Japan, March 2003)
   b. Need/ideas for joint workshop(s) with REX, MONITOR and BASS
   c. Proposed inter-sessional activities
   d. Structure of the fish IBM for herring and saury
   e. Links with spatially explicit models (including NEMURO)
   f. Target-outlets for publication beyond PICES Scientific Report Series and PICES Press
4. Requests for travel to future meetings
5. Membership and selection of MODEL Co-Chairman
6. MODEL Task Team recommendations
7. Other new business

MODEL Endnote 3

Sea of Okhostk data for NEMURO

Water temperature

	sea surface	subsurface	bottom	source
winter (Feburary)	-1.0- -1.5	-0.5- -1.5	no data	Zuenko, Yurasov, 1997
summer (August)	10-15	-1.5- 1.0	-1.5- -1.8	

monthly data are available (Figurkin)

Nutrients

seasonal data are available (Matveev)

Primary production, gC/m2 day

	1994	1997	Source
summer	1…3	1…2	Naletova, p.c.

Chlorophyll a, mkg/l

	1992	1993	
summer	1.25	1.13	Mordasova, Metreveli, 1997

Net phytoplankton in the layer 200-0 m, mg/m3

	1985	1986	1991	1992	1993	1997	Source
spring		300…500					
summer		50…100	50…100	< 50	200…1000	50…100	Lapshina, 1996; Gorbatenko, 1997; Nezlin et al., 1997
autumn	10…30						Gorbatenko, 1997
mean annual in 100-0 m						1120	Markina, Cherniavsky, 1984

Bacteria, mg/m3 in 0-50 m layer

	1992	1993	1994		Source
summer	77	292	336	Sorokin et al., 1995, 1997	

Microzooplankton, mg/m3

	1993	Source
summer	1910	Sorokin, p.c.

Net zooplankton (averaged for 80-90-s, Gorbatenko, 1997), mg/m3

	Sagitta	Amphipoda	Euphausia	Large Copepods	Small Copepods	Total
winter	376	37	774	120	100	1424
spring	341	53	336	135	211	1139
summer	113	138	514	560	456	1891
autumn	199	41	810	200	344	1712

a lot of data for certain cruises in the period since 1984 are available (Gorbatenko)

Destruction, gC/m2 day

	1997	Source
summer	0.5…2	Shuntov, 2001

REPORT OF MONITOR TASK TEAM

Overview of activities during PICES XI

At PICES XI, the MONITOR Task Team convened or contributed to six workshops and committee meetings:

- Annual Task Team meeting (Oct. 19);
- A half-day workshop on *Requirements and methods for "early detection of ocean changes"* (Oct. 19);
- A 1-day CCCC Integration Workshop (Oct. 20);
- Continuous Plankton Recorder (CPR) Advisory Panel meeting (Oct. 20);
- CCCC IP/EC meeting (evening of Oct. 20);
- A half-day workshop on *Monitoring from moored and drifting buoys* (Oct. 23).

MONITOR Task Team meeting

The MONITOR Task Team met from 13:30-17:30 hours on October 19, 2002, to review accomplishments of the preceding year, and the status of various national and regional monitoring programs, made plans for the upcoming year and PICES XII, and made several specific proposals/recommendations to the PICES Science Board. The participation list and meeting agenda are appended as *MONITOR Endnote 1* and *MONITOR Endnote 2*.

MONITOR recommendations

MONITOR should convene a 2-day workshop immediately prior to PICES XII (October 2003, Korea) to *Assemble and critique a North Pacific Ecosystem Status Report*. Drs. Phillip R. Mundy, William J. Sydeman and Vyacheslav B. Lobonov volunteered to join Drs. David L. Mackas and Sei-ichi Saitoh as convenors. Format would be 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. Our goal for the workshop is as an exercise in "process", rather than necessarily producing a polished final product. However, the prototype could usefully be 'published' on the PICES web site. We request full travel support for 2 people from outside the PICES community (one veteran of similar ICES activities, and one expert on "human dimensions" issues). We also request supplementary travel support (2 days accommodation and per diem) for ~25 workshop invitees from within the PICES community.

As contribution to developing liaison with GOOS and ICES, PICES should nominate/endorse as "pilot studies", two developing regional monitoring programs in Pacific coastal waters, one in the NW Pacific (NEAR-GOOS?), and one in the NE Pacific (CAOS and/or ACCEO).

PICES should continue to endorse, and encourage further development of, the very successful North Pacific CPR Program.

The long-standing CalCOFI time series is seriously threatened by an impending ~50% funding cut (effectively the State of California contribution; US federal funding remains in place). An official letter from PICES should be prepared noting the great past and present value of the CalCOFI time series, and the regional and global scientific costs of its cancellation. CalCOFI representatives (Checkley or Hunter) will notify PICES of potential addressees (university, state and federal government officials).

MONITOR Workshop on *Requirements and methods for "early detection of ocean changes"*

A half-day Workshop on *Requirements and methods for "early detection of ocean changes"* was convened on October 19. The following performance "wish list" for an observationally-based "ocean change index" was suggested in the Convenor's introductory remarks:

- Learning from past experience (reliable performance in retrospective re-analysis, few missed events, few false positives)
- Robust to possible new modes of change
- Timely (short time lag between event and detection)
- Provide information about cause of change (in addition to timing and magnitude)
- Efficient (high ratio of information to collection cost)
- Allow comparison among locations and variables, and input to numerical models
- Sustainable through time (not vulnerable to changes in methodology, not entirely dependent on research surveys)

Seven papers were presented (list of papers is included elsewhere in this Annual Report), ranging from design criteria and statistical methodologies (Overland, Radchenko, Batten) through excellent examples of long- and short-term time series sampling of both open ocean (Sugimoto) and continental margin/coastal sea systems (Wen, Oozeki, Suh).

The presentations were followed by a wide-ranging group discussion. Emerging themes are listed below:

Choice of variables

- ***Diversity is good***. Useful to combine data (different places, variables), but analysis should retain/display a reasonable sense of the full suite of input information, not just project all variables onto a single "index".
- Range of motivations for monitoring and analysis: global warming vs. pollution vs. fishing policy and economic forecast vs. damage from individual environmental events vs…..
- Useful to observe spatial pattern of time variation and try to link pattern to mechanism.
- Biological variables may have higher signal: noise ratio at interannual time scales than physical variables (because more auto-correlated in time?). But some important variables (*e.g.* mid-water fishes) are rarely monitored.
- Many new time series are developing.
- Quick-look processing and exploratory analysis of a subset of data points may give good summary of emerging pattern and help to guide subsequent analysis priorities and hypotheses.
- Promising new technologies (see below).

Choice of analysis method

- ***Diversity is again good.*** Many data analysis techniques are now available. Different strengths and weaknesses for each. No single technique has model assumptions that match the characteristics of our time series.
- Formal time series methods have difficulty with "short" series, especially near ends of records.
- Category and rank statistics perform well to provide overview - exploratory analysis??? May be less sensitive to deviations from statistical model.
- Need better theory of how ocean ecosystems function.

Opportunities for the present & near-future

- Many new time series are developing (more data).
- Quick-look subset of 'labor intensive' data retains good summary of full pattern (*e.g.* CPR experiment by Batten).
- Promising new technologies: satellite remote sensing, buoy and drifter networks, radar measurement of surface currents.
- Users more receptive to concept of ocean change, but need to move our output further along path "data to decisions" by greater outreach and communication effort.

CCCC Integration Workshop

Dr. Mackas gave a presentation summarizing MONITOR activities since 1998, and plans/priorities for the future. Key points include:

- MONITOR's role is not primarily *internal* integration within CCCC. More important role is to *connect CCCC to past and future* (much of the "past" and "future" has been/will be external to CCCC):
  - *Past* via identification of existing long time series;

- *Future* via developing ongoing monitoring network (GOOS etc.), and developing routine application of monitoring data (*e.g.* North Pacific Ecosystem Status Report).

- Important unfinished (perhaps permanent??) tasks and what we are doing about them:
  - *Detecting changes in the North Pacific ocean* – Many good ideas from the MONITOR Workshop on *Requirements and methods for "early detection of ocean changes"* regarding multivariate data collection and analysis and interpretation. Progress will continue because this is "interesting science". MONITOR's primary roles are to 1) promote access to data and tools, and 2) note major data gaps (*e.g.* micronekton).

- Outrearch to users or 'converting data to decisions' (via North Pacific Ecosystem Status Report):
  - Recommend 2-day workshop next year (with earlier homework) to assemble and critique an NPESP.

- Liaison with GOOS and ICES:
  - Recommend 2 (not 1) PICES pilot coastal ocean monitoring programs: CAOS (or broader CAOS + ACCEO), and NEAR-GOOS.

CPR Advisory Panel

The North Pacific CPR Program continues to perform well. Summary of CPR activities in 2002 (prepared by Dr. Sonia Batten) is appended as *MONITOR Endnote 3*.

MONITOR Workshop on *Monitoring from moored and drifting buoys*

A half-day Workshop on *Monitoring from moored and drifting buoys* was convened October 23, 2002, as part of PICES XI. The workshop was attended by 43 people from 8 countries.

Presentations included an overview of time-series network (Dickey), ARGO buoy operations (Ando, Riser), real-time buoy system (Nam), conventional moored buoy observation (Shevchenko), bio-optical drifting buoy and satellite validation buoy development (Iida, Saino), and recent activities of the North Pacific Data Buoy Advisory Panel (O'Donnell, McLaren). List of papers is included elsewhere in this Annual Report.

The presentations were followed by a wide-ranging group discussion. Emerging themes are listed below:

<u>Observation networking and maintenance</u>
- How to use coarse data sets for data assimilation in global observation network.
- How to protect sensor system from bio-fouling in long-term observation.
- Importance of cross-calibration between buoy systems, for example, TRITON buoys and ARGO buoys.
- Useful to apply recent smart communication technology for gathering buoy data in real-time.
- Useful to apply two-way communication skill for controlling observation interval and parameters, etc.
- ARGO buoy distribution is not uniform, need to deploy buoys in the southern hemisphere including Antarctic Ocean.

<u>New sensors and "smart" system</u>
- Biological and optical sensors will be required for monitoring biological and ecological environment. K-SOLO system attached to ARGO buoy is useful to monitor biological production.
- Need water sampling system for future buoy system.
- Need low power buoy system for long-term observation.
- AUV (Autonomous Underwater Vehicles) system will be combined with conventional buoy system (*e.g.*, NEPTUNE system).

<u>Requirements for the present and near future</u>
- Need to expand utilization and analysis of ARGO data sets (more analysis and integrated results for maintaining program).
- Data quality control is still important issue for long-term buoy observation.

MONITOR Endnote 1

Participation List

Members

Douglas F. Bertram (Canada)
Vyacheslav B. Lobanov (Russia)
David L. Mackas (Canada, Co-Chairman)
Phillip R. Mundy (U.S.A.)
Yutaka Nagata (Japan)
Yoshioki Oozeki (Japan)
Sei-ichi Saitoh (Japan, Co-Chairman)
William J. Syderman (U.S.A.)

Observers

Andrew Bakun (U.S.A.)
Sonia D. Batten (U.K.)
David M. Checkley (U.S.A.)
Ken Drinkwater (Canada)
Dong-Young Lee (Korea)
David L. Musgrave (U.S.A.)

MONITOR Endnote 2

MONITOR Meeting Agenda

1. Review accomplishments in 2002
   a. Report(s) on CPR North Pacific program, and April 2002 workshop on instrumentation of Volunteer Observing Ships (Batten)
   b. Reports on MONITOR workshops at PICES XI:
      - *Methods and requirements for "early detection of ocean changes*"
      - *Monitoring from fixed and drifting buoys*
   c. North Pacific component of the International Data Buoy Cooperation Panel (Mackas for McLaren)
2. Goals/activities of the GLOBEC Focus 1 Working Group on *Retrospective Analysis*, and liaison with MONITOR (Bakun)
3. Regional monitoring programs:
   a. ACCEO: Alliance for California Current Ecosystem Observations (Checkley)
   b. Status of GEM, Gulf of Alaska Ecosystem Monitoring, and NPRB, North Pacific Research Board (P. Mundy); Dr. Mundy reported that the GEM monitoring program for the Gulf of Alaska is now formally started, and that NPRB planning and approval are well underway. He noted the great value of PICES inputs in the design and review of these important emerging programs.
   c. CAOS: Coastal Alaska Observing System (Musgrave)
   d. NEAR-GOOS (Lee, Lobanov); Planning for NEAR-GOOS Phase II that will include significantly more biological components is underway.
   e. CoML NaGISA (Natural Geography of Inshore Areas); an Alaska pilot program is being funded through GEM.
4. Discussion of plans and progress toward a "North Pacific Ecosystem Status Report"
5. Scientific, logistic and methodological issues:
   a. Identify time series at risk (CalCOFI, Japan training ship cruises cut back to 60 days per year and 2 major N-S lines, M2 mooring in Bering Sea is funded for only one more year)
   b. Development of additional monitoring platforms (CODAR/high frequency radar shore stations for real time mapping of surface currents over large areas, potential Japan Sea VOS triangle between Japan, Vladivostok and Pusan)
6. Additional plans for 2003-2004:
   a. MONITOR workshop theme for PICES XII
   b. Further development of CPR time-series
   c. Liaison with GOOS
   d. Liaison with ICES - plans for pilot Ocean Status reports and for one or more pilot coastal ocean monitoring studies.

MONITOR Endnote 3

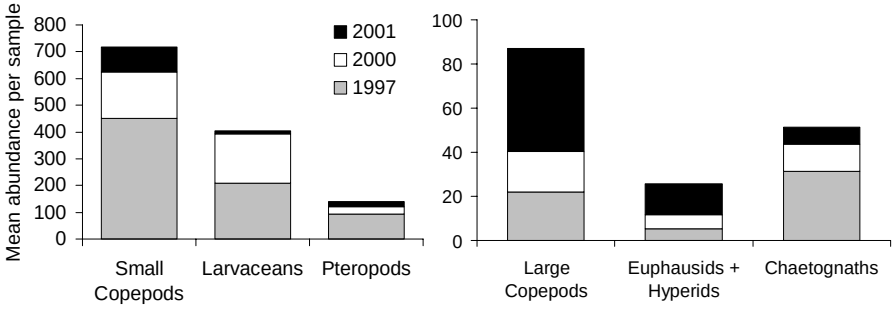
Summary of CPR (Continuous Plankton Recorder) activities in 2002

Sampling continued on both transects, funded by the EVOS GEM program. The Valdez Alaska-to-California transect was sampled in April, May, June (twice, owing to a re-routing because of a problem with the vessel on the first transect) and August. A period of dry-dock delayed the final routine transect until late October. Additional funding received during 2002 (from the North Pacific Research Board) enabled the sampling season to be extended through to winter, with transects sampled in December and January (2003). The Vancouver-to-Japan transect was sampled as usual in June and then again, with the additional funding, in October and December. For 2003, sampling the regular 5 Alaska-to-California transects is planned between March and September, and 3 Vancouver-to-Japan transects are planned for March, June and October.

Other, collaborative, projects began in 2002. A thermosalinograph was fitted to the vessel operating on the Valdez-to-Alaska transect (project led by S. Okkonen) which records underway temperature and salinity from the ship's water intake. The vessel makes about 4 runs each month between the two ports and so a wealth of data on horizontal water structure will be obtained from this instrument. A chlorophyll fluorometer is due to be fitted for Spring 2003.

The second collaborative project involves marine bird and mammal observations along the Vancouver-to-Japan transect (led by W. Sydeman). An observer was aboard in June 2002 for the first time and recorded over 112,000 observations. The focus was marine birds, with mammals being recorded where possible, and the most dominant group were shearwaters. Some birds feed directly on the larger plankton species sampled by the CPR (euphausiids and *Neocalanus* copepods) with the remainder feeding on small fish and squid species which themselves feed on zooplankton. This simultaneous data collection should enable trophic linkages to be investigated on the scale of the North Pacific. A second set of observations was made in October 2002, during the fall bird migration, and it is planned to have an observer on board during each of the three 2003 transects.

*The mean abundance (as stacked bars) of main groups of plankton in each of 3 summers for the **oceanic section** (42-59°N) of the CPR transect.*



Data from previous years of CPR sampling were further analysed. Samples were first collected in summer 1997, as a pilot project. This sampling took place when the northeast Pacific was anomalously warm (a warm period that extended throughout the 1990s but was particularly apparent during the 1997/98 El Niño). There is a growing consensus that 1999 saw a switch to a cool regime in the northeast Pacific, both the Pacific Decadal Oscillation (PDO) and the Northern Oscillation Index (NOIx) switched phases at this time. The CPR monitoring program began in 2000, and so data exist from a warm regime summer and two cool regime

summers (2000 and 2001 data are available). A comparison of zooplankton abundance and estimated biomass for these two periods shows that the climate shift occurring in 1999 is clearly evident in the CPR data. Before the shift, the anomalously warm oceanic region of the Gulf of Alaska contained large numbers of small species, chiefly copepods, and these were species of a more southerly origin (see Figure). The Alaskan shelf had very low numbers of copepods in the warm regime, and the implication is that rather than northern species being replaced by southern species (as happened in the oceanic Gulf of Alaska), northern species simply failed to do well on the shelf. After the climate shift the oceanic areas saw a return to larger organisms, and colder boreal species of copepods became more abundant. The Alaskan shelf saw a large increase in small boreal copepod species leading to higher recorded zooplankton abundance and biomass in the cool regime. This result fits very well with other more coastal studies, undertaken in the northeast Pacific (*e.g.* Peterson, the Newport Line and Mackas, British Columbia). Significantly, the oceanic areas appear to be as responsive to climate changes as do more coastal regions.

