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REPORT OF OPENING SESSION

The Opening Session was called to order at 8:30 am on of October 11th. The Chairman, Dr. Hyung-Tack Huh, who welcomed delegates, observers and researchers to the Eighth Annual Meeting. Dr. Huh called upon Vice-Governor Vladimir A. Stegny to welcome participants on behalf of the Government of the Prymorye Region.

Dear Mr. Chairman, Executive Secretary, distinguished delegates, members of the Secretariat and Local Organizing Committee, participants, observers, ladies and gentlemen:

It is the first time that Russia is hosting an annual meeting of the North Pacific Marine Science Organization. The City of Vladivostok, the Primorski Krai capital, is the venue of the Eighth Annual Meeting. On behalf of the Russian Far East, let me welcome you to the Pacific Russia.

It is a great honor for Vladivostok and the entire Primorski Krai to host the Eighth Annual Meeting attended by such a large number of participants from the scientific communities of the Pacific Rim countries.

Fisheries and marine transport are by far the most important sectors of the Russian Far East economy. Work at sea creates jobs, thus providing for considerable employment for the population. The Far East fisheries account for more than 70% of Russian catches. The maximum catch was observed in 1988, which could be explained by a very high abundance of two particular species - pollock and sardine. In 1993-94 the catch was at its minimum. That was due to the sardine disappearance in the Russian waters and to the pollock population drop. These two species alone - pollock and sardine - in the years of their maximal abundance, accounted for 66% and 17% of the catch in the Russian Far East respectively. Only two species predominance in the catches makes Far East fishery very vulnerable, and as a result the responsibility of scientists increase. Also of paramount importance is research of both ecosystems and the prediction of environmental long term changes.

The changes occurring in the resource structure of the fishery cannot but strongly influence the conditions of fisheries management. First and foremost, these changes depend on the environment, and joint scientific efforts in the area of marine studies are difficult to overestimate. In this respect PICES is a unique international organization of scientists with unprecedented capabilities to accumulate scientific knowledge in the largest range of events observed in the Pacific, and the results of anthropogenic pressure on the marine environment.

I would like to emphasize the following: PICES is represented by both the governments and scientific organizations of the Pacific Rim countries with very different levels of ethnic, cultural and economic backgrounds. This last factor is very valuable in the light of different approaches towards ocean investigation and development, since the number of aspects to be considered while planning the ocean management in the interests of mankind is increased. And the intermixing of various viewpoints mutually enriches the parties through cooperation.

No doubt, the World Ocean is a unifying area for making our scientific effort worthwhile. Methods and techniques of scientific investigations, those instruments for carrying out marine research, are gradually being standardized. This is also important because the results of scientific studies will be equally shared by all PICES member countries. Moreover, of no less importance are the national identities and traditions of each and every State involved, of scientific schools and particular results of research obtained. Recognizing this fact will surely make the mutual understanding easier, and this is one of the main objectives of any international organization. PICES should not be an exception.

Why have we picked Vladivostok of all the cities as the venue of PICES Eighth Annual Meeting? It is because this city in the Pacific Russia is most representative in the areas of research with concentrated science and technology potential in the Far East. It meets the demands of national economy of the Russian Far Eastern regions. At the same time Vladivostok is one of the youngest Russian cities in the Pacific. By founding the port Vladivostok, father-founders put an end to a remarkable historic epoch of great geographic discoveries and development, when the Russian pioneers discovered new territories along the coastline of the Pacific in the 18th and 19th centuries, including the Okhotsk Sea coast, Kamchatka, the Kuril Ridge, Sakhalin, and Alaska.

Glorious traditions of Russian researchers of the Pacific and World Oceans were upheld in the 20th century. The contribution of Russian fisheries science to the World Ocean and its bioresources research has been especially great: the last century has witnessed years when scientific investigations had covered 70% of the marine basins in the open areas of the World Ocean.

Despite the economic difficulties, marine studies are underway today in the Far East. One should emphasize the farsighted policy of the TINRO-Center administrators who, during the years of reforms in Russia, managed both to retain the research fleet, to continue the growth of its numbers, and improve its technical and scientific equipment. Fifteen research vessels of different profiles enable the Center to constantly monitor marine bioresources and to study the environment. The scientists record global changes of the environment parameters, which considerably influence the number and distribution of marine inhabitants and change the conditions of economic management in the Ocean.

In this respect of great importance to us is the participation of Russian scientists in such International Programs on ecosystems research as "GLOBEC", in scientific symposia and working meetings on "Nature and the Impact of Climatic and Oceanological Epochs Changes on the North Pacific", "Modelling and Forecasting Physical Processes in Subarctic Region of the North Pacific", "Ecological Consequences of Oil Spills and Oil Deposits Development", etc. The last subject is very relevant for the Sakhalin region with its unprecedented potential for Russian offshore oil extraction. No doubt, it will be very difficult here to strike a balance of interests among ecological movements, fishermen and oil developers. In this respect, we should follow a strictly scientific and independent analysis and evaluate comparative advantages versus negative consequences of this gigantic project. Profit of the Sakhalin Oblast and foreign investors of the oil development project are put on the scale against the impact of inevitable pollution of the sea on marine ecosystems resulting thus in losses for both the Russian fishermen and those of the neighboring countries in the regions.

On the threshold of the new millennium with an extremely high level of human activity, it has become even more difficult to preserve harmony of relations between man and nature. Nature can very easily destroyed as a result of rash actions undertaken by man for his selfish, and as a rule short-term, purposes aimed at making nature look "more culture-oriented". One cannot stop all the economic activities including those in the World Ocean. We should go on with these activities but they should be preceded by painstaking research to evaluate possible consequences as well as possible economic benefits.

I am sure that in this respect PICES will open a lot of new opportunities for both the scientists and those responsible for political and economic decision-making based on rigorous scientific knowledge. PICES also means unlimited opportunities for mutually beneficial scientific cooperation, exchange of latest information and scientific knowledge dissemination.

Hopefully, the present Meeting will make a considerable contribution to solving the problems facing the organization. I would like to wish successful work to all the participants of the Annual Meeting, and have no doubts that your scientific findings will find practical

implementation. Thank you for the attention.

Dr. Huh thanked the Vice-Governor and asked Mr. Alexander Chistyakov (Deputy Chairman, State Committee of Fisheries, Russian Federation) to welcome participants on behalf of the Russian Government.

Dear Mr. Chairman, dear Executive Secretary, distinguished delegates, dear members of the Secretariat and Local Organizing Committee, ladies and gentlemen:

It is with great pleasure that I welcome the delegates and participants of the Eighth Annual PICES Meeting in Vladivostok on behalf of the State Committee of Fisheries of the Russian Federation.

The Far East is the main fishing region in Russia, and it is the Far Eastern fishermen who are mostly interested in practical scientific results both in the area of fundamental research and applied studies of the World Ocean. An opportunity of long-term forecasting of the ecosystems' changes in the Northern Pacific is a sine qua non condition to formulate tactical and strategic fishing policy in the Russian Far East. Activities of such a highly prestigious international organization as PICES are a very important contribution to a rational development of marine bioresources.

TINRO-Center is the largest research and fisheries management organization in Russia. The Center is actively involved in international scientific and technical cooperation with many Pacific Rim countries, and it has a vast experience in this area. This experience proved very beneficial when Russia joined PICES. The TINRO-Center Director represents Russia in PICES, and I would also like to highlight the efforts of TINRO-Center in organizing and holding this Eighth Annual Meeting.

Efficient and rational utilization of all the World Ocean resources first and foremost depends on the depth of scientific knowledge about global processes occurring in the hydrosphere. Such kind of work is above the effort of any one scientific institution or even country. It is by joint research of all the countries interested in intensive studies of the Ocean that we can reach the necessary level to represent the trends of marine ecosystems' changes.
I am absolutely sure that the present Annual Meeting will help us to move one step further on the way to achieving the objectives set forth by PICES. I would like to wish successful and fruitful work to all the participants of this meeting. Thank you.

Dr. Huh then called upon Dr. William G. Doubleday to make a statement on behalf of the Canadian Government.

Mr. Chairman, honourable Vice-Governor, honoured guests, distinguished Delegates, and colleagues!

On behalf of Canada and the Canadian delegation, I wish to thank Russia for inviting PICES here to Vladivostok for the Eighth Annual Meeting. With this meeting, the scientists of PICES have been able to meet their colleagues at home in all member states and all member states have had an opportunity to meet PICES. We from overseas can now appreciate the close links between the Far Eastern Region of Russia and the sea, with its living and non-living resources.

Today, I will emphasize two themes: observing the influence of extreme climate events on marine ecosystems and improving the observation of the oceans.

PICES member countries and PICES scientists were very active during the big 1997-98 El Niño, observing the changes in the ocean and its ecosystems. We will see the results of this work at the Beyond El Niño symposium next spring. I expect this symposium, with the participation from several co-sponsoring fisheries commissions, will give new insights into the influence of climate extremes on living marine resources. We can expect more extreme climate variations in the future. PICES should seize these opportunities as they arise in order to gain understanding of how climate change will affect ocean ecosystems in the

coming century.

Observation of the oceans has always been limited. The lack of widespread and reliable data has held back description and understanding of the oceans. We are on the threshold of obtaining much better observations of the ocean. The ARGO system of profiling drifting buoys will have a similar effect on advancing ocean modelling and forecasting as weather balloons have had on meteorology. ARGO and other elements of GOOS, the Global Ocean Observing System, will provide a stronger base for the coupled ocean-atmosphere models, which forecast future climate. If we can forecast ocean conditions six months ahead, we will be able to provide useful weather forecasts six months ahead because the ocean is the dominant factor influencing weather on this time scale. Ocean observation of the North Pacific will require a major effort by PICES member countries. PICES should play an active role in coordinating both ARGO and GOOS in the North Pacific to ensure that the best possible results are achieved.

Mr. Chairman, Canada has been a strong supporter of PICES from the beginning. We continue to support the growth of PICES as the main forum for advancing and coordinating international marine science in the North Pacific. Thank you.

Dr. Huh called upon Dr. Makoto Kashiwai to speak on behalf of the Japanese Government.

Honorable Vice-Governor of Prymorye, Deputy Chairman of the Russian State Committee of Fisheries, distinguished delegates, and PICES scientists:

It is a great pleasure for me to be here as a part of the Japanese delegation to attend the Eighth Annual Meeting of PICES. On behalf of the Japanese Government and the Japanese marine science community, I would like to express our sincere thanks to the host, the Russian Government, and the Local Organizing Committee. As the result of their devoted efforts, we are here to accomplish PICES activities.

I would like to take this opportunity to make remarks on my expectation from, proposal to, and request for PICES.

First, my expectation from PICES. PICES is addressing the scientific questions on Climate Change and Carrying Capacity. This problem has a larger scientific scope that can be covered by any single discipline of marine science and has larger geographical scale than can be covered by any single country. Therefore, we need intergovernmental and interdisciplinary cooperation. I believe PICES was established to realize such cooperation and has been developing to strengthen such a function. Thus, I would like to expect PICES to continue to advance as a problem-solving organization rather than a big organization intending to cover larger number of discrete disciplines in marine science.

Second, my proposal to PICES. It is my pleasure to inform you that the Japanese Government proposes to hold the next Annual Meeting in the city of Hakodate. Hakodate is the sister city of Vladivostok, with a beautiful bay area, sightseeing spots and hot springs. You will never be disappointed by visiting Hakodate.

The scientist who was wishing most to invite the next Annual Meeting to Hakodate was Prof. Kiyotaka Ohtani. He had been a member of the FIS Committee since the first Annual Meeting. I feel very sad to inform you that we lost Prof. Ohtani in the middle of September. But I am sure that his hope is almost coming true. A "potential" local organizing committee for the next Annual Meeting has already been established in Hakodate, and two officers from Hakodate staff are observers at this Annual Meeting to understand its structure and arrangement. Therefore, I would like to propose all of the participants here to promise me to come to Hakodate and attend the Ninth Annual Meeting of PICES.

Third, my request to PICES scientists, and especially young scientists. I would like to request that young participants, especially from non-English speaking countries, do not think of

PICES Annual Meetings only as a place to present their papers. It is a place to commit and contribute to the scientific activities of PICES. The scientific sector of PICES is designed to receive your input. Therefore, I would like to request that you make positive participation in the meetings of scientific committees, working groups, CCCC-IP, and to encourage you to input your comments and ideas. Thank you for your attention.

Dr. Huh called upon Mr. Hai-Qing Li, to make a statement on behalf of the Chinese Government.