REPORT OF REX TASK TEAM

The REX Task Team met from 13:30-17:30 hours on October 19, 2002, to review the past year's accomplishments and to plan activities for 2003. The Co-Chairman, Dr. William T. Peterson, called the meeting to order and welcomed the participants (*REX Endnote 1*). 13 scientists from Canada, Japan, Russia and U.S.A. attended the meeting. There were no representatives from the People's Republic of China and Republic of Korea. The meeting agenda is appended as *REX Endnote 2*.

Inter-sessional activities in 2001 - 2002

The proceedings of the REX Workshop on *Temporal variations in size-at-age for fish species in coastal areas around the Pacific Rim* (convened in October 2001, at PICES X in Victoria, Canada) was published in PICES Scientific Report No. 20.

A 4-day joint MODEL/REX Workshop to *Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes* was held January 24-27, 2002, Nemuro/Yokohama, Japan (co-sponsored by Nakajima Foundation and Nemuro-city).

Dr. Peterson gave a brief presentation on a research project that was to examine the feasibility of reproducing the seasonal cycle of nutrients and plankton in the coastal zone off Oregon, using a simulation model. Cheryl Brown, an associate at a laboratory in Newport, used the Edwards code of the circulation in the Oregon upwelling zone and added to that an NPZ model. Plankton data collected at bi-weekly intervals during the year 1999 were used to test the simulations. Excellent agreement was found between the model and the data when coastal winds were used to force the model. Lesser agreement was obtained when the model was forced with winds from a buoy located 25 miles from shore.

Subarctic seas studies

Dr. George L. Hunt presented the results of a workshop on *Ecosystem studies of subarctic seas*, held September 4-6, 2002, in Laguna Beach, CA, U.S.A. He is working on a new research initiative that is meant to compare the response of subarctic and polar seas to inter-annual variations in sea ice resulting from forcing by the Arctic Oscillation. The project is of great interest to REX scientists since this research initiative seeks to compare ecosystem dynamics in the eastern and western Bering Sea as well as in the Sea of Okhotsk. Also included in the initiative would be study of the Barents and Labrador Seas, making the project of interest to both PICES and ICES scientists. The research would have gadoid fishes as its focus.

GLOBEC Focus 2 Working Group

Dr. Dian Gifford, a member of the International GLOBEC Focus 2 Working Group on *Process studies*, requested time to make a presentation to explore potential topics of common interest between this Working Group and REX. The goal of the Working Group is primarily to facilitate communication among GLOBEC countries, and they are in process of developing their Terms of Reference. The Focus 2 Working Group will organize a meeting in 2004 to review the achievements of the regional programs, to identify gaps between plans and completed work, and to review and evaluate the importance of the key processes affected by climate variability. This meeting is definitely of interest to REX.

CCCC Program integration

The Task Team discussed Dr. Makoto Kashawai's proposal for implementation of a better integrated CCCC Program. Dr. Peterson reviewed the 8 Key Questions posed by the CCCC Program and the REX tasks (see list of

Key Questions at http://www.pices.int/Annual/pices11/agendas/REXWhitepaper.pdf).

REX activities contribute to Questions 2, 3, 4, 6, 7 and 8. REX recommended that Questions 2 ("comparisons of ecosystems in the eastern and western sides of the Pacific"), 3 ("ecosystem structure") and 7 ("differential responses of dominant species to climate forcing") be combined and that these tasks should form the basis of REX work in the next few years. REX felt that Question 4 ("flow dynamics") had been addressed as well as it could at this point and that this was more a problem for BASS. REX also recommended leaving question 6 for other groups (salmon research).

Proposal for a CCCC Symposium

As a means of making progress on the integration of Questions 2, 3 and 7, REX proposed that an inter-sessional Symposium (or Topic Session at a future Annual Meeting) on *The climate shifts of 1977, 1989 and 1998: differential physical forcing and ecosystem response in the PICES region* be held in 2004 or 2005[1]. The REX Co-Chairmen were recommended as covenors.

Three climate shifts have been observed in the North Pacific Ocean during the past 25 years: in 1977, 1989 and 1998. The physical forcing and biological response appear to be different in the eastern and western sides of the Pacific. In this symposium, we ask "*What do the differences tell us about physical forcing and biological response, and what are the mechanisms that lead to these differences? Is species diversity different in the east and the western Pacific? Do changes in dominance of species affect ecosystem structure? What is the relative importance of basin-scale forcing vs. local scale forcing on changes in ecosystem structure? Do differences in diversity at the beginning of a climate shift influence changes in community structure?* (e.g., it was noted that the 1998 shift may have started with a different mix of species than 1989, 1977 or 1947)."

[1] Science Board recommended to convene a REX Workshop on this topic at PICES XIII in 2004.

Proposed activities at PICES XII

REX Workshop[2]

Given that the focus of PICES XII is on *Human dimensions of ecosystem variability*, REX recommends to hold a workshop on *Influence of fishing and/or invasive species on ecosystem structure in coastal regions*. The purpose of the workshop is chiefly to explore the following ideas: *Do we know enough about the influence of fishing or invasive species on ecosystem structure to be able to identify an effect? Can we distinguish the signal from the noise?*

REX-sponsored Topic Session[3]

A scientific result of the La Paz Symposium on *North Pacific transitional areas* was that distinct latitudinal differences in the magnitude and variability of distribution, productivity and recruitment of plankton and fish stocks were identified. In the Topic Session on *Latitudinal differences in response of productivity and recruitment of marine organisms to climate variability, from subarctic to subtropical waters, in the eastern and western sides of the Pacific*, we would further explore latitudinal clines in life history strategies at various temporal scales of variability. We would focus on the north-south clines in environmental variability and life history strategies in the eastern Pacific from Mexico to Alaska, and in the western Pacific from China to Russia. We would encourage presentations on scales of physical variability, and clines in productivity and recruitment of plankton, fish, birds, mammals, the benthos and intertidal invertebrates.

Selection of REX Co-Chairman

There was discussion of selection a new Co-Chairman to replace Dr. Peterson. The Task Team suggested that Dr. Richard D. Brodeur be contacted. Dr. Peterson discussed this with Dr. Brodeur and he declined the invitation because he is already committed to working on BIO (member) and the WG 14 (Co-Chairman). REX members will continue discussion on an alternate potential Co-Chairman.

[2] Accepted as a ½-day Topic Session at PICES XII.
[3] Accepted as a 1-day Topic Session at PICES XII.

REX Endnote 1

Participation List

Members

Kenji Asano (Japan)
William T. Peterson (U.S.A., Co-Chairman)
Vladimir I. Radchenko (Russia, Co-Chairman)
Yoshiro Watanabe (Japan, Co-Chairman)
Yutaka Watanuki (Japan)

Observers

Alexey A. Baitalyuk (Russia)
Vladimir A. Belyaev (Russia)
Svetlana V. Davydova (Russia)
Dian Gifford (U.S.A.)
Douglas E. Hay (Canada)
George L. Hunt (U.S.A.)
Takashi Minami (Japan)

REX Endnote 2

REX Meeting Agenda

1. Welcome and opening remarks
2. Inter-sessional activities in 2001 – 2002
   a. MODEL/REX Workshop to *Develop a marine ecosystem model of the North Pacific Ocean including pelagic fishes*
   b. Proceedings of the REX Workshop on *Temporal variations in size-at-age for fish species in coastal areas around the Pacific Rim*
   c. Project to examine the feasibility of reproducing the seasonal cycle of nutrients and plankton in the coastal zone off Oregon, using a simulation model
3. Subarctic seas studies – results of a NSF workshop
4. Activities of GLOBEC Focus 2 Working Group
5. CCCC Program integration
6. Proposal for a CCCC Symposium
7. Proposed activities at PICES XII
   a. Workshop *Influence of fishing and/or invasive species on ecosystem structure in coastal regions*
   b. Topic Session on *Latitudinal differences in response of productivity and recruitment of marine organisms to climate variability, from subarctic to subtropical waters, in the eastern and western sides of the Pacific*
8. Selection of REX Co-Chairman

DOCUMENTING SCIENTIFIC SESSIONS AT PICES XI

Session S1 (Science Board Symposium)
Technological advances in marine scientific research

Co-Convenors: R. Ian Perry (SB), Vladimir I. Radchenko (BIO), Douglas E. Hay (FIS), John E. Stein (MEQ), Kuh Kim (POC), Igor I. Shevchenko (TCODE), Harold P. Batchelder and Makoto Kashiwai (CCCC)

Background

This symposium examined the potential for new technologies to advance the scientific activities conducted by PICES researchers. Technological advancements are occurring in a variety of research areas (biology, biomass assessments, physical and biological oceanography, etc.). For example, advances in stock identification methods are occurring in the areas of: microscopic laser ablation techniques; new nuclear DNA techniques; smart tags, including acoustical tags for fish and mammals, etc. For stock assessments there are new developments in the areas of laser technology and associated data analyses that can scan the upper 20-30 m from aircraft and satellite technology. Plankton assessments are advancing through bio-optical recording and analysis systems. There are continuing developments in acoustical assessments, such as towed vehicles with upward- and downward-looking transducers, and long-range sidescan SONAR. Some of the most rapid advancements are occurring in physical oceanography, with the development of smart drifters. This emphasis on technological advancements includes new developments in information technology, numerical modeling, data processing and visualization.

Summary of presentations

The session consisted of eleven oral presentations and seven posters. Papers dealt with aspects of new technologies in physical and biological oceanographic observations, in new methods for tracking movements of fish and other large organisms, and new approaches to integrate and visualize the large volumes of data that result from these new observing techniques. With many "new" techniques, such as observations from satellites, sufficient data have been collected over the past >10 years to begin to permit time series analyses. Modelling techniques that use 4-dimension optimal interpolation methods are also becoming sufficiently developed to integrate and assimilate the large volumes of physical observations. The coming trend is to use smaller and faster devices, and to integrate multiple sampling systems. Current issues to be resolved include data transfer rates (which are presently too slow for the amount of data that could be collected), visualization and analyses of these large data sets, and their dissemination. Biological observation systems are taking novel approaches to use the organisms themselves as platforms to describe their environment, for example, the tagging projects discussed by David Welch and Jeffrey Polovina. However, the ability of biological observations to sample rapidly over a wide range of spatial scales lags the present ability of physics. Models that can integrate these biological observations are also severely lacking. The final oral presentation by Neville Smith underlined the additional problem of managing and archiving these large volumes of data. These latter issues are presently not strong components of most research programs. The greatest challenge may be in the area of outreach to the scientific community and organizational behaviour with respect to data management issues than in the technological problems.

List of papers

Oral presentations:

Stephen C. Riser (invited)
Building a global ocean observing system with profiling floats

Masafumi Kamachi, Tsurane Kuragano, Xiaobing Zhou and Yosuke Fujii
JMA operational ocean state estimation and prediction system in the North Pacific: COMPASS-K

David W. Welch
POTENT: The Pacific Ocean Tracking & Evaluation NeTwork description & applications in marine science

Albert J. Hermann, C. Moore and Nancy N. Soreide
Recent advances in immersive visualization of ocean data: Virtual Reality through the web on your laptop computer

Joji Ishizaka and Hiroshi Kawamura (invited)
Near future opportunities in satellite remote sensing of physical and biological properties of the Ocean

Tommy D. Dickey (invited)
Toward global ocean interdisciplinary observations using emerging autonomous sampling technologies

Oscar M. Schofield and Scott Glenn
Development of coastal ocean observatories for synoptic oceanography

Gabriel Gorsky (invited)
Can optical methods quantify, measure and classify zooplankton efficiently?

Sukyung Kang, Suam Kim, David Welch, Kevin Telmer and Youn-Ho Lee
The analysis on trace elements in chum salmon otolith using laser-ablation technology: Habitat characteristics and stock identification

Jeffrey J. Polovina, Don Hawn, Evan Howell and Michael Seki
A new approach to fisheries oceanography with advances in electronic tags

Neville R. Smith (invited)
Ocean Information Technology: Some new opportunities for marine data management

Posters:

Irina Y. Bragina and Valery N. Chastikov
The experience of the optical plankton counter TRAP -7A application in the Okhotsk and Japan Seas, 2001-2002

Irina Y. Bragina and Gennady A. Kantakov
The results of McLane Autonomous Zooplankton Sampler Application in the Okhotsk Sea, 2000-2001

Yang Ho Choi and Young Jae Ro
Web-based realtime monitoring of water quality conditions in the Korean coastal waters

Joseph C. Huang
Revisit OTEC System

Katsumi Matsushita
An applicable automatic continuous sampling method of small pelagic organisms

Donghwa Sohn, Sukyung Kang and Suam Kim
Trace element analysis for the stock identification of Chum salmon (*Oncorhynchus keta*) in Korea

Vladimir N. Vologdin
Technique of a combined research of near-surface fish formations behaviour and structure with the help of sonars and echosounders

Session S2 (BIO/MEQ)
Food web dynamics in marginal seas: Natural processes and the influence of human impacts

Co-Convenors: Paul J. Harrison (Canada) and Hideaki Nakata (Japan)

Background

Marginal seas are often one of the most productive regions of the world's oceans. They are sites of abundant natural resources and fisheries. In some cases, nutrients and production are transported offshore, enriching these areas. Human impacts are evident in some areas of these marginal seas and these anthropogenic inputs including excessive nutrients, heavy metals and various organics, have altered various foodwebs. Sometimes changes in the phytoplankton species have resulted in changes in higher trophic levels, including fisheries. Excessive nutrients may lead to over-production of phytoplankton which are not eaten by zooplankton, and the decomposition of the bloom at depth may result in hypoxic or anoxic bottom waters with significant effects on the benthos. We need to understand these changes and their causes, if we are to better manage our marginal seas. For this session, contributed talks and posters on the influence of excessive anthropogenic inputs on food web dynamics were encouraged.

Summary of presentations

The topic of the session was very broad and papers addressed nutrients, heavy metal, organic pollutants and the effects on a wide variety of geographical sites and on a variety of organisms. Therefore, there were no general themes, but here are some generalities.

Nutrients

Nutrient ratios, concentrations and nutrients fluxes are all important. Eugene Turner clearly showed that nutrient ratios such as Si:N can influence what group of phytoplankton (e.g. diatoms vs. flagellates) will dominate. If diatoms dominate, then copepods are more abundant, and there will be more high quality carbon flux to the benthos in the form of fecal pellets. If flagellates dominate because the Si:N ratio is <1, there will be less flux and poorer quality, and therefore the benthos will not benefit as much from the surface productivity. Therefore the final conclusion is that the effect of nutrient ratios propagates all the way up the food chain and down to the benthos. Nianzhi Jiao also showed that parts of the East China Sea might be silicate-limited and affect the abundance of diatoms in this area. Paul Harrison indicated that Hong Kong waters are P-limited in some areas and N-limited in the areas further away from Hong Kong. He suggested that the waters surrounding Hong Kong are not as hypoxic as those of the Mississippi River estuary, because the phosphate concentration is not as high as in the Mississippi River, and therefore the algal biomass production is lower, and hence there is less utilization of oxygen, since there is less algal biomass produced. Iron limitation was discussed in the subarctic gyre and in the South China Sea. Atsushi Tsuda showed that when Fe was added to the western subarctic gyre, only 10% of the primary productivity was eaten by zooplankton, however that amount did decrease the mortality of the naupliar stages of some copepods. Yang demonstrated in some lab experiments that additions of Fe to picoplankton from the South China Sea, did increase their growth rate.

East China Sea

Carbon flux in the East China Sea was shown to be influenced by downwelling and bottom currents carrying large amounts of sediment, but with low carbon content. Alternatively, there were smaller events with mass sinking that carried organic matter that had high carbon content in it. Jiao showed the distribution of picoplankton in the East China Sea and suggested that temperature, salinity and nutrients were important factors affecting their distribution.

List of papers

Oral presentations:

R. Eugene Turner, Nancy N. Rabalais, Quay Dortch and Dubravko Justic (invited)
Variations in nutrient ratios and aquatic food webs

Shang Chen and Mingyuan Zhu
Modeling response of marine pelagic ecosystem to phosphate enrichment

Nianzhi Jiao, Shujiang Zhao, Zhiliang Shen and Yulin Wu
Causes and consequences of changes in nutrient structure in a typical coastal waterbody, with special reference to silica-limitation of phytoplankton

Nelson Sherry
Predicting the influence of episodic physical events on longer term and/or larger scale estimates of biomass and production at lower trophic levels

Paul J. Harrison and Kedong Yin
Eutrophication in Hong Kong waters: Why is it not worse?

Ruixiang Li and Mingyuan Zhu
The competition between two HAB species a diatom and a dinoflagellate - mesocosm experiment

Atsushi Tsuda, H. Saito, J. Nishioka and T. Ono
Mesozooplankton responses during the Subarctic Ocean enrichment and ecosystem dynamics study (SEEDS 2001)

Yanhui Yang and Nianzhi Jiao
Effects of iron enrichment on picoplankton cell abundances in the South China Sea: A result from deck experiment

Kazuo Iseki (invited)
Continental margin carbon fluxes in the East China Sea

Jinhui Wang and Xiuqing Huang
Harmful algal bloom and nutrient overenrichment of East China Sea

Nianzhi Jiao, Yanhui Yang, Hiroshi Koshikawa and Masataka Watanabe
Coupling of hydrographic conditions and picoplankton distribution in the East China Sea, a marginal sea of the Northwest Pacific

Jintao Li, Dengfeng Yang and Weihong Zhao
Studies of influence of nutrients on growth of red tide plankton in the East China Sea by field experiment

Hui Huang, Renlin Zou and Sheng Liu
Impacts of warm effluent from the Daya Bay nuclear power plant on stony coral community

Bangqin Huang
Alkaline phosphatase activity and utilization of dissolved organic phosphorus by algae in subtropical coastal waters

Olga N. Lukyanova
Molecular biomarkers in the marine organisms of various trophic level influenced of human impact

Session S3 (BIO/POC/FIS)
The importance of biophysical coupling in concentrating marine organisms around shallow topographies

Co-Convenors: Richard D. Brodeur (U.S.A.), John F. Dower (Canada), David L. Musgrave (U.S.A.) and Orio Yamamura (Japan)

Background

The primary goal of this session was to bring physical and biological oceanographers together with fisheries scientists, to explore mechanisms underlying the widespread phenomenon of biological aggregations around shallow topographic features. Even though the existence of these dense aggregations and their frequent association with shallow topographies, have long been known, only a few scientific symposia have been devoted to this particular topic. This session featured 10 oral and 6 poster presentations, and included scientists from Canada, Japan, Israel, Mexico, Russia, South Africa and the United States. Of the 16 contributions, 10-12 will be included in an upcoming special issue of the *Journal of Marine Systems* to be edited by Drs. Richard D. Brodeur, John F. Dower and Stewart (Skip) M. McKinnell.

Summary of presentations

The session opened with an invited lecture by Amatzia Genin from the Hebrew University of Jerusalem. In his talk, Dr. Genin used a comparative approach to examine the mechanisms underlying aggregations over seamounts, canyons, sills and shelf break fronts. His presentation drew heavily on examples from the North Pacific, and provided an ideal introduction to the session. Several of the key themes to emerge from the invited lecture were also echoed by subsequent speakers. Chief among these was that dense aggregations of zooplankton and fish over shallow topographies are not usually linked to locally enhanced primary production. As pointed out by Dr. Genin (and others), in most cases, dense aggregations of zooplankton over topographic features result from a combination of three mechanisms: bottom-trapping of downward migrating organisms, enhanced horizontal flux of food in topographically accelerated flows, and counter-upwelling depth retention (in which plankton swimming downward against an upwelling current are accumulated into dense swarms). In turn, the favourable food environment created by these mechanisms acts to attract higher trophic level organisms. These findings served to highlight the importance of interactions between physics and behaviour, and even life history strategies, in producing topographic aggregations. Despite the apparent widespread nature of such aggregations, Dr. Genin ended his talk on a cautionary note, and pointed out that the literature may be biased toward positive results, since studies failing to find topographic aggregations may less likely be published.

Jack Barth discussed some of the mechanisms by which continental shelf banks have been hypothesized to affect the circulation. Included among these are their ability to redirect coastal jets, create regions of weaker flow, enhance vertical mixing, affect the along shore pressure gradient, and lead to re-circulation around the bank. Each of these is likely to have a biological response. Dr. Barth provided examples of these based on multi-disciplinary sampling around the Heceta Bank off Oregon from 1999-2002. Based on shipboard ADCP, CODAR tracking and satellite-tracked drifters, the pattern of circulation was determined to be different from the "classical" upwelling regime, in that there was a shoreward redirection of the coastal jet which created a low-velocity region in the lee of the bank. Within this region was observed very high chlorophyll concentrations during most cruises. Higher trophic level organisms including copepods, euphausiids, seabirds and marine mammals were also found in high densities in this region.

Susan Allen's paper dealt with both the general concept of aggregations around submarine

canyons, as well as the specific case of dense euphausiid swarms around Barkley Canyon off the coast of British Columbia. She began by demonstrating the hydrodynamics of an along-shelf current that encounters a submarine canyon. The result of this interaction is a localized upslope flow along the floor of the canyon, and a re-circulating flow in the near-surface flow above the canyon. This interaction also leads to the formation of dense euphausiid swarms, usually along the downstream edge of the canyon. Dr. Allen explained that this phenomenon likely results from the interactions between the canyon flow, and the diel vertical migratory behaviour of the euphausiids. Thus, euphausiids migrating up out of the canyon at night are carried downstream and become trapped near the edge of the canyon as they attempt to descend near dawn. These aggregations attract fish which feed upon the euphausiids. The process is visible in hydroacoustic data as a series of daily pulses of scatterers that form on the downstream edge of the canyon.

Armando Trasvina discussed the flow dynamics around a shallow seamount in the Gulf of California. There are series of such seamounts in the Gulf, several of which support high abundances of zooplankton and ichthyoplankton, as well as dense aggregations of such top predators as sharks, tunas and billfish. Unlike other seamounts discussed in the session, the seamount in this study is relatively close to shore and its circulation patterns, as well as its productivity, result from both local topographic effects and allochthonous input from the neighbouring Bay of La Paz. Although there is no evidence of a closed re-circulating flow over the seamount, dense aggregations of euphausiids are occasionally found over the seamount. The authors propose that these aggregations are maintained by opposing flow regimes near the surface and at depth, which act to retain the vertically migratory zooplankton.

John Dower suggested that Haida eddies and offshore-directed coastal jets may play a key role in the maintenance of isolated Sebastes populations on shallow NE Pacific seamounts. Since 1992, TOPEX Poseidon data have shown that 11 of the 15 Haida eddies that formed off the west coast of the Queen Charlotte Islands passed over at least one shallow seamount in the region. In one case, a Haida eddy was shown to have become "stuck" over Bowie seamount for at least three months, at a time when the eddy was also found to contain high abundances of coastal zooplankton species. Haida eddies in the general vicinity of these seamounts have also been found to contain coastal ichthyoplankton, including larval sablefish, larval kelp greenling and larval rockfish. The authors propose to test their hypothesis using geochemical tracer techniques to look for evidence of coastal origins in otoliths from seamount rockfish.

The papers by Chris Wilson and George Boehlert and Michael Seki and George Boehlert dealt with the dense layers of micronekton that occur over SE Hancock Seamount in the Subtropical North Pacific near Hawaii. The first paper showed that this micronekton layer displayed strong DVM behaviour, and was composed almost exclusively of the sternopthychid fish *Maurolicus meulleri* and the mysid *Gnathophausia longispina*. In exploring the three-dimensional structure of the aggregations, it was seen that the highest densities were recorded within 100 m of the seamount summit. Since the local flow was quite variable (and therefore not generally conducive to retention), the authors concluded that these species must use active swimming, and directed horizontal movement to maintain their populations over the summit. The second paper examined the community composition in the waters surrounding SE Hancock. Given its position near the North Pacific Subtropical Front, there was considerable seasonal variability in hydrography, productivity (more productive in winter) and thus, community composition. Recurrent group analysis revealed several species groups. The main "seamount group" consisted of the two resident species (*M. meulleri* and *G. longispina*). The three "off-seamount" groups included species whose presence/absence was more seasonal. Also of interest was the observation that neither of the "seamount species" appear to be among primary prey of the large demersal predators on the seamount.

The paper by Kohei Mizobata and Sei-ichi Saitoh presented results from a visual analysis of some 1,500 satellite images covering the period from 1998-2001 (and including TOPEX/ERS SST, TOPEX Poseidon altimetry, SeaWIFS ocean colour and primary production estimates based on SeaWIFS imagery). The data was used to describe the distribution of shelf-edge eddies in the SE Bering Sea, and potential impacts on biological production. The authors found that the number of eddies in the SE Bering Sea ranged from 250-324 per year, with higher numbers found in 2000-2001 than in 1998-1999. Eddy number seemed to be inversely related to eddy longevity (i.e. eddies in 1998-1999 were more stable than in 2000-2001), although most eddies seemed to persist for about one month. Eddy velocity also varied between years: the more energetic eddies from 2000-2001 moved at 1.0 – 1.8 cm/s, whereas the weaker eddies in 1998-1999 moved at speeds of 0.43 – 0.54 cm/s. Chlorophyll and primary production were elevated within the eddies (relative to background conditions) in all four years, although the enhancement was highest (and persisted longest) in 2000-2001. The authors concluded that interannual variability in eddy formation plays an important role in regional production in the SE Bering Sea.

David Mackas reported results from a study in Knight Inlet, a deep fjord with a very shallow sill located in British Columbia. Dense aggregations of euphausiids had previously been reported from the sill, but the mechanism underlying this aggregation was unknown. Using an arsenal of nets, acoustics and various optical sensing systems, the authors first confirmed the high abundance (and variance) of euphausiid biomass above the sill. Unexpectedly, they also found abundance minima extending about 10 km on either side of the sill. Analysis of multi-frequency acoustic data revealed that this pattern results from the very strong tidal flows, which alternately aggregate euphausiids on the upstream and downstream sides of the sill. Small fish in the area seem to aggregate in and feed upon the euphausiid aggregations. As they deplete one aggregation, the fish seem to anticipate the changing tide and move to the other side of the sill where the change in tidal flow will produce the next euphausiid aggregation.

Anne Hollowed's talk presented results from a program designed to examine the effects of fishing on the distribution and abundance of Steller Sea Lion prey (specifically, walleye Pollock and capelin). The study involved a comparison between the Barnabas and Chiniak troughs (one of which was fished, the other was closed to fishing) on the continental shelf east of Kodiak Island. A variety of trawls, drifters, ADCP data and satellite imagery were used to map the local circulation and distribution of the two species in each trough. The two species were distributed differently within the two regions, with capelin being the patchier of the two. Passage of a storm through the system eroded near-surface stratification and resulted in a post-storm surface phytoplankton bloom (likely via mixing of a previously existing sub-surface Chl maximum). The circulation patterns in the two troughs were found to be quite different, and seemed to be linked to the existence of a frontal system in Barnabas trough. In general, it seemed that the capelin distribution followed the distribution of the coldest waters. In contrast, walleye pollock distributions seemed to be related to the feeding environment, and followed the warmer near-shore waters which (due to enhanced cross-shelf advection) were characterized by higher zooplankton advection.

List of papers

Oral presentations:

Amatzia Genin (invited)
Trophic focusing: The role of bio-physical coupling in the formation of animal aggregations in the sea

Jack A. Barth, Stephen D. Pierce and Timothy J. Cowles
The influence of Heceta Bank, Oregon, on the coastal ecosystem

Susan E. Allen
Canyons and euphausiids: Trapping and aggregation mechanisms

Armando Trasvina, G. Gutierrez de Velasco, A. Valle-Levinson, R. González-Armas, A. Mulhia and M.A. Cosio
Dynamics of the flow in the vicinity of a shallow seamount top in the Gulf of California

John F. Dower, Sonia D. Batten and William R. Crawford
Biophysical coupling and the maintenance of dense rockfish populations on shallow seamounts in the Northeast Pacific

Chris D. Wilson and George W. Boehlert
Ocean currents and diel migrators at a seamount in the central North Pacific

Kohei Mizobata and Sei-ichi Saitoh
Variability of Bering Sea eddies and primary productivity along the shelf edge during 1998-2000 using satellite multi-sensor remote sensing

Mark Trevorrow, David L. Mackas, , Douglas R. Yelland and Mark Benfield
Aggregation of macrozooplankton and fish at a fjord sill

Michael P. Seki and George W. Boehlert
Species composition and assemblage patterns of oceanic micronekton at a central North Pacific Seamount

Anne B. Hollowed, Chris Wilson, Phyllis Stabeno and Sigrid Salo
Effect of ocean conditions on the cross-shelf distribution of walleye pollock (*Theragra chalcogramma*) and Capelin (*Mallotus villosus*) (S3-038)

Posters:

Keith L. Bosley, Richard D. Brodeur, W. Waldo Wakefield, Robert L. Emmett and Kara Rehmke
Food-web dynamics in Astoria Submarine canyon off the Oregon coast

Vyacheslav B. Lobanov, V. Zvalinskiy, S. Zakharkov, P. Tishchenko, A. Salyuk, A. Salomatin, S. Ladychenko, Y. Zuenko, V. Nadtochiy and T. Orlova
Physical causes and biological consequences of cross-shelf water exchange intensification along Primorye coast, Japan Sea in the fall season

Evgeny Pakhomov
“Life-support systems” of sub-Antarctic archipelago and seamounts: Physical and biological coupling mechanisms

Vadim F. Savinykh, Vladimir A. Shelekhov and Vladimir B. Darnitsky
Biology of the lightfish *Maurolicus imperatoricus* and the importance of physical processes on the dominance of this species over the Emperor Seamounts

Phyllis J. Stabeno, E.D. Cokelet, N. B. Kachel, C. A. Mordy and S.A. Salo
Mixing over Portlock Bank, Alaska

Session S4 (BIO/FIS/CCCC)
Responses of upper trophic level predators to variation in prey availability: an examination of trophic level linkages

Co-Convenors: Hidehiro Kato (Japan), Elizabeth A. Logerwell (U.S.A.) and Gordon A. McFarlane (Canada)

Background

There is increasing interest in this topic as evidence accumulates of the impact of physical forcing on prey resources over a wide range of temporal and spatial scales. Predators respond to changes in their prey resources in a variety of ways and over a range of ecological organization, from the individual to the population to the species. Understanding these responses is important for gauging the usefulness of predators as indicators of ecosystem change. In addition, ecosystem management strategies require defined inter-specific relationships and an understanding of the role of predation in the regulation of marine populations. Presentations were invited on the responses of seabirds, mammals and fishes at the individual (behavior, physiology), population (reproductive performance, mortality) or species (evolution) level. Dimensions of prey availability could be quantity, spatial and temporal distribution or quality. Particularly interesting are presentations that discuss predator response as an indicator of ecosystem change, predator-prey relationships in the context of ecosystem management strategies or predation as a regulator of marine populations. This Topic Session complemented the BIO/POC/FIS Topic Session "The importance of biophysical coupling in concentrating marine organisms around shallow topographies", and focused on the mechanisms resulting in high biomass concentrations that are utilized by many marine predators, and that may represent an important flux that affects the production in many ecosystems.

Summary of presentations

This session included nine oral presentations (three of which were invited) and eight poster presentations. Participants were from U.S.A., Canada, Republic of Korea, Russia and Japan.

Several presentations described field studies that show how predators respond to variability in prey. The kinds of responses documented included individual-level responses such as body size, stress hormone levels, diet composition, foraging behavior, habitat use, feeding efficiency and growth; and population level responses such as adult survival, reproductive success, juvenile survival and overall population growth or decline. Most of these presentations provided direct measures of the changes in prey availability thought to cause the observed responses. Some also showed that prey variability, and thus predator responses, were linked to climate variability at inter-annual and inter-decadal time scales, leading authors to suggest that predators can serve as indicators of ecosystem change. Prey availability can vary via changes in prey quality or quantity. Most presentations described variability in prey quantity. One presentation showed that changes in prey quality (caloric density) resulted in decreased growth in captive marine mammals.

Two posters and one oral presentation reported on predator diet composition. Although these studies do not deal directly with predator response to prey variability, these types of data are necessary to design field studies and to build trophic models.

Two presentations on trophic modeling were included in this session. One described a new way of modeling the functional response of predator consumption rate to changes in prey quantity. Anomalies in this functional response were observed in a time series of diet composition data from the Eastern Bering Sea, and were shown to propagate up the food web. Another presentation showed a different model of the functional response which was then incorporated into "NEMURO.FISH" to model changes in herring and saury growth as a function of environmental change.

The presentations described so far showed how predators *respond* to variability in prey, a handful of presentations showed how predators *drive* variability in prey. One of the invited presentations suggested that predation determines mortality of salmon early in the first marine year, but that growth (and thus energy stores) determines marine mortality during the first winter. Another talk presented the results of a field study to directly measure the growth of both predated and non-predated Japanese anchovy larvae. The authors found that mean growth rates of predated larvae were significantly lower, and that the effect was independent of length. A poster showed how information of predator-prey relationships was incorporated into stock assessment.

Several interesting issues were raised during the session. These questions may provide guidance for future research in this area:

- What is the temporal scale of food stress (acute versus chronic, recent to distant past)?
- What is the functional response of predator consumption rate to variability in prey abundance?
- What is the shape of the predator response with varying prey availability (linear or non-linear)?
- Which life history stages are most sensitive to changes in prey availability?
- How and why do different species in the same system respond differently to changes in prey availability?
- What are the important spatial scales of prey variability?
- Is the mean or the variance in prey abundance most important in driving predator responses?
- What oceanographic processes drive the prey aggregations exploited by predators?
- How does diet composition vary among individuals of the same species (by sex and/or size)?
- Is predation mortality or growth mortality most important in determining survival during early life history of fish?
- Does growth directly control predation mortality (independent of size or stage duration)? If so, what is the mechanism?

List of papers

Oral presentations:

Alexander S. Kitaysky (invited)
Are top-predators breeding in the Bering Sea food-limited?