Mr. Chairman, the honorable Vice-Governor of Prymorye, Deputy Chairman of the Russian State Committee of Fisheries, distinguished Delegates, experts, ladies and gentlemen:

First of all, the Chinese delegation would like to join all previous speakers in congratulating the opening of the Eighth Annual Meeting of PICES in the beautiful city of Vladivostok. PICES, under the able chairmanship of Dr. Hyung-Tack Huh, has made remarkable progress over the past year in advancing the good of this Organization, and particularly in the promotion of cooperation among its member countries and with other organizations in various aspects of marine scientific research in the North Pacific Region. I am sure that with your leadership, this meeting will be a full success.

We would also like to congratulate Dr. Alexander Bychkov on becoming the new Executive Secretary of PICES. Your competence and experience will certainly benefit PICES and its member countries in pursuing our common goal. You can always count on our support in discharging your responsibilities as the Executive Secretary of PICES.

Since it is my first time to attend a PICES meeting, I would like to tell you how happy I am to join you and hopefully contribute to the work of PICES. I look forward to cooperating with all of you on various matters during the meeting.

Mr. Chairman, the Chinese Government attaches great importance to marine affairs and marine science in particular. China is playing an active role in such international marine scientific organizations as IOC and SCOR. China highly values the importance of PICES in fostering the marine scientific research in the North Pacific region and will continue to contribute to the work of PICES to the extent possible.
Taking advantage of this opportunity, I would like to thank the PICES Secretariat in providing various support and service to the member countries of PICES, including in particular the Chinese scientists.

We would also like to thank the Government of Russia, the Governor of Prymorye, as well as our local organizer, the Pacific Research Institute of Fisheries and Oceanography (TINRO-Center), for their hospitality and excellent arrangements for the meeting. Finally, I wish the meeting a full success. Thank you.

Dr. Huh called upon Dr. Jin Yeong Kim to make a statement on behalf of the Republic of Korea.

Mr. Chairman, distinguished Delegates, Local Organizing committee members, ladies and gentlemen:

It is a great pleasure for me to have the opportunity to be here as part of the Korean delegation. On behalf of my Government, Korean delegation and scientists, I would like to thank Russia and PICES for inviting us to participate in the Eighth Annual Meeting. We appreciate, particularly, the very good work of the Secretariat, Executive Secretary, the Local Organizing Committee, and Dr. Hyung-Tack Huh, the Chairman.

PICES has made important progress since 1992. It was indeed encouraging to see that PICES has progressed from activities focused on reviewing scientific issues to its current efforts to develop cooperative scientific programs addressing vital marine science issues. Thus, we are proud of the progress that has been made through PICES symposia, workshops, and conferences to ensure the sustainable use of the renewable resources of

the North Pacific Ocean.

Korean scientists have studied long-term variation in the marine ecosystem and conservation strategies for fisheries resources through oceanographic observation and living marine resources research since 1915. Recently the GLOBEC study program has been adopted in Korea as a model for our study of climate change and carrying capacity.

With regard to the program for this Annual Meeting, we are pleased to see that PICES is addressing GLOBEC topics including fishery management, climatic change, carrying capacity, scientific visualization to marine ecosystem analysis, modelling and prediction of physical processes. All these topics are important for effective conservation of the North Pacific Ocean.

Korean scientists will be highly supportive of cooperative studies promoting and coordinating marine science in the North Pacific Ocean. These activities promise to be important in the development of PICES for sustaining marine living resources in the 21st century.

The Korean delegation wishes all participants at the Eighth Annual Meeting of PICES success in their scientific undertakings.

Dr. Huh called upon Dr. Vera Alexander to speak on behalf of the U.S. Government.

Mr. Chairman, honorable Vice-Governor, honored guests, distinguished Delegates, and colleagues:

It is a pleasure to have this opportunity, on behalf of the United States delegation, to express sincere gratitude to our Russian hosts for welcoming us here and providing such an outstanding venue to the Eighth Annual Meeting of PICES. We have now completed the circle – PICES has met in each and every member nation, and in doing so, has advanced an agenda of cooperative planning for North Pacific marine research hitherto unprecedented. PICES' tenth anniversary approaches. Are we now a mature organization? I believe that we can say yes, as we have developed traditions, modus operandi, ways of relating to each other and getting things done. PICES has made tremendous progress during its short existence. PICES has learned from ICES and other international marine entities, but yet is unique. PICES has its own spirit, which will move the organization forward.

We cannot deny that there are scientific problems in the North Pacific which can only be solved by international cooperative research on a number of scales, in time, space and manpower. I see the PICES planning process as successfully approaching the scientific questions, which we must answer. The problems engendered by widespread changes in the ocean/atmosphere environment will inevitably affect all people in all places on earth. The North Pacific Ocean environment is inadequately studied and is so vast, that in light of global considerations, ocean research in the PICES area is critical to all nations. But it is especially important to the PICES nations.

We are looking forward to this meeting and to the progress which will be made. Once again, thank you to our hosts on behalf of the United States delegation.

Dr. Huh called upon Dr. Lev N. Bocharov to provide a few words on behalf of the Russian Federation.

Dear Mr. Chairman, Honorable Vice-Governor, Organizing Committee and distinguished Delegates, ladies and gentlemen:

It is a great honor for me as the Russian delegate to PICES to represent my country at the PICES Annual Meeting. This is the Eighth Annual Meeting of PICES, but the first one on Russian territory.

First of all, I would like to use this opportunity, and on behalf of the Russian Government and all Russian scientific quarters interested in profound studies of the World Ocean, to welcome you to Vladivostok, which is the biggest scientific center

in the Russian Far East.

I would also like to note especially the PICES Secretariat's efforts on the meeting arrangements and to thank its members for their huge and fruitful work. I wish to express a hope for further cooperation between the Secretariat and Local Organizing Committee in order to finish the Meeting's marathon with good results. On behalf of all Eighth Annual Meeting participants, let me convey the deepest thanks to the Governments of Prymorye Region and Vladivostok for the great assistance they rendered to TINRO-centre, as the main local organizer of this meeting.

Our country has always paid great attention to ocean studies. That is why the creation and increasing activity of PICES is very appreciated in Russia. Unfortunately, not all Russian participants could take part in the PICES meetings and conferences because of economical difficulties. In this respect the PICES support of such scientists who do not have enough financial ability to participate in PICES creative activity, is invaluable. In this context the Vladivostok Meeting is of great importance because it provides equal chances to all Russian scientific organizations.

For the people of the Russian Far East, it is even more important. There is no one Russian region where the economic prosperity and social stability depend so much on ocean resources and sea transportation.

It is also necessary to note that only the integrated results of the international scientific research activities in the field of the marine ecosystem and environmental capacity make more and more realistic the long-term forecasting in the condition of marine biological resources.

PICES is the international scientific organization which provides to the scientists constantly increasing opportunities. We also welcome the cooperation of PICES with other international marine scientific organizations.

The main results of PICES activities will become obvious in the 21st century. But even now the many positive sides of such activities have made themselves notable. One of them is the opportunity of close and unconstrained contacts. I hope the Annual Meeting in Vladivostok will not be an exception and the results of this meeting will be useful to all participants. The scientists of six countries can revive and develop mutual contacts, strengthen friendship and continue scientific dialogue on a wide scope of science disciplines.

Autumn is the best season in Prymorye. The Annual Meeting participants should not only work, but also spend some free time to know our city better.

In conclusion let me once again wish success to the PICES Annual Meeting in Vladivostok. Thank you.

Dr. Huh thanked Vice-Governor Vladimir Stegny, representative of the Russian State Committee of Fisheries, Mr. Alexander Chistyakov, and all the delegates for their remarks and spoke on behalf of PICES.

Honorable Vice-Governor of Prymorye, Deputy Chairman of the State Committee of Fisheries for the Russian Federation, distinguished Delegates, ladies and gentlemen:

I would like to begin my remarks by thanking our hosts, the Russian Federation, and the State Committee of Fisheries for their hospitality in hosting this meeting, and the Pacific Research Institute of Fisheries and Oceanography (TINRO-Center) for their hard work in organizing the Eighth Annual Meeting of PICES.

I am very much delighted that the Eighth PICES Annual Meeting is held for the first time in the Russian Federation, in this beautiful city of Vladivostok, the capital of Prymorye and the center of all ocean-related scientific as well as commercial activities in the Far-Eastern Russia. We have gathered, from all directions of the Northern Pacific, here in Prymorye, "a land attached to the sea where the winds of all oceans meet".

As one of those who have been privileged to attend most of the previous PICES meetings, I am especially delighted to take part in this year's meeting, eye-witnessing the advancement of the PICES activities. Since the first annual meeting in 1992, PICES has steadily grown and expanded its activities through the workshops, symposia and publications. PICES has been a faithful apparatus in fulfilling its mission of promoting and coordinating marine science research and disseminating relevant information and data on the Northern Pacific Ocean among the marine scientists in the region.

PICES has been effective and successful in fostering enhanced communication among scientists of different countries and various disciplines, in identifying research priorities and in building up the research network, and in facilitating collaborative marine research in the North Pacific Ocean. It has been able to produce a rich array of scientific papers and publications, and to increase understanding that could be applied to problems such as the conservation and allocation of resources, protection of the marine environment, and prediction of the impacts of climate change, etc.

However, the process of transferring the scientific findings to users has not been well elaborated yet. There is no adequate international system to assess and monitor the state of the marine environment. As yet it is not possible for anyone to state unequivocally what the status of many parts of the Pacific is, how serious the threats are, if any, and what specifically should be done about them. I believe that an international organization such as PICES can make a major contribution toward the advancement of scientific knowledge that could serve for a better understanding and management of our oceans. Therefore, I sincerely hope that PICES will continue to establish effective links for collaborative efforts by countries of this region.

PICES is a young organization, but it has been recognized for its achievement not only by member countries, but also by other international organizations such as IOC, ICES, SCOR, NPAFC, etc. We should strive to strengthen its ties with other international scientific organizations and programs and continue to serve as a focal point for integrating research programs in the North Pacific Ocean.

This year we have an exciting program of scientific sessions and workshops with many interesting topics such as climate regime shifts, physical processes in the subarctic North Pacific, coastal eutrophication and harmful algal blooms, fishery management, population dynamics of planktons, GOOS, GLOBEC and many more. I hope that everybody will take full benefit by actively participating in the sessions of this meeting.

Before closing my remarks, I would like to mention on the parting of Prof. Kiyotaka Ohtani of Hokkaido University, Japan. Prof. Ohtani had been deeply involved in PICES activities as a member of Working Group 5 on the Bering Sea, and served as one of co-editors for the new book "Dynamics of the Bering Sea". I hope you would join me in offering our sincere condolence to his passing.

In closing, I am confident that the PICES Eighth Annual Meeting will be another fruitful meeting providing us with new visions, ideas, and challenges toward the new ocean era. I hope you will find everything to your satisfaction, and that your meetings be enriched and successful. I wish you an enjoyable and memorable stay in Vladivostok.

Dr. Huh then introduced Ms. Patricia Livingston, the Science Board Chairman, to review PICES' scientific accomplishments.

The work of PICES is most visible in the annual science meetings that it organizes. However, the PICES Annual Meeting is just one way that PICES accomplishes its scientific purposes. The main scientific purposes of PICES are to:

Promote and coordinate marine scientific research in the northern North Pacific and adjacent seas

especially northward of 30 degrees North;
Advance scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities;
Promote the collection and rapid exchange of scientific information on these issues.

PICES as an organization has set up a structure to accomplish these goals. We have four Scientific Committees organized around the four broad disciplinary areas of:
Biological Oceanography (BIO)
Fishey Science (FIS)

Marine Environmental Quality (MEQ)
Physical Oceanography and Climate (POC).

In addition, PICES has a Technical Committee for Data Exchange (TCODE), and a Scientific Program for Climate Change and Carrying Capacity (CCCC), which has its own science and implementation plans. These committees and programs hold business meetings at the Annual Meeting that are open to the broad scientific community for input into the scientific sessions that will be held the next year or beyond, and to proposals that would benefit the scientific community, such as reviewing progress in their field or accelerating advances. Working Groups, workshops, and cooperative work with other programs are some of the ways these advances or reviews can be made. We have developed several ways of communicating the results of our scientific efforts.

One of the primary ways that PICES scientists exchange scientific information is at our Annual Meetings. These meetings are designed to promote the presentation of interdisciplinary research results and innovative trends in research within the disciplines. Working Groups and scientific programs may also hold workshops just prior to these Annual Meetings. Unlike many other scientific meetings that focus on a particular discipline, PICES is relatively unique in the Pacific with its focus on integrating knowledge across the marine science disciplines.