Tsutomu Tamura (invited)
Diet variability of common minke whales in relation to changes in food availability

Kerim Y. Aydin
Where do predator/prey anomalies come from in the eastern Bering Sea

William J. Sydeman, K.L. Mills, C.A. Abraham, J.A. Thayer and P. Warzybok
Marine birds of the southern California Current ecosystem: Demographic and foraging consequences of variation in prey availability and quality

Douglas F. Bertram, B. Smith, A. Harfenist and A. Hedd
Contrasting adult survival of Cassin's Auklet on colonies in different oceanographic domains within British Columbia: 1994-2000

George L. Hunt, Jr., Lucy Vlietstra, Jaime Jahncke and Kenneth O. Coyle
Feathered oceanographers: The foraging ecology of marine birds

Andrew W. Trites and David A.S. Rosen
Responses of marine mammals to variability in prey availability

Richard J. Beamish and Gordon A. McFarlane (invited)
Predation and other beliefs and speculations

Akinori Takasuka, Ichiro Aoki and Isamu Mitani
Is a slower growing larval Japanese anchovy actually removed by predation at a given moment in the sea?

Posters:

Jae-Bong Lee, Yeong Chull Park, Dong Woo Lee, Doo Hae Ahn, Hyung Kee Cha, Seok Gwan Choi and Chang Ik Zhang
Predation by yellow goosefish, *Lophius litulon*, on yellow croaker, *Pseudosciaena polyactis*, in the East China Sea of Korea

Bernard A. Megrey, Robert A. Klumb, Francisco E. Werner, Kenneth Rose, Douglas Hay, Shin-ichi Ito, and Michio J. Kishi
Application of a nutrient-phytoplankton-zooplankton-fish bioenergetics trophodynamic simulation model (NEMURO.FISH) to Stocks of Pacific Herring and Pacific Saury in the North Pacific

Sue E. Moore, Janice M. Waite
Distribution of mysticete whales along the Alaskan coast: Southeast Alaska to Bristol Bay

Ilyas N. Moukhametov
Feeding habits of Pacific halibut *Hippoglossus stenolepis* from the southern Kuril Islands

Svetlana V. Naydenko
The role of Pacific saury in trophic structure in the epipelagial in the south Kuril Islands

Alexei M. Orlov
Summer diets, feeding habits and trophic relations of the most abundand elasmobranchs in the western Bering Sea

Yasuhiro Ueno and Mitsuyuki Namiki
Function of the gill-raker of the major pelagic fishes and the density effect

Yutaka Watanuki, Tomohiro Deguchi and Akifumi Nakata
Effects of Tsushima current on annual variation of diet and chick production in surface and sub-surface foraging seabirds breeding at Teuri Island, northern Hokkaido

Session S5 (FIS)
Comparison of the productivy of marginal sea with emphasis on the western Pacific (Japan/East Sea, Yellow Sea and East China Sea) with a focus on small pelagics

Co-Convenors: Vladimir Belyaev (Russia), Suam Kim (Korea), Hideaki Nakata (Japan) and Qi-Sheng Tang (China)

Background

The northwestern Pacific marine ecosystem, including three regional sub-areas (i.e., Japan/East Sea, Yellow Sea and East China Sea), is one of the most productive ocean areas in the world. The emphasis of this session was on understanding and comparing factors affecting the production of small pelagic fishes and zooplankton among the three regional ecosystems. Also, the submission of papers for new and innovative approaches, especially those that focus on decadal-scale changes in productivity and shifts in species dominance, was encouraged.

Summary of presentations

Comparison of catches of the small pelagic fishes in the different ecosystems (Zhang) showed the very large role of these species in the fish communities and economy of these regions. Long-term variability of the ecosystem in the northwestern Pacific connects directly with climate and productivity changes (Kang, Tang). These small pelagic fish species (anchovy, jack mackerel, saury, etc.) are very important

elements of the ecosystem of the northwestern Pacific (Takahashi, Kim and Lee).

An overview of the temporal variation in the hydrological and biological conditions in relation to the stock changes in several small pelagic fishes (including sardine, anchovy, saury, mackerels) was made for the Japan/East Sea ecosystem (Davydova, Belyaev and Baitalyuk), showing dynamic features of the stock changes in response to the thermal regime. An interesting hypothesis on the success/failure of the hatching of common squid eggs in the shelf/slope region was proposed (Yamamoto), providing support to the explanation that squid catch responds to the cold/warm regime. On the other hand, a peculiar pattern of distribution of zooplankton in the near bottom layer (Guo), and temporal and spatial changes of the fish community structure (Xu) in the Yellow Sea, were well demonstrated.

After the oral presentations, participants discussed the issues, directions and problems in research, and all agreed that the session was very successful, but recognized some gaps in research. The most valuable point was the comparison of ecosystems. Several case studies were reported in this session, and some presentations showed similar phenomena. However, different findings due to the difference in dynamic systems or different hydrographic characteristics were also found. It was concluded that in the future, elaboration of ecological phenomena can be made through collaboration among research groups, and that "integration" of ecosystems as the direction of the next steps should be considered.

There is a lack of information to understand the entire ecosystem. Oceanic and fisheries information from some areas, e.g., North Korean waters, are not available at this moment. Age information should be included in fishery biology, and some ways to differentiate fishing effects and natural variability should be investigated. Also, it was realized that this session did not include some upper-trophic level organisms such as marine birds and mammals. One suggestion was made to include various economic properties for the proper management of fish resources.

List of papers

Oral presentations:

Chang-Ik Zhang, Jae Bong Lee, Young Il Seo, Sung Il Lee, Man Woo Lee, Sun Kil Lee, Sang Chul Yoon, Kyum Joon Park and Yeong Gong (invited)
Productivity of small pelagics in Korean waters

Young Shil Kang and Ginger A. Rebstock
A comparison of three marine ecosystems surrounding the Korean peninsula: Responses to climate change

Qi-Sheng Tang and Xianshi Jin
Long-term variability in the ecosystem productivity of the Bohai Sea and control mechanisms

Motomitsu Takahashi and Yoshiro Watanabe
Growth of larvae and early jevenile Japanese anchovy, Engraulis japonicus, and environmental condition in the Kuroshio-Oyashio transition region

Hee-Yong Kim, Shingo Kimura and Takashige Sugimoto
Transport of jack mackerel eggs and larvae inferred from the numerical experiment in the East China Sea

Jae-Bong Lee, Yeong Gong and Chang Ik Zhang
Relationship between the abundance of Pacific saury and biological productivity in the East Sea

Svetlana V. Davydova (invited)
Factors affecting the production of small pelagic fishes in the Japan/Easr Sea

Vladimir A. Belyaev, V.B. Darnitzkiy and S.Yu. Shershenkov
Dynamic processes in the fish community of the Japan Sea epipelagial

Alexey A. Baitalyuk
Contemporary stock status, distribution, place and role of Pacific saury in the Japan Sea/East Sea

Jun Yamamoto, Yasunori Sakurai and Tsuneo Goto
Does pycnocline depth affect the hatching success of Japanese common squid paralarvae from pelagic egg masses?

Xuewu Guo and Zhinan Zhang
Zooplankton in the near bottom layer of the Yellow Sea in summer

Xian-Shi Jin, Binduo Xu and Zhenlin Liang
Changes in the fish community structure in the Yellow Sea

Posters:

Ichiro Aoki and Tetsu-ichiro Funamoto
Comparison of reproductive patterns of inshore and offshore spawning populations of Japanese anchovy *Engraulis japonicus* around Japan

Vladimir A. Belyaev, V.B. Darnitskiy and S.Yu. Shershenkov
Abundance dynamic of Japanese mackerel in the Japan Sea

Seok-Gwan Choi, Jin-Yeong Kim, Soon Song Kim, Young Min Choi and Kwang Ho Choi
Biomass estimation of anchovy (*Engraulis japonicus*) by acoustic and trawl surveys during spring season in the Southern Korean Waters

Nianzhi Jiao, Yanhui Yang, Koshigawa Horoshi and Masataka Watanabe
Distribution patterns of autotrophic picoplankton and heterotrophic bacteria and their affecting factors in the East China Sea

Nianzhi Jiao, Yanhui Yang
Ecological studies on *Prochlorococcus* in China Seas

Olga Moukhametova
Some peculiarities of fish eggs and larvae distribution in northern Japan Sea

Yanhui Yang and Nianzhi (George) Jiao
Distribution of virioplankton in the Kuroshio current and the adjacent area in the East China Sea as determined by flow cytometry measurements

Session S6 (FIS)
Physical forcing of walleye pollock life history and population structure: new approaches to identifying critical spatial and temporal scales

Co-Convenors: Martin W. Dorn (U.S.A.), Akira Nishimura (Japan) and Mikhail A. Stepanenko (Russia)

Background

Walleye pollock (*Theragra chalcogramma*) occupy diverse habitats in the North Pacific Ocean, ranging from semi-enclosed fjords to large oceanic basins. For some pollock populations, an annual migration between spawning and foraging habitats can be identified; in other populations, a gradual ontogenetic shift in distribution seems most prevalent. Although evidence of fine-scale population structure in walleye pollock is equivocal, pollock spawning aggregations are highly consistent in timing and location. This session explored new approaches to studying the life history and population structure of walleye pollock, a key species ecologically, and the target of major fisheries in the North Pacific. Papers and posters with a meta-analytical orientation were encouraged, in which population characteristics, such as life history traits, per unit carrying capacity, migratory

patterns, responses to physical forcing or commercial fishing, and decadal trends in abundance, are contrasted.

Summary of presentations

The session consisted of eight oral presentations and eleven posters concerning pollock throughout the geographic distribution of this wide-ranging species. While Bering Sea populations received the most attention, population structure and life history of pollock from the Pacific coast of Japan, the Japan Sea, and the Sea of Okhotsk were also discussed. Several papers dealt with the complex process of aggregation for spawning. Spawning aggregations can be highly dynamic - both the location and timing of spawning vary in response to decadal-scale environmental forcing and density-dependent effects. Other papers dealt with the early life history of pollock, contrasting years with favorable and unfavorable conditions for larval drift, and settlement. Finally, several papers described novel techniques for characterizing ontogenetic patterns of habitat use by juvenile and adult pollock, and the seasonal migration between feeding areas and spawning sites. In the eastern Bering Sea, different age groups of pollock show a highly consistent pattern of distribution, which is displaced on or off the Bering Sea shelf by environment forcing.

List of papers

Oral presentations:

James N. Ianelli (invited)
Patterns in the abundance of pollock in the Bering Sea: an integrated view of stock structure issues

Yasunori Sakurai, A. Suzaki, J. Yamamoto, T. Hamatsu, T. Hattori and Y. Mihara
Effect of variations in the flow of the coastal Oyashio Current on the year-class strength of walleye pollock in northern Japan

Kyung-Mi Jung, Suam Kim and Sukyung Kang
Ecological characteristics of walleye pollock eggs in the southeastern Bering Sea during the 1970s regime shift period

Anatoly V. Smirnov
Spatial and temporal spawning patterns and interannual variability of walleye pollock in the Sea of Okhotsk

Akira Nishimura, Takashi Yanagimoto and Kei-ichi Mito
Rise and fall of pelagic walleye pollock resources in the Aleutian Basin

Alexander I. Glubokov and Boris N. Kotenev
Spatial – temporal distribution of Alaska pollock *Theragra chalcogramma* in the Northern Bering Sea

Hiroya Miyake
Population structure of the North Japan Sea walleye pollock stock

Mikhail Stepanenko
Structure of eastern Bering Sea pollock (*Theragra chalcogramma*) spawning aggregations and its functional composition

Posters:

Gennady V. Avdeev
Parasitism by indicator species as evidence of walleye pollock redistribution in the Okhotsk Sea

Alexandr Buslov
The use of vertebrae for walleye pollock age estimation

Alexandr Buslov
Growth of walleye pollock during the first year of life

Elena N. Kuznetsova
Geographic variability of the growth rate of walleye pollock from different regions of the northwest Pacific

Alexander V. Nikolaev, M.Y. Kuznetsov, M.A. Stepanenko and L.A. Boretz
Abundance and distribution monitoring of walleye pollock (*Theragra chalogramma*) in the northwestern Bering Sea by echo integration surveys (1997-2001)

Michael C. Palmer and Brenda L. Norcross
Environmental forcing of walleye pollock, *Theragra chalcogramma*, growth in the southeastern Bering Sea

Alexandr I. Varkentin and N.P. Sergeeva
Walleye pollock size-age composition in the eastern Sea of Okhotsk

Alexandr I. Varkentin and N.P. Sergeeva
Walleye pollock survival in the eastern Sea of Okhotsk

Anatoly F. Volkov and Konstantin M. Gorbatenko
Diet of walleye pollock in the Okhotsk Sea during the spawning period

Takashi Yanagimoto and Akira Nishimura
Genetic variation in the walleye pollock, *Theragra chalcogramma* by PCR-RFLP and sequencing analysis of mitochondrial DNA

Oleg G. Zolotov and Pavel A. Balykin
Walleye pollock eggs and larvae drift in waters off Kamchatka Peninsula

Session S7 (MEQ, co-sponsored by Chinese National Harmful Algal Bloom project, CEOHAB)
Eutrophication, harmful algal blooms, and nutrients

Co-Convenors: Edward Black (Canada), Ming-Jiang Zhou (China) and Maurice Levasseur (Canada)

Background

There is growing evidence that the incidence of harmful algal blooms (HABs) has increased on a global scale in recent years. The role of macro- and micro-nutrients in the initiation, propagation and toxicity of HABs is an area of active research. There is also increasing evidence that eutrophication is associated with the initiation and propagation of HABs, although the mechanisms are not fully understood. Determining when and how eutrophication affects bloom dynamics is central to developing effective mitigation strategies that reduce the effect of anthropogenic nutrients on these blooms. Moreover, better knowledge of the natural role of nutrients in HAB events is essential if we are to understand the effects of climate and oceanography.

Summary of presentations

This session attracted 14 papers, including 10 oral presentations and 4 posters. The presentations are divided into several categories:

- Nutrient status assessment and natural biogeochemistry process;
- Relationship between nutrient status and development of harmful algal blooms;
- The role of species-specific physiological characteristics in the development of harmful algal blooms.

Isao Kudo (invited) introduced the spring diatom bloom dynamics and nutrient cycles in the subarctic coastal region, taking Funka Bay as an example. The spring diatom bloom consumes large amounts of nutrient accumulated during winter time. Nitrate depletion terminated the spring diatom bloom in the Bay. However, re-mineralization of organic material produced during the bloom at depth contributes to the

surface production in summer. This has a direct effect on the development of *Alexandrium tamarense* blooms, a HAB species causing paralytic shellfish poisoning.

Patricia Glibert (invited) discussed the relationship between nutrient supply and development of harmful algal blooms. She indicated that some factors, like nutrients ratio, have been successfully applied in predicting shifts from diatoms to dinoflagellates blooms. But many factors, like species-specific nutritional preferences, environmental conditions, and the presence or absence of alternative nutrition uptake mechanisms, make the relationship more complex. Therefore, the ultimate success of a given species depends on its ability to exploit the available nutrients pool, both quantitatively and qualitatively, the timing and intensity of the nutrient supply, other environmental factors such as temperature, presence or absence of competitors for the resource, and finally the grazing pressure.

Three papers were presented on nutrient status assessment and natural biogeochemistry process. Two were reporting studies conducted in the East China Sea, where large-scale red tides occurred in the past three years. The first presentation (X. Wang) introduced the results obtained during the first cruise of the Chinese national key project on harmful algal blooms. It was found that the concentration of the major nutrients in the coastal area was higher than that in the open sea area. Negative correlations between salinity and nutrients concentrations were detected, indicating that Yangtze River was the major source of nutrients. The second presentation (Liu) showed the role of sediments as a nutrient source. The results showed that the regeneration of nutrients from the sediments is responsible for the significant flux of nutrients to the waters column. One more presentation (B. Wang) emphasized the importance of the very high dissolved inorganic nitrogen pool and N/P ratio of the waters of the Yangtze River.

There were two presentations on the relationship between nutrient status and development of harmful algal blooms. One presentation (Foreman) introduced the status of toxigenic phytoplankton *Pseudo-nitzschia (PN)* in Washington and British Columbia coastal waters. Results from the ORHAB project were presented and field, laboratory, and modeling works to be conducted in the recently funded ECOHAB project were outlined. The second presentation (Zuenko) was on seasonal changes in the abundance of phytoplankton. The conditions and driving mechanisms of the succession of spring, summer and autumn blooms in Japan Sea were discussed.

Three papers were presented on the role of species-specific physiological characteristics in the development of harmful algal blooms. One presentation (Fan) introduced the physiological characteristics of *P. minimum* in relation to bloom development in Chesapeake Bay, U.S.A. It was found that an initial pulse of nitrogen from river flow was essential to initiate the bloom. Physiological preference for reduced nitrogen uptake by *P. minimum* also plays an important role in bloom maintenance. A model based on the physiological characteristics of *P. minimum* was tentatively developed. A second presentation (Yu) showed the influence of different nitrogen sources on the growth and toxin production in *Alexandrium minutum*. The results showed that nitrate, ammonia and yeast extract can promote the growth and toxin production of the algae, but urea can be used neither for growth nor for toxin production. The last paper (Huang) demonstrated the role of alkaline phosphatase activity (APA) as an indicator of the dissolved organic phosphorus algal utilization in subtropical coastal waters.

Four posters were presented, including the *in situ* daily growth rate of *Procholorococcus* at the chlorophyll maximum layer at 6.3ºN, 110ºE in the South China Sea based on cell cycle analysis (Yang), the distribution of viroplankton in the Kuroshio current and the East China Sea determined by flow cytometry (Yang), the effects of nutrient status on growth and toxin production in two toxic *Alexandrium* species (D. Wang), and the variations of Alkaline Phosphatase Activity of algae in a mesocosm experiment during a phosphate-induced algal bloom (Ou).