PICES scientists are increasing their collaborations with scientists in other programs. The Beyond El Niño meeting that is planned for the spring of 2000 is the first large co-sponsored meeting in which PICES has taken the lead. PICES and most of the major international fishery organizations of the North Pacific, are working together to examine the effects of the very strong El Niño of 1997-1998 and the interannual, decadal, and interdecadal scales of variability in the Pacific and the possible implications for fishery production and management.

PICES scientists have made significant advancements in the ways they communicate their research results to the scientific community. The results of the 1998 Science Board Symposium on the ecosystem dynamics of the eastern and western gyres of the subarctic Pacific are now published in the peer-reviewed literature in a special issue of Progress in Oceanography. Similar special volumes are planned for the results of this year's Science Board Symposium and for next year's Beyond El Niño Conference. The efforts of the Bering Sea Working Group of PICES has led to the publication of a new book on the Bering Sea (Dynamics of the Bering Sea). This book represents a true international collaboration to update and present our knowledge of this shared sea. Three PICES Working Groups (WG 8 - Practical assessment methodology, WG 11 -Consumption of marine resources by marine mammals and birds, and WG 12 – Crabs and shrimps) have finished their work and will publish the results in the PICES Scientific Report Series this coming year. PICES continues to promote the rapid exchange of information through its Scientific Report Series, PICES Press and the data inventories and other information located on the PICES web site (http://pices.ios.bc.ca)

Some truly collaborative fieldwork is now being conducted and planned by the PICES scientific community. This year, a Practical Workshop was held in Vancouver Harbor by scientists of MEQ Working Group 8 on Practical Assessment Methodology. Scientists from each of the PICES member countries were able to attend. This

Practical Workshop has set the stage for these scientists to do future collaborative work in the area of marine environmental quality. Similarly, POC Working Group 13 (CO2 in the North Pacific) also held a multi-national Technical Workshop this year. Their intercalibration exercise for laboratory measurements of CO2 was recognized by the IOC/JGOFS Advisory Panel on Ocean Carbon Dioxide as contributing to the high quality of North Pacific CO2 measurements in the future, which will allow multinational synthesis and lead to improved understanding of carbon cycle processes. The PICES-GLOBEC Climate Change and Carrying Capacity Program (CCCC) was successful in obtaining funding from the North Pacific Marine Research Program to perform a two-year study to initiate continuous plankton recorder (CPR) monitoring in the North Pacific. The next challenge will be to find a way to maintain this monitoring as a long-term effort.

PICES has several directions for its future scientific efforts. Proposals are being examined on ways to improve our Annual Meeting structure so that it is more focused on integrating across the scientific disciplines and in encouraging the participation of young scientists. We need to find ways to promote more interaction with regional and international programs of the most interest to PICES scientists. In particular, there are many regional programs in the North Pacific that involve several PICES nations. PICES has an opportunity to bring its ecosystem perspective to these regional programs and provide assistance in coordinating research in these areas. There are many large international programs in the marine science area and PICES will be focusing its efforts on cooperation with those that are in the best interest of the PICES scientific community and of greatest benefit to PICES member nations. One of our biggest challenges still lies in promoting and coordinating international research efforts in the open North Pacific. The initiation and continuation of collaborative research efforts in this area will benefit all PICES nations that border this important area. Finally, providing scientific results that are useful to marine policy makers of the North Pacific is our ultimate goal.

Ms. Livingston then called upon Dr. Richard Addison, former Chairman of the Marine Environmental Quality Committee (MEQ), to brief the 1999 MEQ Practical Workshop.

The MEQ Practical Workshop (planned and developed by Working Group 8) was held in the laboratories at West Vancouver (Department Fisheries and Oceans), BC, Canada between May 22 and June 8, 1999. The objectives of the Workshop were to bring together scientists from all member countries to work together on a common issue of marine pollution and, in doing so, to compare different approaches used in member countries. The Workshop was modelled on previous workshops organized by ICES and IOC, and it was recognized that in addition to addressing the general issue of harmonizing approaches to the assessment of marine pollution, there would be a cultural benefit of having scientists from member countries working together and sharing sampling equipment, samples and analytical data.

The Workshop took the form of a two-week practical study of various aspects of pollution in Vancouver Harbour and the surrounding areas. As a general introduction, participants spent a day outlining their national approaches to addressing marine pollution problems. There followed an intensive field program in Vancouver Harbour, which focused on sampling benthos and sediment (involving scientists from all member countries); benthic flatfish sampling (involving scientists from Canada, USA, Japan and Russia); and sampling inter-tidal algae and animals (involving scientists from Russia, China, Japan, Korea and Canada). In all, 22 scientists participated in all or part of the Workshop. The sampling approaches and subsequent analyses were selected to cover both chemical and biological measurements, since one of the underlying aims of the Workshop was to relate these two types of measurements. In some cases, analyses of samples were carried out at West Vancouver and in other cases, samples were shipped to the participants' home laboratories for analysis.

It is too early to summarize much of the data

emerging from the Workshop as analyses are still being carried out, but we can already anticipate some of the outcomes. For example, measurements of the frequency of "imposex" in inter-tidal molluscs made during the Workshop by Dr. Horiguchi (Japan) and Mr. Li (China) will extend a time-series of such measurements made previously in Canada, and which will contribute to a better description of the spatial and temporal trends in this effect of TBT-based anti-fouling paints. Comparison of molecular and pathological responses of benthic flatfish to various organic pollutants (made by Canadian and US scientists) will provide further support for the application of these techniques in the assessment of marine pollution. However, perhaps the greatest benefit of the Workshop was the improved understanding and communication among participants, and the opportunities that were identified for future collaboration among member countries.

Dr. Addison took the opportunity to thank the Workshop organizers, particularly Dr. Colin D. Levings, the local host at West Vancouver, and Dr. John E. Stein and Ms. Carla Stehr from the NMFS Laboratory, in Seattle, all of whose hard work and dedication had made the Workshop a success.

Ms. Livingston introduced Dr. Vyacheslav P. Shuntov, of the Laboratory of Applied Biocenology, Pacific Research Institute of Fisheries and Oceanography (TINRO-Centre), to give the keynote lecture. The following is the full text of the lecture.

Keynote lecture: "Review of Research into Macroecosystems of the Far-Eastern Seas: Results, Objectives, Doubts"

The history of Russian research in the Far Eastern Seas is about one hundred years long. In the beginning there were geographical, hydrographical, zoological and bio-geographical investigations followed by two periods of intensive research development – at the end of the 1920s and during the 1950s. During both periods, biological (including ecological) studies were significantly intensified, mainly due to the requirements of the expanding Soviet Union fishing industry. Despite obvious progress in ecological research, (e.g. the famous research vessel "Vityaz" cruises and long-term TINRO-VNIRO Bering Sea expeditions that started in 1958), these cannot be called ecosystem research programs in the strictest sense. Even a well-known book of P.A. Moiseev "Biological Resources of the World Ocean" (1969) contained no calculations of total biological or fish production in the Far Eastern seas. Yet such calculations had been done for most of the World Ocean regions, based on a general knowledge of carbon and energy transformation across the trophic web. Generally, there were insufficient data on many ecosystem components in Far Eastern seas, especially for the lowest trophic levels. The situation changed significantly during the 1980s. The logic of step-by-step scientific research and necessity of knowledge of biological function resulted in the successful development of complex research in Japan Sea bays conducted by the USSR Academy of Science and TINRO. The aquaculture boom during those years gave additional incentives to initiate such research.

By the 1980s, the need to strengthen traditional biological research with an ecosystem approach became evident, especially in view of multiple failures in fisheries forecasts, and the shift of Russian commercial fishing operations into its Exclusive Economic Zone in 1977. Managing bioresources by fisheries regulation alone demanded a more detailed knowledge on biological structure, productivity, and regular trends in ecosystem functioning including interactions among species and among groups of aquatic organisms. As a result, a new long-term line of research into macroecosystems of the Far Eastern seas was formed in TINRO in the beginning of the 1980s. The lack of researchers in the field of biological production, and in the lowest trophic level components, as well as the lack of sufficient knowledge of the principles of biocenosis structuring, limited the scope and constrained objectives during research planning. It's a pity to speak about this, because from the beginning of the 1980s we managed to arrange

tens of expeditions with only a limited list of objectives. The research potential was partly increased by some hydrochemists and hydrobiologists from VNIRO and the Academy of Science, who participated in TINRO expeditions. Some information on lower trophic levels was collected by academician's expeditions in limited areas. For some reason it is rather difficult or even impossible to extrapolate those data to larger regions. I mentioned such prosaic items in order to show that there are still many "bottlenecks" in working out ecosystem research subjects.

Nevertheless, regular ecosystem (bioceno-logical) research in the Russian Far Eastern seas started nearly 20 years ago, and as a result our knowledge of the nature of the Far Eastern seas has changed and lead to the following set of observations and questions:

1. I suppose, the most important finding is that biological and fish productivity in the Russian Exclusive Economic Zone (EEZ) is significantly higher than it had been assumed before. For years, the Atlantic Ocean was assumed to be more productive. Moreover, it was well known that many commercial stocks decreased as a result of comparatively moderate fishing pressure during the 1950s–1960s (by 1960, the total catch within the Russian EEZ amounted to only 1.1 million metric tons).

As a result of numerous bottom and pelagic trawl surveys, which covered the entire Russian EEZ area down to 1000 meters depth, the total biomass of fish and large invertebrates from the 1980s to the beginning of the 1990s was roughly estimated to be 90-100 million metric tons. Rather unexpectedly, small mesopelagic fishes comprised almost half of the total assessed biomass. At the same time, special research data analyses of various animal groups, and some retrospective estimates made it possible to quantify the highest trophic levels. The present abundance of whales in the Russian EEZ (including residents and migrants) is about 100–120 thousand individuals (the initial estimate was approximately two times higher), plus about 250 thousand small dolphins. The number of resident marine birds is approximately 26 million individuals.

Even the first rough estimates of food consumption required at the highest trophic levels showed an obvious discrepancy between the assessments and lower trophic level biomass and primary production. At peak levels during the 1980s in the Bering and Okhotsk seas, walleye pollock alone consumed about 350 million tons of zooplankton, 11 million tons of squid, and 30 million tons of small fishes. It is hard to imagine such an impressive rate of trophic interrelations. All these facts challenged our methods of data collection and processing of phytoplankton, zooplankton, bacteria and, partially, benthos. Of course, the main difficulty here was (and is) the low catch efficiency of small plankton (straining through the net), and macroplankton avoidance. This problem has a certain history, and has been given no rest to aquatic biologists for a long time. It is worth noting that estimates of primary production of the World Ocean have increased in the last 30 years, as methods were improved. According to the joint TINRO-VNIRO expeditions (papers published by Dr. V.V. Sapozhnikov and co-authors), the yearly production of phytoplankton in various areas of the Bering and Okhotsk Seas lies in the range of 260-350 g/m3. This data is close to my earlier estimates of 430-450 g/m3 for these seas, though in this work total production of phytoplankton, macro seaweed and phytobenthos-periphyton was assumed. These are 2-3 times higher than most of the known estimates.

Not long ago Dr. Yu. I. Sorokin and his colleagues from the Institute of Oceanography of the Russian Academy of Sciences showed that the biomass and production of bacteria and protozoa in the Far Eastern seas are among the most productive in the World Ocean. These organisms play a major role in ecosystem functioning. On the one hand, species of the so called microbial loop (or detritus chain) make the trophic pathways longer, but on the other hand, they provide a more stable and significant source of food for larger plankton and for the early life-history stages of nekton and nektobenthos.

In order to adjust for the sampling bias in estimating macroplankton biomass, we began to use correction factors for catch efficiency and time of sampling. Such a simple practice resulted in substantial changes in our view of the structure and biomass of plankton communities. The revised estimates of zooplankton biomass appeared to be 2-3 times higher (400-460 g/m3 for the Okhotsk Sea and Pacific side of Kuril Islands, and 230-260 g/m3 for the Bering Sea, Japan Sea and Pacific side of Kamchatka). The predominant group was macrozooplankton (70-80%), not micro- or meso-plankton. It is doubtful, whether the situation is different in other areas of the World Ocean. Hence, speaking about biota alone, the scale of biological production in marine ecosystems is much larger than it seemed before. I think there is no need for additional comments to explain importance of this general conclusion, though one problem is worth noting.

As mentioned above, by the beginning of the 1960s, the total catch within the present Russian EEZ reached only 1.1 million tons but we are confident that the stock abundance of the dominant species had decreased by that time due to fishing pressure. During the 1980s the total catch was 4-5 million tons, which is in good agreement with the higher estimates of abundance of nekton and benthos. The intriguing point is that when the catch was 1 million tons, stock abundance was decreasing, but when the catch was 4-5 million tons stock abundance was growing. Of course, in the 1970s–1980s the main harvested species were walleye pollock (Theragra chalcogramma) and sardine (Sardinops melanostictus), but this fact does not explain the matter. This suggests that the susceptibility of species and communities to anthropogenic factors, including fishing, changes with time. Within this context the vulnerability of organisms was higher during the 1940s–1960s, lower during the 1970s–mid- 1990s and probably lower during the 1920–1930s.

2. Such comparisons bring us to the problem of cycles in natural processes with a period of about 40-60 years. With particular attention to these cycles, I don't deny smaller cycles, e.g., those connected with El Niño or the North Pacific oscillation. Nevertheless, I do not think that any significant change in biota is the result of ocean climate change or cosmophysical factors. I believe in the idea of systematic processes in nature, but I can also accept that these changes are the result of synchronous impact of random events.

The 40–60 year cycles are observed in climate-oceanological dynamics, and as a consequence in population, species and biocenosis dynamics. This is favored by rather long duration of these cycles, which could probably be regarded as small epochs, or ages. Everything connected with 40-60 year cycles is an interesting and disputable issue, requiring assessment of current situation with reference to the past and future events. Here we cannot proceed without even passing comments on global warming. It is bound to the "greenhouse effect", especially as there are unfeasible statements that the biomass of walleye pollock in the Eastern Arctic can reach 15–20 million tons providing yearly catch of 5 million tons due to anthropogenic global warming in the foreseeable future (Patin, 1997, "Fisheries", No. 3). These figures sound optimistic, though it should be kept in mind that most of predicted consequences of global warming are rather disturbing. I do not think that the "greenhouse effect" has an absolute effect on global climate. I also do not support the idea of oceanic depletion as a result of ozone shield exhaustion. I cannot identify these ideas as a twentieth century hoax, but rather consider them as extreme interpretations, that are not supported by sufficient arguments.

I would like to recall that different types of cycles are characteristic of the Earth's climate. During the post-glacial period there was a long period of climatic optimum, then the less significant warm Viking age. The so-called lesser glacial period ended almost 150 years ago. In view of this fact, I think that the 20th century is the beginning of next warm period similar to the Viking age. It is intrinsic that events within such period are multidirectional with shorter cycles. I pay special

attention to the above mentioned 40-60 years cycles, which I considered at first as simple alternation of warm (1920-1930s, 1970-mid-1990s), and cold periods (1940-1960s, end of 1990s). Changes in biota, especially in pelagic communities, seemed to correspond to these periods, judging by dynamics in abundance ratio for walleye pollock and herring (Clupea pallasi) in the northern boreal areas, and sardines and Japanese anchovy (Engraulis japonicus) in the southern boreal areas.

Curiously, the temperature background during 1920 - 1930s was generally lower than during the next two decades. During this period, a northward expansion of not only distinctly southern species but also the entire biota communities toward high latitudes was observed. The southern boundaries of cold-loving species and biotic communities moved in the same direction. No similar expansion was observed during the recent and more significant warming, though southern species appeared frequently in the northern areas. It is worth noting that the Japanese anchovy was found in its northernmost and coldest area, Ayano-Ionsky region, for the first time during the Okhotsk Sea research in the summer of 1998. Apparently, this event and the catch of a young swordfish (Xiphias gladius) in the southern Okhotsk Sea in the summer of 1985 have a common background. It is characteristic that strong changes in nekton communities of the Far Eastern seas occurred in the beginning of the 1990s at high temperature background. At that time, multiple migrations of sardines into Russian waters stopped, walleye pollock abundance decreased considerably, while herring, Japanese anchovy, and common squid (Todarodes pacificus) abundance increased. These facts suggest: firstly, that the trend (decreasing or increasing) and duration of water temperature changes played a leading role in these species changes, and not simply the absolute temperature (within a certain limit). Secondly, that a temperature change is evidence of more important processes, particularly changes in dynamics of other, apparently more important complex characters, such as of water exchange rate between the Far Eastern seas and the Pacific Ocean, as well as water dynamics in general, and atmospheric transfer (zonal or meridional).

During the period from 1940 to 1960, no progressive global temperature rise was observed. Sometimes the temperature even decreased. Presently, I think that the temperature rise has already stopped in the modern 40-60 year cycle. Significant positive anomalies persisted up to 1998, but winter, spring and summer periods of 1999 appear abnormally cold on this warm background.

Until recently, it was evident that the biological and fish productivity of the Far Eastern seas increased during warm periods. Such periods have more stable climatic and oceanological conditions. In the beginning of the 1990s, the nekton biomass in Russian waters decreased by nearly 15 million tons. By the middle of the present decade it decreased by 25-30 million tons (walleye pollock, pilchard, northern smoothtongue – Leuroglossus schmidti). By this time the number of cold-loving "alternative" nekton species increased by about 5 million tons (Pacific herring, Atka mackerels – Pleurogrammus spp., Pacific saury – Cololabis saira, common squid). Thus, there was an obvious trend towards decreasing production in Russian waters, and there is no reason to expect that such trend will change in the next few years. Changes were also observed in the plankton communities. In the beginning of the 1990s the percentage of predatory plankton abruptly increased up to 50-60% of total meso- and macrozooplankton biomass. By 1995, the percentage of predatory plankton retained its "normal" level, 20-25% of total biomass.

Unfortunately, thereafter large-scale observations on planktonic communities were conducted only in the Okhotsk Sea where zooplankton abundance decreased abruptly in 1997 and 1998. Relationships between zooplankton abundance and fish biomass, as well as total amount of food consumed by nektonic animals indicated that there was low food availability (Table 1).

Table 1. Interannual abundance (x106 t) of some pelagic community indicators in the northern Okhotsk Sea.

Index	1986 – 1988 (Summer)	1997 – 1998 (Summer)	1999 (Spring)
Nekton biomass	9 – 12	7 - 8	6.5
Zooplankton biomass	140 – 180	73 - 90	182
Nekton daily diet	0,5 – 0,6	0,32 – 0,47	0,29
Zooplankton / nekton 2 month diet	7 – 9	3.2 – 3.8	11.7

It seemed that these recent observations fully corresponded to the conclusion that a less productive period has begun. But in the spring of 1999, the plankton quantity sharply increased to a level more typical of the 1980s, mainly due to an increased abundance of euphausids and copepods. When compared to 1998, the fish feeding rate significantly increased: 3-7 times for walleye pollock, and 1.5-2 times for herring. It is interesting that similar changes had occurred in the Navarin-Anadyr area of the Bering Sea during the previous year. The zooplankton quantity increased thereby almost 3 fold, to 6x106 t in summer, 5x106 t in autumn during 1980s, and 22x106 t in summer, 15x106 t in autumn in 1998. On the other hand, walleye pollock quantity decreased from 3.5x106 t down to 1.2x106 t during that period. The annual food consumption remained approximately the same: 15.5 and 14x106 t. The feeding rate of pollock in the Bering and Okhotsk Seas increased significantly. These data suggest that there could be striking differences in taking advantage of one trophic level potential over another in relation to general production rate. We can also suggest that there is a sufficient resilence in a trophic structure of oceanic communities.

I am not sure if these observations were episodic, i.e. simple interannual dynamics, or whether they are part of a large-scale trend. But this draws attention to some rather disturbing conclusions that there is a critical ecological situation in the Bering Sea (PICES Press, Vol. 7, No. 1, 2). There have been some negative consequences of abnormal warming – coccolithophorid blooms, increased mortality of birds and mammals, decreasing abundance of salmon and other fishes. I can understand such worries, though to my mind there is too much unnecessary drama, and no crisis at all. I assume that similar events have occurred before, and will take place in the future. Moreover, as I already mentioned, plankton abundance in the Bering Sea sharply increased in 1998. But what is more important to note is that natural communities are not rigidly integrated systems. That is why some species can easily get in and out of them without any serious consequences in their long-term dynamics. Such soft bonds in communities and ecosystems are evidenced by a variety of cycles in dynamics of populations and species abundance. Therefore, an anomaly (high or low) does not necessarily result in the "falling domino principle". In my opinion, the chess analogy is more suitable here, where there are many variants under restricted rules. The main point is not to confuse these multiple situations with a global trend, as is frequently done.

Increasing zooplankton abundance, first in the Bering Sea, and then in the Okhotsk Sea suggests that there is an order to the events in the North Pacific. If events also move from east to west as a rule, then other comparisons arise. Recent declines in the reproductive rate and abundance of walleye pollock shifted from the Gulf of Alaska and eastern Bering Sea in the late 1980s to the western Bering Sea, and then to the Okhotsk Sea in the mid 1990s. The same situation was observed in reproduction rate of some marine birds. An increased mortality of birds, particularly kittywake (Rissa tridactila) in American waters was observed in the 1980s, but not until the 1990s in Asian waters. The wave of high abundance of predatory plankton moved from east to west in the 1990s and stopped in the Okhotsk Sea.

The disturbing negative trend in North American salmon abundance has not been observed in Asian

stocks yet. At least in 1999 fishing for salmon was as fruitful as during the previous decade, but I believe that negative trends will appear in the near future. There are probably more examples, but all of them point to the significance of the North Pacific Subarctic Gyre system as a background. The eastern Bering Sea is closely connected with this gyre system through water exchange. The circulation continues through the western Bering Sea down to east Kamtchatka and the northern Kuril regions, and then into the Okhotsk Sea. This is a probable route of expansion for some anomalies.

As I already mentioned discussing the ecological crisis in the Bering Sea, the biota in adjacent areas may not necessarily react in the same way and with the same profile. A common forcing may result in different biological responses in these regions. I consider this as evidence of an underestimated "provinciality law". The biocenosis environment, i.e. the composition and structure (mainly trophic) of communities is of great importance as well. It can either intensify, or on the contrary, quench many processes, providing the so called "chess situations". This is demonstrated in Table 2, where the main areas of Russian waters (data for the entire Bering and Japan seas are presented) are ranged according to abundance of nutrients and main groups of marine animals.

Table 2 shows that hydrochemical prerequisites during generation of first food are used in various regions differently. There are also certain differences in utilizing of energy by various trophic levels. It makes those areas rather specific, with certain peculiarities in ecological capacities. Such a comprehensive ecosystem parameter determines differences in cyclic events in various areas. Since ecological capacity is the main integral ecosystem character it deserves additional consideration.

Table 2. Areas ranked according to abundance of nutrients, plankton and marine animals groups.

No.	Nutrients	Phyto-, bacteria, protozoa	Zooplankton	Benthos	Fishes and commercial invertebrates	Mammals, birds
1	Kur.*, E.Kam.	Okh. S.	Okh. S.	Okh. S.	Ber. S.	Ber. S.
2	Kur., E.Kam.	Ber. S.	Kur.	Ber. S.	Okh. S.	Okh. S.
3	Ber. S.	E.Kam.	Ber. S.	E.Kam	Kur	Kur
4	Okh. S.	Kur.	E.Kam.	Jap. S.	Jap. S.	E.Kam.
5	Jap. S.	Jap. S.	Jap. S.	Kur.	E.Kam.	Jap. S.

* Kur. – Pacific side of the Kuril Islands; E.Kam. – Kamchatka-Kommandor, the Pacific Ocean; Ber. S. – Bering Sea; Okh. S. – Okhotsk Sea; Jap. S. – Japan Sea.

3. Ecological capacity of the habitat is the ability of an environmental complex to provide conditions for reproduction and normal vital activities for a certain number of organisms. Ecological capacity is characterized by the amount of biomass which can make density factor working. Generally speaking, it is worth noting that the term "ecological capacity" has many interpretations – from general system bioproductivity values, down to species and populations abundance levels. It appears as though we deal here with a situation that is similar to a great variety of interpretations of the term "ecology". In any case, it is impossible, and there is no need to narrow the use of this term in the "legal" sense.

Some indirect observations can indicate ecological capacity limits. For example, for a long time I paid much attention to the observation that there

is less plankton in the Bering Sea than in the Okhotsk Sea per unit area, though the fish abundance is higher in the former. Consequently, competitive relationships are stronger in the Bering Sea. Therefore, the dynamics of walleye pollock and herring abundance here are strongly counter-tied. The upper limit of walleye pollock abundance in the Bering Sea was attained during the 1980s. In my opinion, it reached 25 million tons at that time and despite the fact that the warm 1980s were more favorable for pollock reproduction and more than enough spawners took part in reproduction, the reproduction efficiency and total abundance decreased approximately 3-fold due to density.