In discussion, participants addressed different issues related to the session theme. From these, several points were made. First, the importance of distinguishing between low-biomass-toxic blooms from high-biomass-non-toxic blooms was made. For example, a change in nutrient delivery pattern in the costal zone may either result in a large increase in biomass leading to oxygen depletion, or to a change in cell toxicity. This represents two widely different impacts of euthrophication on HABs.

All participants agreed that it is important to consider the influence of euthrophication not only on a single HAB species but also on the whole food chain. Changes in nutrient delivery patterns may have profound effects on the structure of the food chain, and indirectly on HABs. It has been recommended that future studies should look at the whole planktonic ecosystem. Along the same line, the importance of better assessing the mechanisms responsible for the fate of the bloom was mentioned. For example, eutrophication may alter zooplankton grazing pattern which in turn may affect HAB development.

In order to understand and develop a capacity to predict HABs, it is crucial to include a strong physical component in future field studies. The lack of physical oceanographers in the HAB research field was mentioned, and it was recommended to try to encourage the participation of physicists in future studies.

Aquaculture facilities often represent an important point source of nutrients. Some participants would like to see more studies on the impact of aquaculture on HABs. This could be done in the context of long-term study of the impact of euthrophication on HABs.

Finally, not all HABs are triggered by euthrophication, and it was proposed that the comparison between eutrophic and pristine systems sustaining HABs may help to discriminate between the role of natural (freshwater input, wind, precipitations, etc.) and anthropogenic forcing contributing to these blooms. This is particularly important in the present context of climate change.

Participants proposed to hold, during the PICES Twelfth Annual Meeting, a special session on the long-term interaction among euthrophication, ecosystems and HABs in coastal regions.

List of papers

Oral presentations:

Isao Kudo
Spring diatom bloom dynamics and nutrient cycles in subarctic coastal region

Patricia M. Glibert (invited)
Nutrients and harmful algal blooms: The importance of nutrient quality as well as quantity

Xiaoyong Shi, Xiulin Wang and Xiurong Han
Nutrient distribution in a high frequency area of red tides in the East China Sea

Michael G. Foreman, Barbara Hickey, Vera Trainer and Amy MacFadyen
Ecology and oceanography of toxic *Pseudo-nitzschia* in the Pacific Northwest Coastal Ocean

Chunlei Fan and Patricia M. Gilbert
The importance of reduced nitrogen in a *Prorocentrum minimum* bloom – a model approach

Baodong Wang, Xiu-lin Wang and Run Zhan
Excess nitrogen in the Yellow Sea and East China Sea

Yury I. Zuenko, Marina Selina and Inna Stonik
On conditions of phytoplankton blooms in coastal waters of the northwestern Japan Sea

Rencheng Yu, Qingchun Zhang, Yunfeng Wang, Jun Li, Tian Yan and Mingjiang Zhou
Growth and toxin production of *Alexandrium minutum* with organic and inorganic nitrogen sources

Su Mei Liu, J. Zhang
Character of nutrient regeneration from sediments in the Bohai, Yellow and East China Seas

Bangqin Huang
Alkaline phosphatase activity and utilization of dissolved organic phosphorus by algae in subtropical coastal waters

Posters:

Lingjian Ou, B. Huang, H. Hong and D. Wang
Induced algal bloom by phosphate addition in mesocosm - variation of alkaline phosphatase activity

Dazhi Wang

Effects of nutrient status on growth and toxin production in two toxic *Alexandrium* species

Yanhui Yang
In situ daily growth rate of *Procholorococcus* at the chlorophyll maximum layer at 6.3N, 110E in the South China Sea: An estimation for cell cycle analysis

Yanhui Yang
Distribution of viroplankton in the Kuroshio current and the adjacent and in the East China Sea as determined by flow cytometry

Session S8 (POC/FIS)
Detection of regime shifts in physics and biology

Co-Convenors: Jacquelynne R. King (Canada) and James E. Overland (U.S.A.)

Background

Regime shifts are an organizing principle in North Pacific systems. Physical systems might act as a broad-banded oscillator driven by external forcing or internal feedbacks, or as a stochastic system driven by multiple scale processes. Biological systems can act as filters for the noisy physical system. The responses of individual species will vary with life history strategies and trophic level. Some species respond to extremes in interannual variability while others appear tuned to decadal scales. Previous Topic Sessions at PICES Annual Meetings have dealt with the description of regime shifts, outlining the signals observed in physical and biological systems. As advancement to our understanding of decadal-scale processes, this session focused on retrospective and numerical models describing the nature of regimes or the early detection of regime shifts and on conceptual models on the underlying mechanisms connecting physical dynamics to biota. Plans are made to publish selected papers from this session in a special issue of *Journal of Marine Systems* (Elsevier).

Summary of presentations

The issues considered by presenters ranged from transitions in atmospheric circulation and sea surface temperatures, mechanisms for changes in coastal oceanography to linkages between physical processes and marine productivity and variability in lower and higher trophic levels. The geographic areas focused on in the papers included the Northern Hemisphere, the whole North Pacific, the northeast or northwest Pacific and regional areas such as the Yellow, Japan/East and Bering Seas, the Kamchatka, Kuroshio and California Current systems.

The first invited speaker (Masuda) presented an ocean-atmosphere model to investigate mechanisms of regime shifts in the North Pacific. Model results produced two atmospheric stable states during each the ocean acts as a “restoring force” for the atmospheric state. Decadal-scale shifts occur when the

"restoring force" exceeds a threshold. These transitions can be simulated without modelled ENSO variability, but the interval between transitions can be modified by introducing ENSO variability. The second invited speaker (Swartzman) examined the diffusion of regime shift signals across trophic levels, with particular reference to the 1998 regime shift. Zooplankton respond more directly to changes in current flow, upwelling and primary production, which means that regime shift signals are stronger in biota such as euphausiids and dissipates compared to higher trophic levels.

Two papers examined climate changes in the Northern Hemisphere. One (Yasunaka) analysed the connection between tropical sea surface temperature and regime shift signals in the North Pacific sea surface temperatures and the Arctic Oscillation. It noted that regime shifts can be divided into two groups: one in which the shift is closely linked with tropical Pacific variation, and another which is independent. The second paper (Krovnin) also revealed connections between the winter climate in the North Pacific and North Atlantic.

Konstantin Rogachev presented evidence of a major thermohaline transition during 1990-1997 within the Kamchatka Current and Oyashio regions. Evidence of a link between the timing of regional freshwater fluxes and the Arctic Oscillation suggested that the transport and distribution of freshwater components influences climate variability in high latitudes of the western subarctic Pacific.

Chuanlan Lin reported changes in the Huanghai Sea and reported that several oceanographic parameters (temperature, salinity, dissolved oxygen, phosphate, silicate and dissolved inorganic nitrogen) have changed significantly with implications for nitrogen limitation and phytoplankton production.

Two species in the northwest Pacific, Pacific saury (*Cololabis saira*) and Japanese common squid (*Todarodes pacificus*), were suggested as possible bioindicators of regime shifts. Regime shift signals in the Kuroshio current are variable, and stronger signals (1989 and 1998 regime shifts) in the northwestern waters of the current resulted in significant changes in Pacific saury abundance (Tian) . Within the Japan Sea, changes in the mean mantle length of Japanese common squid were coherent with ocean-climate regime shifts (Yatsu).

A paper (Aydin) used integrated food web models (ECOPATH) of the eastern and western subarctic Pacific gyres produced by the PICES BASS Task Team along with lower trophic level models (NEMURO) produced by the PICES MODEL Task Team to examine the nature of large-scale changes in the biomass of Pacific salmon (*Oncorhynchus* spp.) biomass. Observed patterns in historical data were best explained by a direct relationship between climate and salmon biomass, rather than by propagation of bottom-up signals from gyre primary or secondary production, suggesting coastal or regional-scale processes are determinants in salmon productivity. Additional papers investigated linkages between climate variability and Pacific salmon abundance and marine survival in the northeast Pacific (Pyper, Irvine). These papers found that abundance seemed to be related to decadal-scale climate processes, while analyses of survival rates suggested that salmon productivity is driven by regional-scale processes and interannual variation.

Several papers were presented on the California Current system. One paper (Peterson) reported that in the northern California Current system, persistent changes in productivity have increased the carrying capacity of the ecosystem confirming that a regime shift did occur in 1998. Two papers (Rodriguez-Sanchez, Chavez) examined the population dynamics of small pelagic fishes in the southern California Current system. Typically these species have exhibited the first signals of ocean-climate shifts, but recent regime shifts have not resulted in population changes similar to historical observations, suggesting that dynamics of these species has been altered.

Three papers focused on the Bering Sea. One paper (Bond) suggested that the climate variability of the Bering Sea is driven by episodic weather events on time scales shorter

than one month. A second paper (Ladd) also suggested that evidence for regime-like behaviour in summer stratification in the Bering Sea is weak. Interannual variability in spring winds and heat fluxes were important in determining summer stratification patterns and the timing of spring phytoplankton blooms. The third paper (Wang) hypothesized that major multi-year adjustments in the marine ecosystem of the Bering was directly linked to air-sea interactions on time scales of a season or shorter, and provided mechanisms underlying walleye pollock recruitment, tanner crab recruitment and coccolithophorid blooms as examples.

During discussion it was noted that the fact that there are synchronous global patterns is compelling, but the detail on regional scales becomes complex. Often the broad scale pattern falls apart at the regional scale. The fact that mechanisms for the transfer or amplitude of long-term variability have yet to be identified suggests that we need to approach research on ecosystem processes in a radical and new way.

It was agreed that there is a need to move from a research focus of correlative pattern recognition to the determination of mechanisms. The research community should try to explain the patterns that are observed and identify the drivers underlying the patterns. This will require active and creative research and should be encouraged by PICES Science Board, perhaps in a workshop format.

List of papers

Oral presentations:

Shuhei Masuda and Kazunori Akitomo (invited)
A model of regime transitions in the North Pacific

Kerim Y. Aydin, Gordon A. McFarlane, Jacquelynne R. King and Bernard A. Megrey
Signatures of biotic regime shifts and their propagation through trophic webs – historical data and food web models in the eastern and western subarctic Pacific gyres

Sayaka Yasunaka and Kimio Hanawa
Regime shifts found in the Northern Hemisphere SST field

Andrei S. Krovnin and George Moury
Variations in Pacific and Atlantic salmon stocks in association with recent climate changes in the northern hemisphere

Gordon Swartzman (invited)
To shift or not to shift: Biological response to the 1997-1998 regime shift in the California Current Ecosystem

William T. Peterson and Franklin B. Schwing
Recent changes in climate and carrying capacity in the northern California Current shelf waters suggest a regime shift was initiated in July 1998

Brian J. Pyper, Milo D. Adkison and Steve Ignell
Comparison of alternative measures of salmon productivity for quantifying spatial and temporal scales of climate-induced variation

James R. Irvine, D.G. Chen and J.R. King
Regime shifts and British Columbia salmon – linkages between physical processes and ocean survival

Viktoria A. Platonova, L.N. Vasilevskaya and N.I. Savelieva
Connection of the cold periods in the east of Russia with the centers of atmospheric action

Yongjun Tian, Yasuhiro Ueno, Maki Suda and Taturo Akamine
Decadal variability in the abundance of Pacific saury and its response to climatic/oceanic regime shifts in the northwestern subtropical Pacific during the last half century

Chuanlan Lin, Jilan Su, Yian Lin and Bingrong Xu
Changes of the ecological environment in the Yellow Sea during 1976-2000

Akihiko Yatsu and Hideaki Kidokoro
Coherent low frequency variability in biomass and in body size of Japanese common squid, *Todarodes pacificus*, during 1964-2000

Konstantin A. Rogachev and Eddy C. Carmack
Rapid thermohaline transition in the western subarctic Pacific: Evidence for the role of freshwater flux in the variability of coastal currents and fresh-core eddies

Ruben Rodríguez-Sánchez, D. Lluch-Belda, H. Villalobos and S. Ortega-García
Large-scale low-frequency response of small pelagic fishes in the California Current system to major regime shifts

Francisco P. Chavez, John Ryan, Salvador Lluch-Cota and Miguel Niquen C.
Multi-decadal climate variations, fish abundance, oceanic productivity, and atmospheric carbon dioxide

Nicholas A. Bond and James E. Overland
Is the marine ecosystem of the Bering Sea Shelf driven by episodic weather events?

Carol Ladd, George L. Hunt, Jr. and Phyllis J. Stabeno
Climate, mixing, and phytoplankton on the southeast Bering Sea shelf

Muyin Wang, James E. Overland and Nickolas A. Bond
Is the climate of the Bering Sea influenced by hemispheric teleconnections?

Posters:

James E. Overland, Donald B. Percival and Harold O. Mofjeld
A model of North Pacific atmospheric variability on scales of 1-100 years

Brian J. Pyper, Randall M. Peterman and Milo D. Adkison
Use of the Kalman filter and state-space models of stock and recruitment to estimate trends in productivity of 120 stocks of Pacific salmon

Brian J. Pyper, Randall M. Peterman and Milo D. Adkison
Multi-stock state-space models for estimating trends in stock-recruit parameters of Pacific salmon

Jake Schweigert
Detecting the effects of regime switching on Pacific herring in British Columbia

Elena I. Ustinova, G.V. Khen and Yu.D. Sorokin
Large-scale fluctuations in physical oceanography at Far-Eastern seas of Russia in the late 1900s

Session S9 (CCCC/GLOBEC)
ENSO and decadal scale variability in North Pacific ecosystems

Convenor: R. Ian Perry (Canada)

Background

ENSO-scale (4-7 years) variability strongly influences North Pacific ecosystems, with perhaps the most marked effects having occurred in the 1990's. Decadal-scale variability has been recognized over the past decade to also have major impacts on North Pacific ecosystems. It is unclear how processes on these two scales interact, and whether they are coupled somehow to amplify impacts (i.e. cause major changes, or "Regime Shifts") to marine ecosystems. This session examined how ecosystems in the North Pacific respond to variability on these scales, and whether some systems are structured so that they are resilient (or perhaps more susceptible) to variability on these scales.

Summary of presentations

The session consisted of three invited presentations, discussing conditions in the Northeast Pacific, around the Korean peninsula, and in the Kuroshio Current region off Japan. All presentations indicated the importance of climate forcing on marine systems, in particular at ENSO temporal scales. However, climatic changes affect various components of marine systems in different ways, presumably because of structural differences in these systems. In the Northeast Pacific, species with strong relationships between recruitment and climate variability (such as flatfishes and pelagic fishes) appear influenced by changes in transport or habitat quantity/quality. In contrast, species with weak relationships to climate, such as gadoids, appear to have multiple causes of variability. The marine ecosystem around Korea is influenced by El Niño variability in the tropics, but at different lags for different components: 1-3 years for pelagic fishes; 2-3 and 4-5 years for SST, zooplankton and mackerel. In the Kuroshio region in winter, the copepod community has a size-dependent response to climate variability: large copepods respond to ENSO (likely mediated through their diatom food supply), whereas small copepods respond negatively to variations in SST. Variations of small copepods in turn can directly affect the recruitment success of Pacific saury in this region.

List of papers

Kaoru Nakata
Decadal scale variability in marine ecosystem in Kuroshio in winter

Jin-Yeong Kim, Kangseok Hwang and Young-Sang Suh
ENSO and decadal-scale variability of pelagic fish population in the southwestern North Pacific Ocean

Anne B. Hollowed
A comparison of hypotheses linking climate and marine fish production

Session S10 (CCCC/GLOBEC)
Coupled biophysical processes, fisheries, and climate variability in coastal and oceanic ecosystems of the North Pacific

Co-Convenors: Harold P. Batchelder (U.S.A.), Makoto Kashiwai (Japan) and William T. Peterson (U.S.A.)

Background

The past decade has shown renewed scientific investigations in coastal regions on both sides of the North Pacific. New interdisciplinary programs have foci ranging from phytoplankton and harmful algal blooms, recruitment of benthic invertebrate larvae, wind-driven cross-shelf exchange, and the mechanisms that regulate the success of holozooplankton and fish. These programs supplement established longer-term observation programs in both coastal and oceanic regions (KNOT, Stn. Papa) and examine the responses of coastal ecosystems to forcing over broad spatial and temporal scales. A common goal of these programs is to elucidate the biological-physical mechanisms responsible for correlative changes that have been observed in the North Pacific. This session provided a forum for investigators from a number of disciplines -- climatologists, physicists, plankton biologists and fisheries scientists -- to present recent findings from the North Pacific.

List of papers

Oral presentations:

Shoshiro Minobe (invited)
Atmospheric circulation changes in 1998/99 over the North Pacific

Ernesto A. Chávez Ortiz and José Luis Castro-Ortiz
Impact of climate change on fisheries of the eastern Pacific Warm-temperate Transition Zone

Jack A. Barth, Timothy J. Cowles, Stephen D. Pierce and William T. Peterson
Mesoscale physical and biological variability in the northern California Current System

Julie E. Keister and William T. Peterson
Relationships between zooplankton communities and mesoscale physical features during two cruises off the Oregon coast, U.S.A., during early and late summer 2000

Ya-Qu Chen, Zhaoli Xu, Yunlong Wang and Mei Jiang
Study on change of zooplankton to biomass in passing 50 years in the East China Sea

Xian-Yong Zhao, Johannes Hamre, Fuguo Li , Xianshi Jin and Qi-Sheng Tang
Recruitment, sustainable yield and possible ecological consequences of the sharp decline of the anchovy stock in the Yellow Sea

Keita Kodama, Ichiro Aoki, Toru Taniuchi and Makoto Shimizu
Long-term changes in the assemblage of demersal fishes and invertebrates in relation to environmental variations in Tokyo Bay, Japan

Yoshioki Oozeki, Yoshiro Watanabe, Yutaka Kurita, Kaoru Nakata and Daiji Kitagawa
Growth rate variability of Pacific saury Cololabis saira larvae in the Kuroshio Waters

Fei Chai, M.-S. Jiang, R.T. Barber, R.C. Dugdale and Y. Chao
Modeling ecosystem response to interdecadal climate variability in the Pacific Ocean

Phyllis J. Stabeno, Nicholas A. Bond, Nancy B. Kachel and Calvin W. Mordy
The response of the Alaska Coastal Current (ACC) to regional atmospheric forcing

Posters:

Richard D. Brodeur, T.W. Miller, D.C. Reese and R.L. Emmett
Community structure of surface nekton and plankton in the northern California Current in relation to oceanographic con

Steven J. Bograd, Ronald J. Lynn and John A. McGowan
Interdecadal physical-biological coupling in the southern California Current System

Louis W. Botsford, M.F. Hill, A. Hastings and K. McCann
Spatial and temporal scales of variability in California Current salmon and crabs

Miriam J. Doyle, Janet Duffy-Anderson and Susan J. Picquelle
Interannual trends in abundance of ichthyoplankton species in the Gulf of Alaska during spring, 1978 through 2000: Exploring linkages between pelagic ecosystem dynamics and the early life history of fish

Albert J. Hermann, D.B. Haidvogel, E.L. Dobbins and P.B. Stabeno
Interannual variability of SST and cross-shelf transport in the coastal northeast Pacific

George L. Hunt, Jr., Phyllis J. Stabeno and Kenneth O. Coyle
Energy flux to top predator in the eastern Bering Sea: The roles of climate change and biophysical coupling

Nianzhi (George) Jiao and Yanhui Yang
Ecological studies on prochlorococcus in China seas

Nianzhi (George) Jiao, Jinjie Yang, Heyang Li and Yanhui Yang
Viability of bacterioplankton in the Chinese coastal waters and west Pacific

Xian-Shi Jin
Yearly changes of community structure in the Bohai Sea

Yi'an Lin, Mingming Jin, Shengquang Gao, Renyou Tang and Jianming Pan
Cycling and regeneration of nitrogen and phosphorus as well as its significance on ecosystem environment of the Yellow Sea

Xiuren Ning, Yuming Cai, Chenggang Liu and Fei Chai
Size-fractionated phytoplankton standing stock and primary production in Bohai Sea during late spring

Tsuneo Ono, Kazuaki Tadokoro, Takashi Midorikawa, Sanae Chiba and Toshiro Saino
Decadal oscillations of net primary production in the spring Oyashio region

William T. Peterson, Jaime Gomez-Gutiérrez, Tracy Shaw and Leah Feinberg
Abundances of eggs, brood size, molting rates and production by the euphausiids *Thysanoessa spinifera* and *Euphausia pacifica* in the northern California Current

Thomas C. Royer, Chester E. Grosch and Nandita Sarkar
Ocean climate conditions during GLOBEC Northeast Pacific Program (NEP) Long Term Observation Program (LTOP)

Norman Silverberg
Sediment trap information from San Lazaro and Alfonso Basins, off Baja California Sur

Kazuaki Tadokoro, S. Chiba, T. Ono, T. Midorikawa and T. Saino
Interannual variations of *Neocalanus* copepod biomass in the Oyashio water, western subarctic North Pacific

Ernesto Torres-Orozco, A. Trasviña and A. Muhlia-Melo
Interannual variation of the yellowfin tuna catches (*Thunnus albacares*) at the entrance to the Gulf of California

Igor A. Zhigalov and V.A. Luchin
Interannual variability of the bottom water temperature on western Kamchatka Shelf

Session S11 (CCCC/GLOBEC)
Climate change and carrying capacity of the North Pacific: Recent results of GLOBEC and GLOBEC-like programs in the North Pacific (Poster session)

Co-Convenors: Harold P. Batchelder (U.S.A.) and Makoto Kashiwai (Japan)

Background

The purpose of this session was to highlight recent results of GLOBEC and GLOBEC-like programs in the North Pacific. Posters on modelling, retrospective studies, observational programs and process-oriented research addressed how climate change affects ecosystem structure and productivity of coastal and oceanic populations.

List of posters

David G. Ainley, L.B. Spear, C.T. Tynan, J. Barth, T. Cowles and S. Pierce
Biological and physical factors explaining occurrence patterns of seabirds in the California Current

Susan E. Allen, T. Bird, K.L. Denman, J.F. Dower, S. Harris, R.G. Ingram, R.S. Lee and R. Pawlowicz
Biophysical coupling in the Strait of Georgia

Valentina D. Budaeva, Vyacheslav G. Makarov, Valery and P. Tunegolovets
Interannual variability of water regime in the Tatar Strait

Sanae Chiba, Kazuaki Tadokoro, Tsuneo Ono and Toshiro Saino
Has lower trophic level ecosystem changed in the western subarctic North Pacific? - a 30 year retrospective study

Hyo Choi
Response of sea temperature in fishing grouns to wind driven current induced by wind in the mountainous coastal sea

Valery I. Chuchukalo and Larisa N. Bokhan
Seasonal distribution of net plankton in the southern part of the Okhotsk Sea and the Kuril region of the Pacific Ocean

William R. Crawford and Sonia D. Batten
The influence of coastal-origin eddies on oceanic plankton distributions in the eastern Gulf of Alaska

Jaime Färber-Lorda, Ignacio Romero-Vargas and Cesar Almeda-Jauregui
Summer trophic conditions in the Southern California Current

Jaime Färber-Lorda, M.F. Lavin, M. Guerrero-Ruiz and J.M. Robles
Trophic conditions in the Gulf of Tehuantepec during wind forcing

Sergio Hernández-Trujillo, G. Esqueda-Escárcega, R. Pacheco-Chávez, A. Zárate-Villafranco and R. Avendaño-Ibarra
Seasonal abundance of *Acartia clausi* and *Paracalanus parvus* (*Copepoda:Calanoida*) in relation to hydrography in a subtropical lagoon of Mexico

Masahide Kaeriyama, R.R. Edpalina, R.V. Walker and K.W. Myers
Effects of long-term and temporal climate changes on the population dynamics and life history of Pacific salmon

Natalia V. Klovatch and O.F. Gritsenko
Self-regulation of Japan chum salmon abundance

Salvador E. Lluch-Cota, M.O. Nevárez-Martínez, D. Lluch-Belda, A. Parés-Sierra and D. Lluch-Cota
Towards and ecosystem status report for the Gulf of California

Juana López-Martínez, M.O. Nevárez Martínez, D.B. Lluch Cota, E. Herrera Valdivia and A.R. García
Effects of the interannual and long temporal variability, in the brown shrimp fishery in the Gulf of California, Mexico

Wieslaw Maslowski and Stephen R. Okkonen
The influence of mesoscale eddies on biophysical exchanges across the shelf break in the Aleutians and Bering Sea

Ludmila V. Milovskaya
The influence of climate changes on the ecosystem carrying capacity in Kuril Lake

Manuel O. Nevárez Martínez, G.I. Rivera Parra, E. Morales Bojórquez, J. López Martínez, D.B. Lluch Cota, E. Miranda Mier and C. Cervantes Valle
Effects of interannual environmental variability on the jumbo squid (*Dosidicus gigas*) fishery of the Gulf of California

Jun Nishioka, Shigenobu Takeda, Daisuke Tsumune, Takeshi Yoshimura, Isao Kudo, Kenshi Kuma and Atsushi Tsuda
Processes of iron limitation in the subarctic NW Pacific – higher particulate iron concentration than that in the subarctic NE Pacific

Takeshi Okunishi and Michio J. Kishi
A three dimensional ecosystem-physical model including sea ice effect in the Sea of Okhotsk

Olav M. Ormseth and Brenda L. Norcross
Interannual variability in the distribution of spawning Pacific cod in Alaska: The influence of ocean temperature

Chul Park and Chang Rae Lee
Variation in zooplankton assemblages in the Asan Bay, Korea, during the last decade

R. Ian Perry and Stewart M. (Skip) McKinnell
PICES North Pacific Ecosystem Status Report: An update

Vladimir M. Pishchalnik and A.V. Leonov
Modelling of processes of biotransformation of organogenic substances in the La Perouse (Soya) Strait

S. Lan Smith, Yasuhiro Yamanaka and Michio J. Kishi
A version of NEMURO including C, N and P cycles applied to Station ALOHA: Impact of the microbial loop on organic matter stoichiometries and carbon export

Yehui Tan
Assessing long-term changes in early summer zooplankton community construction of the Pearl River Estuary

Jia Wang and Meibing Jin
A 3-D coupled physical-biological model and its application to the spring plankton bloom of 1996 in Prince William Sound, Alaska

C.S. Wong, Liusen Xie and William Hsieh
Variations of nutrients and carbon due to regime shift in subarctic NE Pacific

Jie Zheng, Gordon H. Kruse, James D. Schumacher and Doug Woodby
Spatial and recruitment patterns of eastern Bering Sea crabs in relation to decadal oceanographic variability

Session S12 (TCODE)
Data systems to support technological advances in observation systems

Co-Convenors: Allen Macklin (U.S.A.), Igor I. Shevchenko (Russia) and Ling Tong (China)

Background

This session presented computer-based demonstrations of data systems that support technological advances in observing systems for marine scientific research. Electronic poster displays focused on innovative data acquisition systems, web pages, databases and tools for data analysis and visualization. The goal of this electronic poster session was to improve awareness of new data sources and systems that work with new technologies to advance scientific activities conducted by PICES researchers. This session was purposefully designed to accent the oral presentations and posters of the Science Board Symposium on *Technological advances in marine scientific research*.

Summary of presentations

The 16 presentations in this session fell into four broad categories: (i) collection, archival and service of information by electronic means; (ii) GIS (Geographic Information System) analysis; (iii) sampling and imaging; and (iv) prospective pan-Pacific observing systems.

Innovative techniques in wireless communication are enabling inexpensive telemetry of real-time coastal ocean data over large distances (Kim, Park, Ro). Such systems make it possible to distribute data to researchers

and data centers quickly. National data centers and research institutions continue to expand the amount of information served to the public and improve the interfaces used to access it (Jeong, Oguma, I. Rostov, V. Rostov). A good example is the Russian oceanographic atlas of the Bering Sea, Okhotsk Sea and Japan/East Sea, available on CD-ROM and through the web at http://www.pacificinfo.ru (I. Rostov). A new data rescue project for the western Pacific will identify, digitize, quality control, and serve to the public data that might otherwise be lost (Baba). Researchers having knowledge of data at risk should contact their respective national data centers.

GIS continues to be a valuable tool for organization, display and analysis of spatial data because of its ability to integrate data from various sources with common geographic characteristics (Golik, Merati, Moiseenko, Vance). The latest advances permit GIS access and manipulation of data through the web, and offer conversion techniques for ocean data in other formats to a GIS basis.

The session presented new methods for treatment of net samples and for underwater imaging of zooplankton (Gorsky). A non-destructive method for enumeration, measurement and identification of zooplankton from net samples allows scanning of historical or new collections. An Underwater Video Profiler is used for *in situ* image acquisition of macroplankton, especially of fragile forms frequently damaged using net sampling. Virtual holotyping of fragile organisms allows distribution of images to a larger number of experts for identification.

There is growing interest in collecting, archiving, and distributing ocean information for the complete North Pacific Ocean marine system. Such activities would promote understanding, detection and forecasting of climate change and resulting ecosystem regime shifts, and aid in analyses of ecosystem status. To that end, a North Pacific Data Buoy Advisory Panel (McLaren) was formed by PICES and the Data Buoy Cooperation Panel in the fall of 2001, and a call was issued for formal creation of a North Pacific component to the Global Ocean Observing System (Macklin). The presentation for the latter was cited as an excellent example of how marine scientific ideas can be presented to decision makers and the public. A North Pacific Ocean Observing System would contribute to and enhance PICES' ability to develop a North Pacific Ecosystem Status Report.

All electronic posters are published on the TCODE website (http://tcode.tinro.ru/tcodes12.html).

List of e-posters

Norio Baba
Global Oceanographic Data Archaeology and Rescue Project for WESTPAC

Andrew V. Golik and Vitaliy K. Fischenko
Development of Geographic Information System of Pacific Oceanological Institute for the northwestern Pacific based on Internet/Intranet

Gabriel Gorsky, Philippe Grosjean, Marc Picheral and Caroline Warembourg
New methods for treatment of net samples and for underwater imaging of zooplankton

Sung-Dae Kim, Ki-Cheon Jun, Dong-Young Lee and Soo-Young Park
An interactive www service of wave data produced by numerical models

S. Allen Macklin
Planning a North Pacific Ocean Observing System

Ron McLaren and Brian O'Donnell
The North Pacific Data Buoy Advisory Panel: An initiative of PICES and the Data Buoy Co-Operation Panel

Nazila Merati, Tiffany C. Vance, Jason Fabritz, Mick Spillane, Jon Callahan and Don Denbo
Integrating oceanographic data into GIS - working with both *in-situ* and gridded data

Georgiy Moiseenko
Monitoring of annual catch spatial distributions using GIS

Sachiko Oguma and Toru Suzuki
A construction of data inventory of CO_2-related data in the North Pacific

Kwang-Soon Park, Soo-Young Park, Sung-Dae Kim and Jong-Kook Lee
A real-time data service system using flash visualization and wireless Internet

Young Jae Ro, Yang Ho Choi and Cha Kyum Kim
Web-based real-time monitoring of water quality conditions in the Korean coastal waters

Igor D. Rostov, N.I. Rudykh and V.I. Rostov
Oceanographic atlas of the Bering Sea, Okhotsk Sea and Japan/East Sea: English version of CD-ROM

Tiffany C. Vance and Nazila Merati
Processing and visualization of oceanographic data in 2.5- and 3-D: Examples from the Bering Sea, Arctic and west coast of the United States

Hee Dong Jeong, Bok Kee Kim, Kyu Kui Jung and Seung Heo
Recent Improvements in the Oceanographic Data Base System of KODC (presented as poster)

Igor D. Rostov, V.I. Rostov, E.V. Dmitrieva and N.I. Rudykh
Development of a regional segment of the unified system of information on the World Ocean State (ESIMO) in Russia (presented as poster)

Vladimir I. Rostov, N.I. Rudykh and I.D. Rostov
Data base of archival observations of currents in the North Pacific (presented as poster)

MEQ Paper Session

Convenor: John E. Stein (U.S.A.)

Background

Papers were invited on all aspects of the effects of human activities on the quality of marine environment. The session focused on emerging chemicals of concern (endocrine disrupting chemicals), effects of dietary biotoxin on reproductive success of copepods, results of long-term biological monitoring, regional monitoring of sediment contamination, and review articles on technological advances in ecotoxicology, ecosystem-based management, integration of multiple ecological chemical techniques to relate health of individual organism to ecosystem status.

Summary of presentations

There were seven presentations in this session, and all were consistent with the theme of the session and the overall theme of PICES XI. The significant findings or major conclusions were as follows:

Analyses of water, surficial sediment, and sediment cores for an endocrine disrupting chemical, 4-nonylphenol were used to detect probable sources of this EDC in Korea (Li).

Monitoring of invertebrate species composition in the Seto Inland Sea, Japan, was used to detect improvements in marine environmental quality in the 1990s (Yuasa). This study further confirmed the value of long-term data sets in detecting alterations in the effects of human activities on the marine ecosystem.

Controlled laboratory studies were used to examine the effects of toxic phytoplankton on both the feeding rate and reproductive success of marine copepods of the South China Sea (Liu). Presence of biotoxin did not appear to

appreciably affect rate of ingestion of phytoplankton, however, there appeared to be a negative effect of biotoxin on number of eggs produced, and not on hatching success.

Monitoring of several classes of chemical contaminants in the southeastern Yellow Sea were used to determine spatial patterns in sediment contamination and to estimate flux to sediment (Yang). In general, the levels and estimated flux of contaminants in sediments of the southeastern Yellow Sea were relatively low compared to other marine regions.

Recent advances in biomedicine and advances on the horizon show promise in improving the ability to demonstrate that, for toxic chemical effects on mechanisms acting below the level of the individual, there can be consequences at the level of the population of marine fish species (Stein). These advances should increase the ability to better establish casaulity and generating quantitative data on fitness parameters that can then be incorporated in population models.

There is increasing interest in taking an ecosystem approach to coastal marine resource and habitat management, and in sustaining marine environmental quality. Therefore, operationally defining how to express large conceptual goals of ecosystem health in terms of indicators is an emerging issue. In Canada, efforts are underway to define large ocean management areas, relate conceptual goals to ecosystem endpoints, and then measures can be monitored and regulated through management programs (Jamieson).

Similar to advances in biomedicine, advances in analytical chemical techniques for trace elements in otoliths and stable isotopes and biochemicals in tissues are showing great promise in defining ecological interactions and linking individual animal health and habitat use to ecosystem conditions (Parrish).