Feeding mainly on plankton and small nekton, walleye pollock has a pronounced effect on other community components, especially during peaks of abundance. It was clearly observed in the Okhotsk Sea where, during the peak of abundance in the 1980s, pollock consumed 4.5 million tons of squid and 12 million tons of small fishes annually. By the mid 1990s the biomass of large pollock decreased 3 fold, while the biomass of small nekton (Pacific stout sandlance – Ammodytes hexapterus, northern smoothtongue, capelin – Mallotus villosus) increased 4-5 fold, at least in the epipelagic layers in the northern Okhotsk Sea.

It is easy to provide more specific examples of factors limiting ecological. They have a direct bearing on the widely discussed problem of ecosystem regulation by " bottom-up control" and "top-down control". Not long ago these two mechanisms were opposed to each other in regard to priority. It became evident, that the combination of predator pressure and the availability of resources are widely distributed, as well as their unidirectional influence. Returning to walleye pollock, I would like to review some of my previously published calculations for the Okhotsk and Bering seas. In the 1980s the total catch of walleye pollock in the entire North Pacific was 6-7x106 t, including 3.8x106 t in the Okhotsk and Bering seas. Predators consumed 3.2x106 t in the Okhotsk Sea and 6.9 x106 t in the Bering Sea annually. This is "top-down control". From the other side, the most important argument for the "bottom-up control" is the alternation of long-standing periods of increased and decreased biological production that shows up at various trophic levels. But initially such alternations are determined by dynamics of atmospheric and oceanographic processes with the same regularity.

I would like to note that the concept of ecological capacity and dynamics has an applied importance. It is closely related to rational use of nature, including aquaculture in a wide sense. In my opinion, the introduction of a new species into natural communities means falling into a sticky cobweb of resilient trophic interrelations. Trophic connections depend very much on relation between species ecological potential and the resistance of environment.

Recognizing both the reality and the scale of "top-down control" stimulates the necessity to address the issue of harvesting marine mammals. I pay special attention to it because of wide-ranging "green" opinions on this subject. It is well known that commercial use of lower trophic levels (up to zooplankton) and benthos is quite difficult technically. Protectionist attitudes prevail in utilizing upper trophic levels nowadays. This is "emotional ecology" which considers "lawful" only catching of middle trophic level representatives such as fishes, squids, crabs, etc. I doubt whether such selectivity is an example of rational use of nature. Hunting marine mammals is thus not only possible but perhaps even necessary, with due consideration, or course, to recent negative lessons from global poaching.

Returning to limiting factors and regulation of abundance and biomass in ecosystems, I would like to especially note that this complicated problem is not limited to the problem of top-down and bottom-up control. I think there is sufficient evidence of control by various physical factors, e.g., water temperature. This is quite clear from data presented in Table 3.

Table 3. Density (g/m2) of plankton, benthos, nekton, and nektobenthos concentrations in the northern Okhotsk Sea in 1997.

Groups of animals	North-western Okhotsk Sea	North-eastern Okhotsk Sea
Zooplankton	129	124
Zoobenthos (averaged over years)	300	430
Nekton	5.2	17.4
Bottom fishes	1.8	6.6
Commercial invertebrates (crabs, shrimps, buccinidae, etc.)	0.7	1.6

It is well known that the eastern Okhotsk Sea is much warmer than the western side. Moreover, the northwestern shelf looks like an arctic basin in its climate and biological conditions. The northwestern and northeastern parts of the Okhotsk Sea are not contrasted with each other any more in terms of hydro-chemical conditions of biological productivity. Indexes of primary production, as well as zooplankton and benthos biomass are similar in these two regions. Low temperature in general does not limit their development. As for upper trophic levels, the biomass of pelagic and bottom animals (except marine mammals) is several times higher in the northwestern Okhotsk Sea, which has milder temperature conditions (Table 3). The main limiting factor is the low water temperature, especially the lenses of water with negative temperatures that exist during the whole summer period. It is well known that a large number of fish species and commercial invertebrates are really cold-loving and are attracted by cold waters regarding in their distribution. But their ecological potential is much lower than that of temperate (boreal) species, which serve as a source for fishery in the temperate North Pacific. Henceforward, it is not surprising that those parts of the Okhotsk Sea which are under oceanic influence, as well as Bering and Chuckchi seas, are the most favorable for fish.

In conclusion, I would like to express some general considerations. Applied problems, such as those in fisheries and aquaculture, give a strong impetus to develop our knowledge and research activities in the ocean and its seas, though many people are simply interested in creating new knowledge.

One of the "ultimate applied goals" of long-term research in the Russian Far Eastern seas is to develop large-scale managed fisheries, including fishing and aquaculture. This concept includes conservation, particularly the idea "for us, for children and for grandchildren". Taking into account the current situation it seems Utopian, although there is an evident need to establish desirable, but perhaps unreachable, objectives.

Russians are not deprived of at least one thing. We have no atolls with palms growing, and the Southern Cross does not appear above our cold seas. At the same time, bioproductive potential of the Russian Far Eastern Seas is very large, and there are many commercial species of high value.

Today we know much more about our seas than 10-15 years ago. The ecosystem approach of our research tells a lot, though our knowledge about structure and functioning of ecosystems is still insufficient. We cannot evaluate the scale of events we are dealing with. Evaluation and interpretation of those events are often hypothetical, as I have mentioned above. The three basic scientific items of my report: production hydrobiology, biocenology and trophology, - present various possibilities for improvement of views and concepts in these fields of research. We always should remember that "Only one who keeps going will reach his destination".

It is well known that data collecting alone does not always lead to new steps in knowledge, and

sometimes it looks like a roundabout. New ideas and concepts, which can aim research in a certain direction, are necessary. As for the Russian Far Eastern seas, reliable estimates of abundance of marine organisms have appeared only recently. As for the lower trophic levels, there is almost a complete lack of available data, especially on production and trophic relations. That is why even sheer data collecting is worth doing for the immediate future in this field.

Today our applied fishery science deals with macroecosystems of the Russian Far Eastern seas, including total assessments of biota structure and functional relationships among members of communities. In this connection, I think there are certain problems in other areas of the North Pacific. It is hard to imagine serious progress in ecosystem research without fundamental academic research and certainly without coordinated or synchronous international programs which cover large oceanic areas. Those marine areas present an enormous scene for tremendous and sometimes very intriguing dramatic performances.

REPORT OF GOVERNING COUNCIL MEETINGS

The Governing Council met on October 11, 16 and 17, under the Chairmanship of Dr. Hyung-Tack Huh. Drs. Alexander S. Bychkov and Stewart (Skip) M. McKinnell served as rapporteurs.

All Contracting Parties were represented at the three sessions (*GC Endnote 1*). The Chairman of the Science Board, Ms. Patricia Livingston, and the Chairman of the Finance and Administration Committee, Dr. Richard J. Marasco, were in attendance during part or all of each session.

Agenda Item 1. Opening remarks

At the first session, the Chairman welcomed the delegates and noted that for this Annual Meeting Dr. Richard J. Beamish represented Dr. Laura Richards (Canada); Mr. Hai-Qing Li represented Mr. Jing-Guang Li (China); Mr. Qian-Fei Liu represented Mr. Zheng-Ping Tang (China); Mr. Koji Harunari represented Mr. Yukiya Amano (Japan); Dr. Jin-Yeong Kim represented Mr. Sung-Ho Joo (Korea); Dr. Vladimir I. Radchenko represented Dr. Sergey E. Dyagilev (Russia); and Dr. John E. Stein represented Dr. James W. Balsiger (U.S.A.).

The Chairman asked Parties to confirm their members who would attend the Finance and Administration Committee meeting (*F&A Endnote 1*).

Agenda Item 2. Adoption of agenda

The Chairman reviewed the agenda and suggested the order in which to take up the various items. Dr. William G. Doubleday proposed the adoption of the agenda without changes, seconded by Dr. Vera Alexander. This report summarizes the treatment of each agenda item during the course of the three sessions.

Agenda Item 3. Appointment of Executive Secretary and Assistant Executive Secretary

The Chairman briefed Council on the recent changes in the PICES Secretariat. Dr. Alexander S. Bychkov was appointed as the Executive Secretary, effective June 1, 1999, and subsequently, Dr. Stewart M. McKinnell was appointed as the Assistant Executive Secretary, effective September 7, 1999. Dr. Huh stated with confidence that they will advance the work of the Secretariat as a team. Drs. Bychkov and McKinnell expressed their thanks for the support given by Council.

Dr. Bychkov reviewed the process of selecting the new Assistant Executive Secretary. He noted that the response to the advertisement was overwhelming. The Secretariat received 13 applications from highly competent individuals, representing all the PICES member countries, all with unique talents and assets. The fact that so many distinguished candidates applied for the position to become part of our team suggests that in a mere eight years, PICES has become an influential and inspiring spawning ground for marine scientific research and international cooperation, and has a potential to grow to highly reputable authority.

Agenda Item 4. Preliminary Report on Administration

The Executive Secretary summarized the activities of the Secretariat since the PICES Seventh Annual Meeting (*GC Endnote 2*).

Agenda Item 5. Relations with other international organizations and observers from such organizations

Letters of invitation to attend PICES VIII were sent to inter-governmental and non-governmental organizations on the agreed Standing List of Organizations and Programs, and the following sent observers:

Global Ocean Observing System (GOOS) Dr. Ned Cyr
International Pacific Halibat Commission (IPHC) Dr. Steven R. Hare
Intergovernmental Oceanographic Commission (IOC)
North-East Asian Regional GOOS (NEAR-GOOS) Prof. Jihui Yan
North Pacific Anadromous Fish Commission (NPAFC) Dr. Yukimasa Ishida
Scientific Committee on Oceanic Research (SCOR) Dr. Suam Kim

Council approved the additions to the Standing List of International Organizations and Programs, and a selected subset of organizations and programs that are considered to have the highest priority for PICES with respect to scientific cooperation and facilitation in the coming year (See Agenda Item 10, Decision 99/S/6 and Appendix C for details).

Agenda Item 6. Membership and observers from other countries

Non-member countries were not officially represented as observers at this year's Annual Meeting. The Secretariat did not receive proposals from non-member countries to accede to the PICES Convention in 1999.

The Executive Secretary informed Council that in June 1999, letters were sent to Dr. Marco Polo Bernal Yarahuan (Director, Unidad de Educacion en CyT del Mar) and Dr. Mario Martinez Garcia (Director General, Centro de Investigaciones Biologicas del Noroeste). They were invited as observers from Mexico to attend the PICES Eighth Annual Meeting. Their response suggests that they are interested in PICES activities and attending our Annual Meeting, but other commitments prevent their participation this time. Mexican scientists are already involved in PICES activities. It was reported that two scientists from Mexico have received partial travel support to attend the Annual Meeting in Vladivostok, and Dr. Daniel Lluch-Belda (CICIMAR) is serving as one of the convenors for the Beyond El Niño Conference (March 2000).

Dr. Ned Cyr

Accordingly Council adopted the following resolution:

The Governing Council of PICES is pleased by the possibility of having Mexico accede to the PICES Convention. The Chairman should pursue this matter vigorously by sending a letter to appropriate authorities to encourage the Mexican Government to move ahead, and by making high-level personal contacts. (Decision 99/A/5).

Agenda Item 7. Tenth Anniversary of PICES

The Convention for a North Pacific Marine Science Organization entered into force on March 24, 1992, and the First Annual Meeting of the Organization was held in October 1992, in Victoria, Canada. Council discussed various activities and events that are being proposed to commemorate the tenth anniversary of PICES, and agreed to form a PICES Anniversary Steering Committee consisting of the PICES Chairman, Executive Secretary, Science Board Chairman, F&A Chairman, Dr. Warren Wooster and a Canadian representative from the Institute of Ocean Sciences, Sidney (subsequently identified as Mr. J. Roderick Forbes). A plan for celebratory events is to be developed by January 1, 2000, and circulated to all Contracting Parties (Decision 99/A/6).

It was generally accepted that all

celebrations commissioned by Council require additional funding. The recommendation was approved that Council send a request to the Contracting Parties for voluntary contributions to support the Tenth Annual Meeting and special events related to the PICES' tenth anniversary (Decision 99/A/6).