List of papers

Oral presentations:

Zhengyan Li, Jong-Jeel Je, Donghao Li and Jae-Ryoung Oh
Contamination of alkylphenolic compounds in Shihwa Lake, Korea

Ichiro Yuasa
Long-term changes of coastal fauna and the monitoring techniques of index for coastal fauna in the Seto Inland Sea, Japan

Sheng Liu and W.-X. Wang
Feeding and reproductive responses of marine copepods in South China Sea to toxic and nontoxic phytoplankton

Dong Beom Yang, Jun Yu, Kyung Tae Kim, Chang Soo Chung, Young Il Kim and Gi-Hoon Hong
PAHs, PCBs and organochlorine pesticides in the bottom sediments of the southeastern Yellow Sea. Results of observation made in 1999-2000

John E. Stein
Recent technological advances to answer old ecotoxicology questions

Glen Jamieson, Brenda Bauer and Herb Vandermeulen
Ecosystem-based management as part of a Marine Environmental Quality (MEQ) approach in the Central Coast, British Columbia, Canada

Julia K. Parrish
Tracing the path: Contaminants, elements and metabolites

Posters:

Anastasia S. Chernova, T. Lishavskaya, A. Moshchenko and T. Konovalova
Effect of physical and chemical properties of the bottom sediments on distribution of petroleum hydrocarbons, phenols and detergents contained in sediments of the northeastern shelf and in a number of other coastal water areas of Sakhalin Island

Ludmila S. Dolmatova, A.L. Kovaleva, O.A. Shitkova and N.F. Timchenko
Generaton of reactive oxygen species by the coelomocytes of the holothurian eupentacta fraudatrix in response to bacterial toxin

POC Paper Session

Convenor: Kuh Kim (Korea)

Background

Contributed papers on bays of China and Sakhalin, the Japan/East Sea, the Okhotsk Sea, and the North Pacific Ocean were presented.

Summary of presentations

Examination of the water exchange time for the passive, conservative matter between the Jianzhou Bay and the Yellow Sea, adopting the concept of the half-life time for a box model and an Eulerian model, allows the estimation of the self-purification of water (Liu).

The air temperature along the east coast of Korea is affected by the East Korea Warm Current (Choi). Comparison of hydrochemical properties taken in summer of 1999, and late winter of 2000, in the Japan/East Sea revealed that the convective mixing in winter extends several hundred meters deep. The northern region is a source of carbon dioxide and the southern region is a sink (Tishchenko). Also analysis of historical data suggests a possibility that the Japan/East Sea Intermediate Water may originate from the East China Sea, flowing through the Korea Strait in summer (Watanabe). Direct measurements show a warm current west of Hokkaido, whose transport about 1.2 Sv for the baroclinic and 1.5 Sv for the barotropic part (Nakata). Satellite SAR images from ERS-1 and ERS-2 show eddies in the subpolar zone, upwelling along the Primorye coast, packets of internal waves and ice eddies in the Japan/East Sea (Mitnik). Data assimilation of the circulation model with data from profiling floats in the East Sea opens a challenging opportunity (Eung Kim).

Several papers describe a variety of ocean conditions in the northwestern Pacific Ocean and the northern Bering Sea. Observation of the maximum in winter and the minimum in summer in the absolute transport of Oyashio suggests intensification due to the atmosphere in winter (Kusaka). Decadal changes in dissolved inorganic carbon at station KNOT show trends consistent with those previously calculated by others (Wakita). The changes in dissolved oxygen content in subarctic intermediate water is due to fresh water and decreased ventilation in the Bering Sea (Andreev). Current and water property off southern Sakhalin are described with particular attention to two eddies, one of which was inertially driven, in Aniva Bay. Eddies in the Kamchatka Current are presented with surprisingly large estimates of the mass transport in both the eddies and the current itself (Shevchenko). A summary of techniques and preliminary estimates of transport through Bering Strait using Topex-Poseidon satellite altimetry are also presented (Crawford).

The fact that each paper generated several questions is an indication of continuing interest in physical oceanographic phenomena in the PICES region.

List of papers

Oral presentations:

Zhe Liu, Hao Wei, Guangshan Liu and Jing Zhang
Simulation of water exchange time in Jiaozhou Bay with the half-life time concept

Hyo Choi
Modification of air and sea temperatures in the coastal seas of the path of the East Korea Warm Current

Pavel Ya Tishchenko, L.D. Talley, V.B. Lobanov, V.A. Luchin, A.P. Nedashkovskj, S.G. Sagalaev, R.V. Chichkin, E.M. Shkirnikova, I.A. Zhabin, V.I. Ponomarev, D. Masten, D.-J. Kang and K.-R. Kim
Seasonal variability of hydrochemical properties of the Japan/East Sea

Tatsuro Watanabe and Norinobu Ota
A possible origin of Japan Sea intermediate water

Akifumi Nakata, Mayumi Sawada, Tomomi Watanabe, Hideo Yoshida and Iori Tanaka
Direct current measurements of the Tsushima Warm Current at the west of Hokkaido in the North Japan Sea

Eung Kim and Young Jae Ro
New opportunity for data assimilation in the circulation model in the East Sea with Argo float data

Akira Kusaka, Shin-ichi Ito, Kazuyuki Uehara and Yasuhiro Kawasaki
Seasonal variability of Oyashio velocity and volume transport, southeast of Hokkaido, Japan

Masahide Wakita, Shuichi Watanabe, Nobuo Tsushima, Tsuneo Ono, Yutaka W. Watanabe and Shizuo Tsunogai
Temporal change in dissolved inorganic carbon content in the western North Pacific water

Andrey G. Andreev
Temporal changes in dissolved oxygen of the intermediate water in the subarctic North Pacific

George V. Shevchenko, Gennady Kantakov and Valery Chastikov
Measurements of currents and water parameters in Aniva Bay, southern Sakhalin

Leonid Mitnik and Vyacheslav Dubina
Satellite SAR characterization of oceanic dynamic features in the Japan/East Sea

Konstantin A. Rogachev, Eddy C. Carmack and Igor Gorin
Mass and freshwater transport by mesoscale eddies in the Kamchatka Current

William R. Crawford and Josef Cherniawsky
Observations of sea level anomalies in Bering Strait and surrounding seas using satellite altimetry observations

Posters:

Tatyana Bogdanovskaya
Multi-year variability of AAC midpoint intensity and movement for the Asian Pacific region

Liqi Chen, Zhongyong Gao and Weiqiang Wang
Air-Sea Fluxes of CO_2 in the Polar Ocean

Hyo Choi
Effects of atmospheric circulation and sea surface temperature on sea fog formation

Mikhail A. Danchenkov
Subarctic gyre in the Japan Sea and stationary eddy in its eastern part

Vyatcheslav G. Makarov and Valentina D. Budaeva
Application of piecewise curve-fitting technique for reconstruction of the density CTD profiles near northeastern Sakhalin coast

Leonid Mitnik and Vyacheslav Dubina
Internal waves around Sakhalin: Preliminary mapping with ERS SAR

Valentina V. Moroz
Hydrological conditions of the Kuril Island zone and adjacent areas

Eugene V. Samko and V.M. Petruk
The characteristic of the Okhotsk Sea water dynamics near the western Kamchatka coast in 1996-2001

Igor A. Zhigalov, V.A. Luchin and V.V. Plotnikov
Estimation of the seasonal and interannual variability of the water temperature in the Okhotsk Sea

Igor A. Zhigalov and Vladimir A. Luchin
Classification of the thermal conditions of the bottom waters on the western Kamchatka shelf

Workshop W1 (MONITOR)
Requirements and methods for "early detection of ocean changes"

Co-Convenors: David L. Mackas (Canada) and Sei-ichi Saitoh (Japan)

Background

The goal of ocean monitoring is to provide an ongoing and reliable network of observations to detect and quantify changes in the physical, geochemical, and/or ecological "state of the ocean". From a relatively limited set of paleoceanographic and observational time-series, we now know that such changes occur, and that at least some of them are significant to climate and ecological interactions, and also to human populations. However, there has often been a time lag between the onset of ocean change, and human recognition of, and response to, these changes. In practice, there is sometimes an enforced trade-off between the local intensity of sampling efforts, and their spatial extent and temporal duration. This workshop addressed questions such as: (i) How can we best design our monitoring programs to reduce the time lag between event and detection? (ii) What are the relative costs of false alarms vs. missed detections? and (iii) How can we make our monitoring programs robust to new modes of change?

Summary of presentations

Seven papers were presented, ranging from design criteria and statistical methodologies (Overland, Radchenko, Batten) through excellent examples of long- and short-term time series sampling of both open ocean (Sugimoto) and continental margin/coastal sea systems (Wen, Oozeki, Suh). The presentations were followed by a wide-ranging group discussion (details can be found in the report of the MONITOR Task Team).

List of papers

James E. Overland
Formal and conceptual approaches to change detection

Vladimir I. Radchenko
What tools do integrated ecosystem studies give for the changes detection

Takashige Sugimoto, K. Tadokoro, P. Mishra and E. Sawabe
Use of intake water for monitoring zooplankton biomass and dominant species in the subarctic Pacific

Sonia D. Batten and Warren S. Wooster
Zooplankton detection of environmental change

Quan Wen
Marine environmental monitoring in the People's Republic of China - Status and trends

Yoshioki Oozeki, Kaoru Nakata and Tomowo Watanabe
New monitoring program for detecting global warming in the ocean around Japan

Young Sang Suh, Lee-Hyun Jang, Na-Kyung Lee and Bok-Kee Kim
Detection of low salinity water in the northern East China Sea in summer using ocean color remote sensing

Workshop W2 (MONITOR)
Monitoring from moored and drifting buoys

Co-Convenors: David L. Mackas (Canada) and Sei-ichi Saitoh (Japan)

Background

There is an increasing demand for systematic monitoring of the ocean. At the same time, the costs of conventional manned research vessels continue to rise. Fleets and their operating calendars are shrinking in many countries. One possible remedy to this resource crunch is increased utilization of unmanned moored and drifting buoys as observation platforms. This workshop discussed present and future opportunities and constraints in areas such as: (i) diversity, sensitivity, and long-term reliability of sensors, (ii) on-board data processing, (iii) power requirements and sources, (iv) long range data telemetry, and (v) "smart" sampling platforms.

Summary of presentations

Presentations included an overview of time-series network (Dickey), Argo buoy operations (Ando, Riser), real-time buoy system (Nam), conventional moored buoy observation (Shevchenko), bio-optical drifting buoy and satellite validation buoy development (Iida, Saino), and recent activities of the North Pacific Data Buoy Advisory Panel (O'Donnell, McLaren). The presentations were followed by a wide-ranging group discussion (details can be found in the report of the MONITOR Task Team).

List of papers

Tommy D. Dickey
Toward the development of a global interdisciplinary time-series network

Kentaro Ando, Yoshifumi Kuroda, Hideaki Hase, Shinya Minato, Keisuke Mizuno, Taiyo Kobayashi, Nobuyuki Shikama and Kensuke Takeuchi
Current status of the triton buoy project and the JAMSTEC Argo project

Stephen C. Riser
Monitoring the global ocean using profiling floats

SungHyun Nam, Ki-Wan Kim, Hyung-Rok Kim, Chang-Bong Cho, Sang Jin Lyu, Young-Gyu Kim and Kuh Kim
Development of ESROB (East Sea Real-time Ocean Buoy)

Takahiro Iida, Sei-chi Saitoh and Kohei Mizobata
Phytoplankton distribution as observed from bio-optical drifter and SeaWiFS images in the Bering Sea green belt

George V. Shevchenko and Gennady Kantakov
Monitoring of currents on the southwestern shelf of Sakhalin Island

Toshiro Saino
A profiling buoy system for real time monitoring of the ocean primary productivity

Ron McLaren and Brian O'Donnell
The North Pacific Data Buoy Advisory Panel: An initiative of PICES and The Data Buoy Co-operation Panel

Workshop W3 (PICES/GLOBEC)
GLOBEC data management: Exchange, inventory and archival of GLOBEC data

Co-Convenors: Igor I. Shevchenko (PICES TCODE) and Hester Willson (GLOBEC IPO)

Background

This workshop discussed the goals and objectives of GLOBEC data management and reviewed status of GLOBEC data inventories in PICES countries, and role of the GLOBEC International Project Office, national GLOBEC Committees and PICES Technical Committee on Data Exchange in this effort. The workshop developed an Action Plan for PICES participation in GLOBEC data management.

Summary of presentations and discussion

The PICES/GLOBEC Data Management Workshop was held on October 19, 2002, as part of PICES XI. The workshop was attended by 28 people from Canada, Denmark, Japan, Korea, the People's Republic of China, United Kingdom, Ukraine, and U.S.A. The convenors were pleased with the number of attendees, an indication that Data Management is being recognized as an essential part of successful science.

11 short presentations were given, followed by an afternoon of discussion. Hester Willson opened the session with a presentation on GLOBEC Data Management, describing both the achievements and problems of managing GLOBEC data.

Phil Williamson was invited to give a talk on Data Management for UK GLOBEC and the Marine Productivity Thematic Programme as an example of the best practice in National Data Management. Research leaders for UK GLOBEC projects are encouraged to provide basic information, via DIF entries, to the GLOBEC IPO. The British Oceanographic Data Centre (BODC), hosted by the NERC Proudman Oceanographic Laboratory, interacts with Marine Productivity in the following ways: close involvement in fieldwork planning, formulation of data policy and protocols, and other aspects of programme development, working with the Steering Committee and individual scientists, maintaining a data-tracking system and assembling data into an integrated database, checking on data quality and supporting documentation, providing information services, supervising data access arrangements and publishing data collations, for users within and outside the programme. There has been good progress to date in the transfer to BODC of datasets collected on Marine Productivity research cruises in the northern North Atlantic. For example: 45% completion for Discovery 258 (Nov-Dec 2001), and 26% completion for Discovery 262 (April-May 2002).

Todd O'Brien of the Ocean Climate Laboratory described the World Plankton Database and suggested how it could be used successfully to archive GLOBEC data. OCL has built an archive of globally distributed historical plankton measurements and associated metadata. As part of the *World Ocean Database*, these plankton data are stored with all available co-located temperature, salinity, nutrient, and chlorophyll data. The *World Ocean Database 2001* contains over 2.1 million globally-

distributed Ocean Station Data (OSD) casts, sampled from the early 1800s to the present.

Dr. Sergey Piontkovksi focused on the potential of archived data and described the international efforts of scientists from Ukraine, Russia, UK, Kazakhstan, Azerbaijan and the Netherlands to develop an oceanographic database for the Indian Ocean, the Atlantic Ocean and its enclosed seas (the Mediterranean Sea, the Caspian Sea and the Aral Sea) using data from the Former Soviet Union. The databases incorporate data on taxonomy, biogeography and environmental characteristics of pelagic communities and are linked to a database management system. This product will be available on CD-ROM from April 2003.

The coffee break was followed by presentations on the status of GLOBEC Data Management in PICES countries. Robin Brown gave a presentation on the Canadian GLOBEC metadata inventory for the North Pacific, Igor Shevchenko talked about the metadata inventory of biological data collected by Russian Fisheries Research Institutes, Elena Dulepova described the data collected and the databases at TINRO Center for the North Pacific. Robert Groman was the last of the scheduled talks with a presentation on US GLOBEC Data Management. The group was also fortunate to receive talks from Toru Suzuki on archives of plankton datasets in Japan, from Sung-Dae Kim and Xianshi Jin on Korea and China GLOBEC Data Management, respectively. These excellent presentations set the scene for the lively discussion session that followed in the afternoon.

The discussion session was very productive with several interesting ideas being voiced and actions to be undertaken discussed. The discussion was divided into 3 sections: 1) GLOBEC Data Management and Data Management issues/problems; 2) roles and responsibilities of those involved in Data Management: the GLOBEC Data Manager, PICES TCODE, GLOBEC National and Regional Representatives and the GLOBEC Data Management Task Team; and 3) development of an action strategy and a Workplan. A full report of the meeting will be available at the PICES TCODE (http://tcode.tinro.ru/) and the GLOBEC (www.globec.org) websites.

A key issue to come out of the discussions was that Data Management must be USER driven. Scientists must decide what products they would like to see produced by GLOBEC International Project Office and other data managers. The main points that resulted from the discussion were:

1. It is critical that the GLOBEC metadata inventory is as comprehensive as possible. Collation of datasets will be important for GLOBEC Synthesis to be successful, and comprehensive metadata is the starting point of identification of datasets.
2. Flexibility is a key issue in data submission. The Ocean Climate Laboratory World Ocean Plankton database will take data in any format, including Excel spreadsheets and simple columns of data.
3. Data Managers need to offer incentives to encourage scientists to submit data/ metadata. For example, good software, good tools to extract data, good tools to view/visualize data and more data for people to work with.
4. A liaison system between National Data Centres (NDC) and scientists increases the amount of data submitted. Where this system was stopped due to funding restrictions a negative impact on data submission to NDC's has been seen.
5. Biologists are generally much more reluctant and slower to submit both data and metadata than physicists and chemists. This is due to the long time necessary for analysis of biological samples. This high level of individual investment in the data increases the proprietorial feeling of the scientist toward the data.
6. Scientists are concerned that others will use their data without their consent and before they have had a chance to publish. At present there is no enforceable system in place to prevent this from happening.
7. The value of a dataset is increased the more people use the dataset. Multiple-author papers are becoming more common,

especially as funding agencies are increasingly focused on multi-disciplinary science. Steps must be taken to increase the confidence of biologists in sharing their data so that the full benefits of multi-disciplinary studies can be realized.