Agenda Item 8. PICES Intern Program

Council reviewed the proposal to establish a PICES Intern Program. This document was prepared by the Secretariat and revised by the Finance and Administration Committee. Council agreed that the Intern Program would improve the way the Organization functions. Council made editorial changes and approved the PICES Intern Program as amended (*GC Endnote 3*) (Decision 99/A/7).

The Program will start in 2000, and Contracting Parties should submit their nominations to the Executive Secretary by March 1, 2000. The U.S.A. proposed to contribute CDN $7,000 in addition to their annual assessment to support the Program. Council agreed to invite voluntary contributions from all Contracting Parties, following the lead of the U.S.A.

Agenda Item 9. 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). The report was approved by Council.

9.1 Audited accounts for fiscal year 1998

At the recommendation of the Finance and Administration Committee, Council accepted the audited accounts for 1998. Council agreed to retain the existing auditor *Flader & Greene* for another year (Decision 99/A/1).

9.2 Budget

9.2a Estimated accounts for fiscal year 1999

The estimated accounts from September 1 to December 31, 1999 were reviewed by the Finance and Administration Committee and approved by Council (Decision 99/A/2).

9.2b Budget for fiscal year 2000

Council approved the total budget of CDN $590,000 and a transfer of CDN $58,400 from the 1999 Working Capital Fund surplus to the General Fund to limit the 2000 fees for each Contracting Party to CDN $88,600 (Decision 99/A/2(i)).

9.2c Forecast budget for fiscal year 2001

Council received the forecast budget for 2001 as an information item for Parties (Decision 99/A/2(ii)).

The following guideline was generally accepted to assist Contracting Parties to prepare their funding requests to cover annual contributions, and the Executive Secretary to develop future budgets:

> *For planning purposes it would be reasonable for Parties to expect that the projected budget and annual contributions will increase at the rate of inflation in Canada, currently about 3% per year. Justification and finalization of the budget will occur at the Annual Meeting prior to the beginning of the new PICES fiscal year.*

The Japanese Government considers that, as many member countries are under severe financial condition, in order to continue financial contribution to international organizations, the budget of international organizations should be the minimum necessary. Therefore, the Japanese Government is requesting to many international organizations to keep basically nominal zero increase of budget, and PICES cannot be an exception.

Council agreed to establish a Fund-Raising Committee to seek outside funding

consistent with the goals of the Organization (Decision 99/A/8).

9.2d Working Capital Fund

The Working Capital Fund is forecast to be CDN $175,594 at the end of 1999. Thus, the Fund will have a surplus of CDN $75,594. Council approved that CDN $58,400 be transferred to the General Fund to reduce the fees for each Party and that the residual surplus of CND $17,194 be transferred to the Trust Fund (Decision 99/A/2(iii)).

9.2e Home Leave Relocation Fund

The status of the Home Leave Relocation Fund was reviewed. It was noted that all expenses will be recovered from the income tax levies from foreign staff to adjust the Fund to a maximum level of CDN $110,000 at the end of the fiscal year. No action was taken by Council on this matter.

9.2f Trust Fund

The Trust Fund is forecast to be CDN $71,336 at the end of 1999. With the recommended transfer of CDN $17,194 from the Working Capital Fund (Decision 99/A/2(iii)), net funds available in the Trust Fund for the year 2000 is estimated to increase to approximately CDN $88,530.

Council confirmed that the practice of transferring surpluses from the Working Capital Fund to the Trust Fund should continue in future years (Decision 98/A/2(iii)). It was noted and generally accepted that surpluses of the magnitude of CDN $10,000 or more will unlikely exist in the future. So, PICES should explore other options for the Trust Fund replenishment, or activities that are currently supported by the Trust Fund will need to be reduced accordingly.

9.3 Annual contributions

Council discussed historical statistics on the payment schedule of annual fees to the Organization, and approved the recommendation that the Chairman send a letter to appropriate authorities from each Contracting Party (designated by national delegates). The letter will request prompt payment of annual contributions by the first day of the PICES fiscal year (January 1), as stated by Regulation 5(ii) of Financial Regulations (Decision 99/A/3).

9.4 Time and place for the Ninth and Tenth Annual Meetings of the Organization

Council approved the proposal by Japan that PICES IX be held from October 23-28 in Hakodate, Japan. Meetings of Working Groups, Task Teams and any other groups will be held during the week before the meeting. Council also accepted the recommendation to have the Secretariat hold PICES X in Victoria, Canada (Decision 99/A/4).

Agenda Item 10. Report of Science Board

The Science Board met under the chairmanship of Ms. Patricia Livingston, who presented the report to the Governing Council (see Science Board Report for text). Council approved the Science Board Report. Details are given in the Appendices A-D.

a. <u>Planned and proposed meetings in 2000</u>
   Council approved new inter-sessional meetings and proposed Workshops (Decision 99/S/1) to be held at PICES IX. Council also confirmed dates for the previously approved inter-sessional meetings (Decision 99/S/1).

b. <u>PICES supported travel</u>

Council modified and approved the recommended prioritised list for travel support (Decision 99/S/2), and directed the Executive Secretary to provide as much support as funds permit.

c. Proposed PICES publications in 2000-2001

Council endorsed the list of publications proposed (Decision 99/S/3).

d. Working Groups and proposed new groups

Council approved the proposal concerning existing Working Groups and the establishment of new PICES groups (Decisions 99/S/4 and 99/S/5). It was generally agreed that the Advisory Panel/Group definition should be clarified and included in the Handbook for Chairmen and Convenors.

e. Relations with other organizations and programs

Council approved the additions to the Standing List of International Organizations and Programs, and a selected subset of organizations and programs that are considered to have the highest priority for PICES with respect to scientific cooperation and facilitation in the coming year (Decision 99/S/6). It was generally accepted that this list will be used in part to assist the Executive Secretary and Science Board Chairperson in decisions regarding travel to meetings of other international organizations.

f. PICES Annual Meetings

Council reviewed, modified and accepted the changes to the structure of the PICES Annual Meetings proposed by the Science Board, with an addition that includes the promotion of inter-committee scientific sessions by selection of an annual meeting "theme" by the Science Board (Decision 99/S/7). The potential themes should be discussed by Committees and reflected in the Science Board Strategic Plan. It was suggested that Committees have to choose cross-cutting issues for "theme" sessions and that session of limited interest have to be schedule as poster sessions. It was also emphasized that bringing regional programs for the marginal seas into PICES would result in wider participation in PICES Annual Meetings.

In the discussion initiated by China that followed, it was noted that PICES activities should go beyond the dissemination of knowledge through scientific meetings and publications. It was suggested that the Science Board and Executive Secretary should explore other opportunities for facilitating collaborative marine research in the North Pacific and building up the research networks, for example by supporting scientific proposals, organizing multinational programs and cruises, and training courses.

Agenda Item 11. Other business

11.1 PICES Bureau

Council discussed the formation of a PICES Bureau and agreed with the recommendation of the F&A Committee that a new administrative body is not necessary at this time. As the PICES Chairman provides leadership in long-term planning for the Organization and monitoring progress towards PICES objectives, he/she may call a mid-term meeting of PICES officers for that purpose. The meeting could be held at a convenient and cost-effective location to be determined by the Chairman in consultation with the Executive Secretary.

11.2 Special invitation

His Majesty, the King of Sweden, participated in the opening session of the 1999 Annual Science Conference of ICES (International Council for the Exploration of the Sea) in Stockholm. Canada suggested to examine the possibility of inviting a member of Imperial Family of Japan to open the PICES Ninth Annual Meeting in Hakodate and speak about the relationship between Japan and the sea. It was agreed that once the possibility is established, the Chairman will send the appropriate formal letter of invitation letter from PICES.

Appendix A. Decisions

99/A/1: Auditor

Council accepted the audited accounts for 1998 and agreed to retain *Flader and Greene* as auditor for another year.

99/A/2: General account

Council accepted the estimated accounts of 1999 and agreed to the following actions:

(i) *2000 Budget*. The budget of CDN $590,000 was approved. The amount of CDN $58,400 will be transferred from the Working Capital Fund to reduce the total contribution to CDN $531,600, setting the 2000 fees at CDN $88,600 per Contracting Party.

(ii) *Forecast 2001 Budget*. The forecast budget for 2001 was reviewed and will be further considered during PICES IX.

The following guideline was generally accepted[*)] to assist Contracting Parties to prepare their funding requests to cover annual contributions, and the Executive Secretary to develop future budgets:

For planning purposes it would be reasonable for Parties to expect that the projected budget and annual contributions will increase at the rate of inflation in Canada, currently about 3% per year. Justification and finalization of the budget will occur at the Annual Meeting prior to the beginning of the new PICES fiscal year.

(iii) *Working Capital Fund*. The forecast surplus in the fund is $75,594. Council approved a transfer of CDN $58,400 to the General Fund for 2000, and that the residual surplus of $17,194 be transferred to the Trust Fund.

*) Japanese delegates made an independent statement regarding this decision (see Agenda Item 9.2c for details).

99/A/3: Annual contributions

The Chairman will send a formal letter to appropriate authorities from each Contracting Party (designated by national delegates) requesting prompt payment of annual contributions by the first day of the PICES financial year (January 1), as stated by Regulation 5(ii) of Financial Regulations.

99/A/4: Future Annual Meetings

Council approved the proposal by Japan to host the Ninth Annual Meeting in Hakodate, October 23-28, 2000. Council further agreed to have the Secretariat host the 2001 meeting in Victoria, Canada. The dates of PICES X will be confirmed at next year's Annual Meeting.

99/A/5: Membership

The Chairman will send letter(s) to appropriate authorities and establish personal contacts to encourage the Mexican Govern-ment to accede to the PICES Convention.

99/A/6: PICES Tenth Anniversary

Council agreed to form a PICES Anniversary Steering Committee consisting of the PICES Chairman, Executive Secretary, Science Board Chairman, F&A Chairman, Dr. Warren Wooster and Canadian representative from the Institute of Ocean Sciences (TBD). A plan for celebratory events is to be developed by January 1, 2000, and circulated to all Contracting Parties for comments.

The Chairman will send a formal letter to all Contracting Parties for voluntary contributions to support the Tenth Annual Meeting and special events related to the PICES' tenth anniversary.

99/A/7: PICES Intern Program

Council approved the PICES Intern Program as attached (*GC Endnote 3*). The Program will start in 2000, and Contracting Parties should submit their nominations to the Executive Secretary by March 1, 2000.

99/A/8: Fund-Raising Committee

Council agreed to establish a Fund-Raising Committee to seek outside funding consistent with the goals of the Organization. The committee should be represented by all Contracting Parties (membership to be determined), the Executive Secretary and chaired by the F&A Chairman, Dr. Richard J. Marasco, and will work by correspondence.

99/S/1: Inter-sessional Meetings, Working Group and CCCC Program Workshops

The following new inter-sessional meetings, Working Group and CCCC Program workshops are to be convened (see Acronym List at the end of the Annual Report):

a. An NPAFC-hosted workshop (organized by NPAFC and PICES) on "Factors affecting production of juvenile salmon: comparative studies on juvenile salmon ecology between the East and West North Pacific Ocean" on October 29th, 2000, in Tokyo, Japan;

b. A BASS Workshop on "Development of a conceptual model of the Subarctic Pacific Basin Ecosystem(s)", a MODEL Workshop on "Strategies for coupling higher and lower trophic level marine ecosystem models", a MONITOR Workshop on "Progress in monitoring the North Pacific", a REX workshop on "Trends in herring populations and trophodynamics", and a Technical Workshop on "The basis for estimating the abundance of marine birds and mammals, and the impact of their predation on other organisms", October 2000 (immediately prior to PICES IX), in Hakodate, Japan;

c. An NIES-hosted Symposium/Workshop on "North Pacific CO_2 data synthesis" (co-sponsored by PICES and JST/CREST), October 2000 (4 days, immediately prior to PICES IX), in Tsukuba, Japan;

d. A Planning Workshop on "Designing the iron fertilization experiment in the Subarctic Pacific" (co-sponsored by PICES and CRIEPI), October 2000 (2 days immediately prior to PICES IX), in Tokyo, Japan;

e. A CREAMS/PICES Workshop on "Oceanography of the East Asian Marginal Seas", May 2000, in Vladivostok, Russia.

The following inter-sessional meetings were previously approved and will occur after PICES VIII (Decisions 98/S/2 and 98/S/7):

f. A CCCC/MODEL Workshop on "Lower trophic level modeling", January 31-February 3, 2000, in Nemuro, Japan;

g. A conference "Beyond El Niño: A conference on Pacific climate variability and marine ecosystem impacts, from the Tropics to the Arctic" (co-sponsored by PICES, IATTC, IPHC, ISC, NPAFC and SCOR), March 23-26, 2000, in La Jolla, U.S.A.;

h. A mini-workshop on "Zooplankton ecology of the North Atlantic and North Pacific" in conjunction with the meeting of the ICES Working Group on Zooplankton Ecology, April 17-19, 2000, in Honolulu, U.S.A.

99/S/2: Travel support

a. PICES will provide full travel support (or equivalent) for one invited speaker per Scientific Committee or Program to attend the PICES Ninth Annual Meeting;

b. Membership and Co-Chairmen for PICES Working Groups are normally identified inter-sessionally. For new working groups to develop working plans shortly after their formation, PICES will support up to a maximum of 2 persons annually to travel for inter-sessional planning;

c. PICES will cover the travel costs of the Science Board Chairman to attend the ICES Symposium on "100 Years of Science under ICES", August 1-4, 2000, in Helsinki, Finland;

d. PICES will cover the travel costs of one person to attend the SCOR General Meeting in October, 2000, in Washington, DC, U.S.A.

99/S/3: Publications

The following publications were approved:

a. Final report of WG 11 on Consumption of Marine Resources by Marine Birds and Mammals, Proceedings of the 1999 MONITOR and REX Workshops and 2000 MODEL Workshop, and Bibliography of Japan/East Sea in the PICES Scientific Report Series;

b. Progress reports of WG 8 on Practical Assessment Methodology, WG 12 on Crabs and Shrimps, and WG 13 on CO_2 in the North Pacific in the 1999 Annual Report;

c. Selection of papers presented at the 1999 Science Board Symposium on "the Nature and impacts of North Pacific climate regime shifts" in a special issue of Progress in Oceanography;

d. Selection of papers presented at the Beyond El Niño Conference in a special issue of Progress in Oceanography in 2001;

e. Selection of papers presented at the CCCC/MODEL workshop on "Lower trophic level modeling" in a special issue of Fisheries Oceanography in 2001;

f. Review and results from the PICES/WG 13 Technical/CO_2 Intercalibration Workshop in a bilingual (Japanese/English) report published by the National Institute for Environmental Studies, Japan (at no cost to PICES).

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

a. WG 8 on Practical Assessment Methodology will remain for one more year to complete collation, editing and publication of results from the MEQ Practical Workshop.

b. WG 10 on Circulation and Ventilation in the Japan/East Sea will be disbanded. The WG 10 report will be published on the PICES web page as a revisable document.

c. WG 11 on Consumption of Marine Resources by Marine Birds and Mammals will be disbanded.

d. WG 12 on Crabs and Shrimps will remain for one more year to complete collation, editing and publication of results (no further meetings of the Working Group are required).

e. WG 14 on Effective Sampling of Micronekton will remain established for at least two more years. Dr. Richard D Brodeur (U.S.A.) is recommended as Co-Chairman to replace Dr. Bruce

Robison (U.S.A.). To account for gaps in expertise and/or national representation, additional members from Korea and China are requested.

f. Revised terms of reference for MONITOR Task Team were approved (see Appendix B (i) for terms of reference).

99/S/5: New PICES groups

The following new groups will be organized:

a. Advisory Panel (under BIO) on Marine Mammals and Birds with a lifespan of 5 years, renewable by vote of BIO (see Appendix B (ii) for terms of reference);

b. Advisory Panel (under CCCC/ MONITOR) on the Continuous Plankton Recorder survey in the North Pacific with a lifespan of 2 years, renewable with prospect of future funding for the CPR program (see Appendix B (iii) for terms of reference);

c. WG 15 (under MEQ) on the Ecology of Harmful Algal Blooms in the North Pacific (see Appendix B (iv) for terms of reference);

d. WG 16 (under FIS) on Climate Change, Shifts in Fish Production, and Fisheries Management (see Appendix B (v) for terms of reference).

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

The annual revision of the Standing List of International Organizations and Programs was endorsed in order to facilitate relations with other organizations and programs, and identify priorities for interaction in the coming year (See Appendix C for the revised list).

99/S/7: PICES Annual Meetings

In order to enhance the PICES scientific meetings and focus efforts on promoting an interdisciplinary ecosystem approach, the changes in the structure of PICES Annual Meetings were approved (See Appendix D).

Appendix B. Working Group and Task Team Terms of Reference

i) Monitor Task Team (revised)

1. Review existing activities of PICES member nations and to suggest improvements in the monitoring of the Subarctic Pacific to further the goals of the CCCC Program;

2. Consult with REX, BASS and MODEL Task Teams and TCODE on the scientific basis for designing the PICES monitoring system. Questions of standardization and intercalibration of measurements, particularly in the area of biological collections, should be addressed;

3. Assist in the development of a coordinated monitoring program to detect and describe events, such as El Niño, that strongly affect the Subarctic;

4. Develop a PICES-GOOS action plan for how PICES should take an active and leading role in further development and implementation of GOOS at a North Pacific level. The action plan would:

   i. identify existing ocean observations in the coastal and open North Pacific

that are relevant to GOOS;

ii. develop a PICES-GOOS implementation plan based on existing routine observations and augmented by new observations as appropriate;

iii. provide a structured plan on how to transfer relevant CCCC program activities to a PICES-GOOS program.

5. Advise and support the CCCC Implementation Panel and Science Board on GOOS-related matters, including representing PICES at key GOOS planning meetings.

ii) Advisory Panel on Marine Mammals and Birds

1. Provide information and scientific expertise to BIO, CCCC Program, and, when necessary, to other scientific and technical committees with regard to the biology and ecological roles of marine mammals and seabirds;

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.

iii) Advisory Panel on the Continuous Plankton Recorder (CPR) Survey in the North Pacific

1. Review and advise on the most appropriate locations, timing and frequency of CPR routes for "A Continuous Plankton Recorder Monitoring Program for the eastern North Pacific and Southern Bering Sea" currently funded through the North Pacific Marine Research Initiative;

2. Provide technical advice on parameters to be measured for additional monitoring initiatives;

3. Advise on linkages to other potential initiatives in the North Pacific and elsewhere.

iv) Working Group 15: Ecology of Harmful Algal Blooms in the North Pacific

1. Identify the various species involved, and the timing, frequency, and duration of harmful algal bloom events;

2. Develop a regional database of relevant observational parameters associated with bloom events, including maps, bibliography, existing programs and data sets, and expanded list of researchers in the area;

3. Investigate links between bloom events and environmental factors, trophic interactions and possible anthropogenic stress (e.g., eutrophication);

4. Assess the economic, health-related, and environmental impacts arising from harmful algal bloom events in order to improve the ability to predict the occurrence of these events and thus minimize their overall impacts;

5. Suggest areas where critical data are missing and where future research is

necessary;

6. Facilitate regional collaborative research efforts at various levels to address these problems.

v) Working Group 16: Climate Change, Shifts in Fish Production, and Fisheries Management

1. Identify key examples of species that have been affected by climate and ocean changes;
2. Investigate and assess the impact of inter-annual and decadal-scale physical changes in relation to fishing effects;
3. Describe or hypothesize the mechanisms linking climate and ocean changes to changes in the populations dynamics;
4. Using these mechanisms and indices of climate change, examine the possibility of long-term forecasting of changes in population dynamics and ecosystem structure.

Appendix C. 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 biological 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. 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.

APEC	Marine Resources Conservation WG (MRC), Asia Pacific Economic Cooperation
APFIC	Asia-Pacific Fisheries Commission
CLIVAR*	Climate Variability and Predictability
ECOR	Engineering Committee on Oceanic Resources
FAO	Food and Agriculture Organization
GESAMP	Group of Experts on Scientific Aspects of Marine Pollution
GIPME	Global Investigation of Pollution in the Marine Environment
GIWA*	Global International Waters Assessment
GLOBEC*	Global Ocean Ecosystem Dynamics
GOOS*	Global Ocean Observing System
GOOS-LMR*	GOOS Living Marine Resources
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
IPHC*	International Pacific Halibut Commission
ISCTNP*	Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
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
PSC	Pacific Salmon Commission
SCOPE	Scientific Committee on Problems of the Environment
SCOR*	Scientific Committee on Oceanic Research
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

1999 additions to list:

AMAP	Arctic Monitoring and Assessment Program (AMAP)
ACIA*	Arctic Climate Impact Assessment Program (ACIAP of AMAP)
ARGO*	International Program for deployment of profiling floats (linked with GOOS)
CREAMS*	Circulation Research in the East Asian Marginal Seas

Appendix D. Structure of PICES Annual Meetings

1. To promote inter-committee sessions, the Science Board should select a "main theme" for each Annual Meeting; proposed topic sessions must then fit the overall "theme" of the meeting;

2. To advance the role of the Science Board Symposium, it should be arranged as the first scientific session of the Annual Meeting, immediately following the Opening Session;

3. To upgrade image and position of poster presentations, the poster sessions should be arranged to have a formal poster viewing time near the end of each day in conjunction with a social hour. Posters to be focused on for each day should be summarized just prior to the poster session by a person appointed by each Committee. Poster presenters for that session would be required to stand by their poster for that social hour;

4. To increase the participation of young scientists, a Young Scientists' Travel Grant (as a part of the Trust Fund) should be advertised.

GC Endnote 1

Participation List

Canada
William G. Doubleday (delegate)
Richard J. Beamish (alternate delegate)

China
Hai-Qing Li (alternate delegate)
Qian-Fei Liu (alternate delegate)
Jian Kang (advisor)
Yanan Hu (advisor)

Japan
Makoto Kashiwai (delegate)
Koji Harunari (alternate delegate)

Republic of Korea
Jin Yeong Kim (alternate delegate)
Young Shil Kang (advisor)

Russian Federation
Lev N. Bocharov (delegate)
Alexander Kurmazov (advisor)

U.S.A.
Vera Alexander (delegate)
John E. Stein (alternate delegate)
Dorothy Bergamaschi (advisor)

Others
Hyung-Tack Huh (Chairman, PICES)
Alexander S. Bychkov (Executive Secretary) (Rapporteur)
Stewart M. McKinnell (Assistant Executive Secretary) (Rapporteur)
Patricia Livingston (Chairman, Science Board)
Richard J. Marasco (Chairman, Finance and Administration Committee)

GC Endnote 2

Report on Administration for 1999

1. 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 were paid as follows:

Canada	November 30, 1998
U.S.A.	January 27, 1999
Japan	March 29, 1999
Korea	August 16, 1999
China	not received as of Sept. 15, 1999
Russia	not received as of Sept. 15, 1999

2. National Delegations

The following reflects changes in membership for Council, Finance and Administration Committee, various Scientific and Technical Committees, Working Groups and Task Teams

Governing Council

Dr. William G. Doubleday replaced Ms. Kathryn Bruce (Canada)
Dr. Laura Richards replaced Dr. John C. Davis (Canada)
Dr. Makoto Kashiwai replaced Dr. Satsuki Matsumura (Japan)
Mr. Yukiya Amano replaced Mr. Akio Suda (Japan)
Mr. Sung-Ho Joo replaced Mr. Jang-Hyun Choi (Korea)
Mr. Su-Han Woo replaced Dr. Jhin-Kyoo Chae (Korea)

Finance and Administration Committee

- Dr. William G. Doubleday replaced Ms. Joyce Quintal-McGrath (Canada)
- Dr. Laura Richards replaced Dr. John C. Davis (Canada)
- Dr. Makoto Kashiwai replaced Dr. Satsuki Matsumura (Japan)
- Mr. Hiroshi Oka replaced Kimihiro Ishikane (Japan)
- Mr. Sung-Ho Joo replaced Dr. Jhin-Kyoo Chae (Korea)

Committees, Working Groups and Task Teams

Biological Oceanography Committee

- Mr. Song Sun replaced Prof. Rong Wang (China)
- Dr. Woong-Seo Kim replaced Dr. Sung-Yun Hong (Korea)

Fishery Science Committee

- Dr. Laura Richards replaced Dr. Michael A. Henderson (Canada)
- Mr. Jia-Hua Cheng replaced Prof. Zheng Yan (China)
- Dr. Xian-Shi Jin replaced Prof. Ming-Jiang Zhou (China)
- Dr. Takashi Minami replaced Dr. Tokyo Wada (Japan)
- Dr. George W. Boehlert replaced Dr. John R. Hunter (U.S.A.)