The group recommended that the following proposals be considered:

1. Funding Agencies should take a firmer line with those scientists who do not submit data to National Data Centres in accordance with funding requirements.
2. Submitting a dataset should carry a similar credit to publishing a paper with funding agencies/employers.
3. A system should be developed to give credit to individuals whose data is used in publications. When a paper is published, the metadata entry identifier and database should be cited.
4. The longer timescale needed by biologists (in comparison to physicists and chemists) to submit their data should not be used as an excuse for not submitting data within a reasonable timescale.
5. Scientists should 'claim' their data officially by writing metadata entries. Increased visibility of the dataset would increase awareness of those who were not following dataset-sharing etiquette. By submitting metadata, the scientist would notify the community of the dataset's existence but would be allowed time to work on the dataset and publish before sharing.
6. Steps must be taken to increase the confidence of biologists in sharing their data so that the full benefits of multi-disciplinary studies can be utilized.
7. Each GLOBEC National programme should be encouraged to produce a CD-ROM of data collected in their projects.

List of papers

Hester Willson
GLOBEC Data Management

Phil Williamson and Gwenaëlle Moncoiffé
Data management for UK GLOBEC and the marine productivity thematic

Todd D. O'Brien
Expansion and quality control of a global plankton database

Sergey Piontkovski
Potential of archived data

Robin M. Brown and Stephen J. Romaine
Canadian GLOBEC metadata inventory for the North Pacific

Igor I. Shevchenko, Victoria Khan, Lilia Miromanova and Georgiy Moiseenko
Metadata inventory of biological data collected by Russian Fisheries Research Institutes

Elena P. Dulepova, Igor Volvenko, Anatoly F. Volkov, Valery I. Chuchukalo and Victor A. Nadtochy
Data collected and databases at TINRO Center for the North Pacific (zooplankton, nekton, zoobenthos, trophic levels bioproductivity databases for the North Pacific

Robert C. Groman
US GLOBEC data management

Toru Suzuki and Sachiko Oguma
Archives of Plankton dataset in Japan

Kim Sung Dae
Korea GLOBEC Data Management

Xianshi Jin
GLOBEC Data Management and Exchange in China

Workshop W4 (PICES/CLIVAR)
Climate variability in the Pacific and its impact on the marine ecosystem

Co-Convenors: Kimio Hanawa (PICES) and Kelvin Richards (CLIVAR)

Background

The Pacific sector is influential in a wide range of climate phenomena on interannual to decadal timescales. Climatic variations in both the atmosphere and ocean affect primary productivity and higher trophic levels of the marine ecosystem, and the cycling of important biogeochemical constituents such as carbon. Improved understanding of the physics of these climatic phenomena and their predictability is the remit of the WCRP's CLIVAR project. PICES is concerned with the marine ecosystem from physical forcing to primary production, biochemical cycles and fisheries in the North Pacific Ocean. The purpose of this joint PICES/CLIVAR workshop was to bring together these two scientific communities.

The workshop explored our present understanding of the climate phenomena in the PICES area and their links to the ecosystems of the region. The hoped-for outcome was the identification of ways in which collaboration between CLIVAR and PICES can further our understanding and aid the implementation of observational and modelling activities in the PICES area and over the wider Pacific.

Funding for invited speakers came from WCRP, NSF, NOAA, NASA and PICES. We are grateful to these organizations for their support.

Summary of presentations and discussion

The workshop was held over one day. The subject matter attracted a large audience. A number of keynote speakers were invited to give overviews on particular topics related to climate variability and changes to the biological and chemical marine system. In order to give speakers enough time to elaborate on their theme each speaker was allotted 30 minutes. A series of shorter presentations were also given to further extend the topics under discussion. A list of speakers is given at the end of this report. Without diminishing the contribution by other speakers this report will focus on the keynote talks.

The morning was spent primarily on the physical aspects of climate variability. An excellent overview of what we know about seasonal to decadal variability of the physical environment was given by Stephen Riser. Over the last few decades our knowledge of how the ocean is changing on decadal timescales has increased remarkably. However, there is still much to be learnt about what causes the observed changes. Providing a good estimate of the state of the ocean was the topic of the talks by Neville Smith and Tony Lee. Dr. Smith gave an update on the progress of GODAE, a programme designed to provide an ocean prediction system for the global ocean. Progress towards this goal has been better than expected, and the programme will move shortly to its operational demonstration phase. Dr. Lee talked about constraining ocean models with data, and the ECCO programme designed to provide a near operational tool to understand climate variability of the ocean. Again results to date are encouraging but point to the need for ways of estimating the impact of model deficiencies in model solutions. The progress achieved in climate research is in no small part due to the massive increase in computer power over the last few decades. Akimasa Sumi reported on Japan's latest effort to increase the computing power available for climate research still further. The Earth Simulator is the result. Plans are to run a high resolution coupled atmosphere/ocean model for O (1,000yrs) and have the capacity to run the model several times allowing numerical experimentation.

The afternoon talks were devoted to biogeochemical cycles and the marine ecosystem. The problem of distinguishing anthropogenic CO_2 from that occurring naturally makes it difficult to not only provide estimates of the ocean's uptake of CO_2 since the industrial

revolution, but also to study naturally occurring changes to that uptake caused by changes to variations in the atmosphere/ocean system. Christopher Sabine discussed the methodologies of estimating anthropogenic CO_2 in the ocean and the most recent estimates. We now have a global estimate of anthropogenic CO_2 distributions based on high-quality WOCE, JGOFS and OACES data. He also described the Global Carbon Project which is designed to coordinate and synthesise global carbon observations. The most direct impact on the marine ecosystem of a variable climate is through primary production. Daniela Turk described a multi-sensor approach to monitor the inter-annual variations of production applied to the equatorial Pacific. Ways of extending this approach to higher latitudes were discussed. Arthur Miller concentrated on the organized basin-scale patterns of variability observed in the Pacific and how these may relate to the response of the ecosystem. Zooplankton are often quoted as being key indicators of climate change because of their reliance on food supply and transport by ocean currents. This was clearly shown by David Mackas for zooplankton communities along the NE Pacific continental margin. Records going back to the 1970's show regime shifts in population abundance and community structure. Richard Beamish highlighted that only relatively recently did scientists accept the fact that climate variability also impacts upon higher predators and fisheries. Variations in pink salmon stocks, for instance, can quickly shift to a new regime following changes in the physical environment. He concluded by remarking that climate variability needs to be taken into account in the management of fisheries.

The talks during the day sparked off a lot of discussion. However, because of the structure of the programme, there was little time left for a formal discussion period. Most people were also exhausted after such a long and stimulating day. Nevertheless, one of the overriding impressions to come out of the workshop was the need for a more mechanistic approach to establishing the casual links between variations in the Earth's climate and the marine ecosystem. Most studies to date, with a few notable exceptions, rely on statistical correlations between climate indices and abundances of species. CLIVAR is committed to establishing the mechanisms of climate variability and change. It is timely to apply a similar approach to the impact of climate variability on marine biology and chemistry.

The convenors hope this workshop is the first step to establish a strategic consortium between the PICES and CLIVAR communities in the future. To this end, at the POC Committee meeting following the workshop it was agreed to hold a further session on a joint CLIVAR/PICES theme at PICES XIII (2004) in Honolulu, focusing on the mechanisms of climate-induced decadal variability of the marine ecosystem. Such a session needs careful planning and it would be useful to hold discussion at PICES XII in preparation for the session.

One final comment, a workshop held within one day can be a tiring affair. The PICES Science Board might consider splitting a session, and particularly workshop, by starting in the afternoon of one day and finishing mid-day the next. In that way people have the opportunity to discuss the science in the evening and formulate their ideas for general discussion before starting afresh in the morning.

List of keynote papers

Stephen C. Riser
Seasonal to decadal variability of the North Pacific Ocean

Neville R. Smith
Ocean state estimation for the Pacific

Tony Lee
Ocean state estimation for climate studies

Akimasa Sumi
Model developments in the era of the Earth Simulator

Christopher L. Sabine, Richard A. Feely, Robert M. Key, Ben McNeil, Kitack Lee and Niki Gruber
Estimates of anthropogenic CO_2 uptake in the Pacific Ocean: A comparison of three methods

Daniela Turk
Interannual variability of biological production in the Pacific

Arthur J. Miller
Decadal variability in the Pacific and its effects on the marine ecosystems

David L. Mackas and William T. Peterson
Interannual to decadal variability of zooplankton communities along the continental margin of the northeastern Pacific

Richard J. Beamish
Climate and fisheries

List of shorter contributions

Kelvin Richards
CLIVAR in the Pacific Ocean

Shoshiro Minobe
A review of decadal variability over the North Pacific and some ideas for further studies

James E. Overland
Atmospheric connections across ecosystems

Masao Fukasawa
Some "operational" field plans in the Pacific

Humio Mitsudera, K. Levedev, M. Yaremchuk, I. Nakano and G. Yuan
Monitoring Kuroshio Extension through dynamically constrained synthesis of the acoustic tomography, altimetry and in situ data

Ichiro Yasuda, Emiri Takeuchi and Masayuki Noto
Variability of the mixed layer in the North Pacific Transition area and its relation to biological productivity and Japanese sardine

Toshiro Saino
Effects of climate variation on lower trophic level ocean environment in the western North Pacific

Yasunori Sakurai, Jun Yamamoto, Hideaki Kidokoro and Ken Mori
How the winter wind stress might effect the stock size of Japanese common squid (*Todarodes pacificus*)

Workshop W5 (CKJORC/PICES)
Regional cooperation for the conservation and management of the marine environment and resources in the Yellow Sea

Co-Convenors: Dong-Young Lee (CKJORC) and Stewart (Skip) M. McKinnell (PICES)

Background

The China-Korea Joint Ocean Research Center (CKJORC) hosted a workshop at PICES XI to consider the present status of international cooperation and research in conserving and managing the living marine resources of the Yellow Sea and their environment. Topics included the availability of necessary technologies and suggestions for new areas of bilateral and regional cooperation. The goal of the workshop was to provide a forum for

exchange of ideas among scientists. The workshop consisted of several invited speakers followed by a stimulating panel discussion.

Summary of presentations

The success of the PICES/CREAMS workshop on the Japan/East Sea (Seoul, August 2002) is an example that might be applied to the Yellow Sea. Topics of interest and relevance include the increasing use of satellite data for monitoring SST, turbidity and ocean colour, and the need to integrate observations in modeling and data assimilation techniques. Regional issues involve: environmental protection, disasters, fisheries and bioresources, and development and megaprojects in coastal areas. The region is interesting for oceanographers because of the shallow marginal sea. Scientists are concerned about inadequate funding for real-time operational and research programs, and the PICES approach to developing regional studies can be an appropriate way to proceed. CKJORC has initiated some cooperation plans to establish YOOS (Yellow Sea Ocean Observing System). The interests and issues in the Yellow Sea are somewhat similar to those being considered in NEAR-GOOS.

List of papers

Yu Zhong Liu
Present status and future plans for the ocean observing system in China for the Yellow Sea

Hee-Dong Jeong
Overview of the long-term oceanographic survey in the North East Asia Regional Seas and discussion of future improvements

Chang S. Kim
How can we establish an operational marine environment and ecosystem prediction system for the Yellow Sea through China-Korea cooperation?

Fangli Qiao
Research activities in the marine environment and ecosystem modeling in China

Dong-Young Lee
Regional cooperation to improve the ocean observing system in the Yellow Sea

Stewart (Skip) M. McKinnell
PICES North Pacific Ecosystem Status Report and regional cooperation

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LIST OF ACRONYMS

ACCEO	Alliance for California Current Ecosystem Observations
ACIA	Arctic Climate Impact Assessment Program (ACIAP of AMAP)
ADCP	Acoustic Doppler Current Profiler
AFSCAR	American Fisheries Society Program on Climate and Aquatic Resources
AGU	American Geophysical Union
AMAP	Arctic Monitoring and Assessment Program
APEC	Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fisheries Commission
Argo	International Program for deployment of profiling floats
ASLO	American Society of Limnology and Oceanography
BAHC	Biospheric Aspects of the Hydrological Cycle
BASIS	Bering-Aleutian Salmon International Survey
BASS (TT)	Basin Studies (Task Team), PICES
BIO	Biological Oceanography Committee, PICES
BODC	British Oceanographic Data Centre
CACGP	Commission on Atmospheric Chemistry and Global Pollution
CAOS	Coastal Alaskan Observing System
CBSG	Capacity Building Study Group
CCCC	Climate Change and Carrying Capacity Program, PICES
CDIAC	Carbon Dioxide Information and Analysis Center
CEOHAB	Chinese National Harmful Algal Bloom Program
CIBNOR	Centro de Investigaciones Biologicas del Noroeste, Mexico
CICESE	Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Mexico
CICIMAR	Centro Interdisciplinario de Ciencias Marinas, Mexico
CKJORC	China-Korea Joint Ocean Recearch Center
CLIVAR	Climate Variability and Predictability Program
CODAR	COastal raDAR
CoML	Census of Marine Life Program
CPR	Continuous Plankton Recorder Program
CREAMS	Circulation Research of the East Asian Marginal Seas Program
CSIRO	Commonwealth Scientific and Industrial Research
DBCP	Data Buoy Cooperation Panel
DIS	Data and Information Service (IGBP-DIS)
DIVERSITAS	International Programme of Biodiversity Science
DMS	Data Management System
EASEC	East Asian Eel Committee
EBM	Ecosystem-Based Management
EC/IP	Executive Committee / Implementation Panel for CCCC
ECCO	Estimating the Circulation and Climate of the Ocean
ECOHAB	Ecology and Oceanography of Harmful Algal Blooms Program
ECOR	Engineering Committee on Oceanic Resources
EDC	Endocrine Disrupting Chemicals
ENSO	El Niño-Southern Oscillation
EPOC	Eastern Pacific Ocean Conference
EVOS	Exxon Valdez Oilspill Trustee Council

FAO	Food and Agriculture Organization
FGDC	Federal Geographic Data Committee
FIS	Fishery Science Committee, PICES
GAIM	Global Analysis, Interpretation and Modelling
GCM	General Circulation Model
GCOS	Global Climate Observing System
GCTE	Global Change and Terrestrial Ecosystems
GEC	Global Environmental Change
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
GIS	Geographical Information Systems
GLOBEC	Global Ocean Ecosystem Dynamics Programme
GLODAP	Global Ocean Data Analysis Project
GODAE	Global Ocean Data Assimilation Experiment
GOOS	Global Ocean Observing System
HAB	Harmful Algal Blooms
HAE-DAT	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	PICES Advisory Panel on Iron Fertilization Experiment
IGAC	International Global Atmospheric Chemistry Project
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
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
IRI	International Research Institute for Climate Prediction, Columbia University
IWC	International Whaling Commission
JAMSTEC	Japan Marine Science & Technology Center
JECSS	Japan (East) and East China Seas Study
JGOFS	Joint Global Ocean Flux Study (IGPB)
JMA	Japan Meteorological Agency
JODC	Japanese Oceanographic Data Center
KORDI	Korea Ocean Research and Development Institute
LOICZ	Land-Ocean Interactions in the Coastal Zone

LTL	Lower Trophic Level
LUCC	Land-Use/Cover Change
MBMAP	PICES Advisory Panel on Marine Birds and Mammals
MEDS	Marine Environmental Data Service
MEQ	Marine Environmental Committee, PICES
MIRC	Marine Information Research Center
MODEL (TT)	Conceptual / Theoretical and Modeling Studies (Task Team), PICES
MONITOR (TT)	Monitor (Task Team), PICES
MRC	Marine Resources Conservation
MSC	Meteorological Service of Canada
NAFO	North Atlantic Fisheries Organization
NaGISA	Natural Geography of Inshore Areas
NASCO	North Atlantic Salmon Conservation Organization
NASA	National Aeronautics and Space Administration
NDC	National Data Centre
NEAR-GOOS	North East Asian Regional GOOS
NEMURO	North Pacific Ecosystem Model for Understanding Regional Oceanography
NERC	Natural Environment Research Council
NEXT	NEMURO Experimental Planning Team
NFRDI	National Fisheries Research and Development Institute
NIES	National Institute for Environmental Studies, Japan
NMISS	National Marine Information and Service System
NMFS	National Marine Fisheries Service
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
NPDBAP	North Pacific Data Buoy Advisory Panel
NPESR	North Pacific Ecosystem Status Report
NPRB	North Pacific Research Board
NSF	National Science Foundation, U.S.A.
NWFSC	North West Fisheries Science Center
OACES	Ocean Atmosphere Carbon Dioxide Exchange Study
OBIS	Ocean Biogeographic Information System
OCEANS	Ocean Biogeochemistry and Ecosystems Analysis Program
ORHAB	Olympic Region Harmful Algal Bloom project
PAGES	Past Global Changes
PAMS	Pacific Asian Marginal Seas
PICES	North Pacific Marine Science Organization
PICNIC	PICES Carbon Dioxide Related Data Integration for the North Pacific
PMEL	Pacific Marine Environmental Laboratory
POC	Physical Oceanography and Climate Committee, PICES
PORSEC	Pacific Ocean Remote Sensing Conference
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
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
TOGA	Tropical Ocean Global Array
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WCRP	World Climate Research Program
WESTPAC	Sub-Committee for the Western Pacific Intergovernmental Oceanographic Commission
WG	Working Group
WGZE	Working Group on Zooplankton Ecology, ICES
WHOI	Woods Hole Oceanographic Institute
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
WSSD	World Summit on Sustainable Development
YOOC	Yellow Sea Ocean Observing System