Marine Environmental Quality Committee

- Mr. Steve Samis replaced Dr. John Pringle (Canada)
- Dr. John E. Stein replaced Dr. Usha Varanasi (U.S.A.)

Physical Oceanography and Climate Committee

- Dr. Kenneth L. Denman replaced Prof. Paul H. LeBlond (Canada)
- Dr. Susan E. Allen replaced Dr. Kenneth L. Denman (Canada)

TCODE

- Ms. Susan Bates replaced Mr. Bill Shaw (Canada)
- Dr. Bernard A. Megrey replaced Dr. William A. Karp (U.S.A.)

WG 12

- Mr. Zhi-Meng Zhuang replaced Mr. Sheng-Min Ren

WG 14

- Dr. David L. Mackas was added (Canada)
- Mr. Naoki Iguchi was added (Japan)
- Dr. Vadim F. Savinykh replaced Dr. Eugene N. Il'insky (Russia)

PICES-GLOBEC CCCC Implementation Panel

- Dr. David L. Mackas replaced Dr. Michael A. Henderson as a national member (Canada)
- Dr. Masahide Kaeriyama replaced Dr. Makoto Terazaki as a national member (Japan)
- Dr. Andrey S. Krovnin was added as a national member (Russia)
- Dr. Warren S. Wooster replaced Ms. Pat Livingston as a national member (U.S.A.)
- Dr. William T. Peterson replaced Dr. Anne B. Hollowed as U.S. GLOBEC representative
- Dr. Yukimasa Ishida replaced Dr. Michael Dahlberg as NPAFC representative

BASS Task Team

- Mr. G.A. McFarlane replaced Dr. Richard J. Beamish (Canada)
- Dr. Masahide Kaeriyama replaced Dr. Makoto Terazaki (Japan)

MODEL Task Team

- Dr. Da-Ji Huang replaced Prof. Ji-Lan Su (China)

MONITOR Task Team

- Dr. Thomas C. Royer replaced Dr. William A. Karp (U.S.A.)
- Dr. Warren S. Wooster (U.S.A.) was added as a new member

REX Task Team

Dr. Michael Henderson was removed (Canada)

Dr. William T. Peterson replaced Dr. Anne B. Hollowed (U.S.A.)

3. Observers

Invitation letters to attend PICES VIII were sent to inter-governmental and non-governmental organizations using the PICES standing list. Organizations and Programs that accepted our invitation are:

Global Ocean Observing System (GOOS) Dr. Ned Cyr

International Pacific Halibat Commission (IPHC) Dr. Steven R. Hare

Intergovernmental Oceanographic Commission Dr. Ned Cyr

North-East Asian Regional GOOS (NEAR-GOOS) Prof. Jihui Yan

North Pacific Anadromous Fish Commission (NPAFC) Dr. Yukimasa Ishida

Scientific Committee on Oceanic Research (SCOR) Dr. Suam Kim

4. Travel and representation at other organization meetings

a. Ms. Patricia Livingston attended the ISC's (Interim Scientific Committee for Tuna and Tuna-like species in the North Pacific) Annual Meeting in Honolulu in January.

b. Dr. Alexander Bychkov and Ms. Patricia Livingston attended the NPAFC CSRS (North Pacific Anadromous Fish Commission – Committee on Scientific Research and Statistics) meeting in Vancouver in March. Ms. Christina Chiu also traveled to Vancouver at the same time to discuss PICES VIII preparations with Dr. Vladimir I. Radchenko.

c. Dr. Chang-Ik Zhang attended the SCOR/ICES Symposium on Ecosystem Effects of Fishing/SCOR Working Group 105 meeting in Montpellier, France, in March.

d. Dr. Alexander Bychkov and Ms. Christina Chiu traveled to La Jolla to discuss the Beyond El Niño Conference preparations with the Local Organizing Committee in April.

e. Dr. Alexander Bychkov and Ms. Christina Chiu attended the Pension Society Meeting in Ottawa in April.

f. Ms. Patricia Livingston visited the PICES Secretariat and met with Mr. Martin Esseen of the United Nations Development Programme (UNDP) in April.

g. Dr. Alexander Bychkov and Ms. Christina Chiu traveled to Vladivostok to discuss Annual Meeting preparations with the Local Organizing Committee in April.

h. Dr. Alexander Bychkov attended the MEQ Workshop briefly in Vancouver in June.

i. Dr. Hyung-Tack Huh attended IOC's (Inter-Governmental Oceanographic Commission) Assembly in Paris in June.

j. Support from the Trust Fund was provided for Dr. Boris Ivanov to attend the WG 12 meeting in Qingdao, People's Republic of China, in August.

k. Dr. Alexander Bychkov went to Vancouver to visit the Secretariats of the North Pacific Anadromous Fish Commission and the Pacific Salmon Commission in August.

l. Travel support was provided for 4 candidates to attend the interview for the Assistant Executive Secretary position in August.

m. Support was provided for Secretariat staff, Chairman Dr. Hyung-Tack Huh, and Science Board Chairman Ms. Patricia Livingston, to attend the Annual Meeting in October.

n. Travel support was provided for 9 invited speakers to attend the PICES Eighth Annual Meeting in October.

o. Trust Fund travel support to the Annual Meeting was provided as follows:
   - Full support for 9 Chinese scientists;
   - Full support for 1 Korean and 1 Canadian scientist;
   - Partial support for 2 Korean scientists, 1 Canadian scientist, 2 Russian scientists, and 2 scientists from Mexico; and
   - Full support for 1 young scientist.

p. Support was provided to Prof. Jihui Yan to represent NEAR-GOOS and China NEAR-GOOS at the Annual Meeting in October.

q. Ms. Patricia Livingston and Dr. Stewart McKinnell attended the NPAFC Seventh Annual Meeting and International symposium on Recent Changes in Ocean Production of Pacific Salmon in Juneau, Alaska, in October/November (under planning).

5. Publications

List of publications produced this year:

a. Handbook 1999 and the 1999 Handbook for Chairman and Convenors were distributed in January.
b. The 1998 Annual Report was published and circulated in January.
c. A poster and the First Announcement for the Eighth Annual Meeting were printed and circulated in January.
d. A poster and the First Announcement for the Beyond El Niño Conference were printed and circulated in January.
e. Vol. 7 nos. 1 and 2 of PICES Press were circulated in January and July.
f. Scientific Report No. 10: Proceedings of the 1998 Science Board Symposium on the Impacts of the 1997/87 El Niño Event on the North Pacific Ocean and its Marginal Seas, was printed and distributed in March.
g. The 1999 Directory was updated and circulated in June.
h. The Final Announcement for the Eighth Annual Meeting was distributed in June.
i. The Final Announcement for the Beyond El Niño Conference was distributed in June.
j. The special issue of Progress in Oceanography on Ecosystem Dynamics in the Eastern and Western Gyres of the Subarctic Pacific was published in July and will be distributed in October.
k. The book “Dynamics of the Bering Sea” was published in September and will be distributed in October.
l. Scientific Report No. 11: PICES Climate Change and Carrying Capacity Program/Summary of the 1998 MODEL, MONITOR and REX Workshops and Task Team Reports, was published in September and will be circulated in October.
m. Scientific Report No. 12: Proceedings of the Second PICES Workshop on the Okhotsk Sea and Adjacent Areas, was published in September and will be circulated in October.
n. A program and abstracts for scientific sessions were prepared for circulation at the Annual Meeting in October.

6. Inter-sessional meetings

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

a. A 4-day CO_2 Technical Workshop was held April 20-22, 1999, in Tsukuba (Japan);
b. A 2-week MEQ Practical Workshop was held in May 1999, in Vancouver

(Canada);

c. A 5-day WG 12 meeting was held August 10-14, 1999, in Qingdao (China).

The Symposium "Pandalid Shrimp Fisheries:- Science and Management at the Millenium" (September 8-10, 1999) has been co-sponsored with NAFO and ICES.

7. Electronic communication

a. Methods for handling registration and abstract submission for the Annual Meeting have been improved. On line registration and abstract submission to PICES VIII compared to last year: registration through the web increased by more than 20% (to 75%) and submitted abstracts increased by more than 15% (to 50%).

b. The Secretariat continues to disseminate PICES Scientific Report series publications (with graphics) electronically through the PICES Home page.

c. The Long-Term Time Series Data Set Inventory was updated.

d. Updates to the list of internet resources and web sites of interest to PICES scientists were made.

GC Endnote 3

PICES Intern Program

Introduction

A PICES Intern Program will allow individuals from PICES member countries to gain experience in operations of intergovernmental scientific organizations and coordination of multidisciplinary international ecosystem research programs by working in the PICES secretariat for periods of up to one year. The PICES Secretariat would supervise up to one intern at any point in time. PICES would benefit from the intern program **directly** through the presence of an additional professional in the secretariat and **indirectly**, over a period of years, by strengthening the capacity of member states to coordinate their involvement in PICES programs.

Objectives

The PICES Intern Program has two goals:

1. professional development of marine scientists and managers from PICES member countries;

2. increasing the capacity of the PICES Secretariat to support the work of PICES.

Nature of the internship

Under the supervision of the Assistant Executive Secretary, interns will work on projects of the Secretariat relevant to their professional interests and development needs, including ESL (English as a Second Language) training if required. Interns may be given a wide variety of tasks as to assist in:

- preparing information for and providing secretarial support to PICES Working Groups and Scientific and Technical Committees;
- organizing scientific meetings;
- preparing and editing various PICES

publications;
- coordinating international cooperative program in marine science; and
- coordinating PICES activities with efforts of other relevant organizations.

Internships will normally begin on or about April 1 and extend for a period up to a maximum of 12 months.

Qualifications of candidates

Applicants must be staff of the academic or government sector of PICES member-countries, have a M.Sc. or Ph.D. degree, the ability to read, write and speak English (taking into consideration whether English is the candidate's native language), the ability to use computers and the internet, and be self-motivated.

Guidelines for application and selection procedure

In the selection process, it is important to ensure balanced distribution of internships among member countries. There will be an annual competition for PICES interns. A member country that has had an intern in any year is not eligible to have an intern in the following two years.

- Governing Council delegates will be responsible for advertising the PICES Intern Program within their countries.

- Applicants will apply to their main national delegate for PICES, describing their interests and qualifications, providing a resume delineating their academic and work experience and three professional references.

- The national PICES delegate will review applications from his/her country and transmit his/her nominee(s) to the PICES Secretariat for final selection. Applications must be received by the Executive Secretary by the date of the first Governing Council meeting at the PICES Annual Meeting.

- The Chairman of PICES will select the successful candidate in consultation with the Executive Secretary and the Chairman of Science Board.

- The Executive Secretary will inform all Governing Council members of the result of the competition.

Financial support

PICES interns will be provided a stipend of CDN $2,000 per month by the secretariat. Travel costs for the intern to and from the place of residence and the location of the Secretariat will be normally borne by the individual's home country. Travel expenses associated with the intern's work in the Secretariat will be covered by PICES. Since the intern will continue to be an employee with his home institution while at the Secretariat, his/her medical insurance and all other benefits will remain the responsibility of the intern's home country.

REPORT OF SCIENCE BOARD

The Science Board met on October 13 (18:00-21:00), to discuss those agenda items with financial implications for 2000 and beyond. The remainder of the Science Board agenda was considered on October 16 (08:30-12:30). Dr. Stewart (Skip) M. McKinnell served as rapporteur (See *SB Endnote 1* for participants). The Science Board Chairman, Ms. Patricia Livingston, welcomed the members of Science Board and observers and called the meeting to order. She reviewed the agenda and asked for changes and additions. The agenda was adopted without changes (*SB Endnote 2*).

Inter-sessional meetings proposed for year 2000 and beyond (Agenda Item 3a) (See Decision 99/S/1)

Science Board reviewed inter-sessional meetings, Working Group and CCCC Program workshops. The following list was developed, endorsed and forwarded to Governing Council for approval:

a. An NPAFC-hosted workshop (organized by NPAFC and PICES) on “Factors Affecting Production of Juvenile Salmon: Comparative Studies on Juvenile Salmon Ecology between the East and West North Pacific Ocean” on October 29th, 2000, in Tokyo, Japan;

b. A BASS Workshop on "Development of a conceptual model of the Subarctic Pacific Basin Ecosystem(s)", a MODEL Workshop on "Strategies for coupling higher and lower trophic level models", a MONITOR Workshop on "Progress in monitoring the North Pacific", a REX Workshop on "Trends in herring populations and trophodynamics", and a Technical Workshop on "The basis for estimating the abundance of marine birds and mammals, and the impact of their predation on other organisms", October 2000 (immediately prior to PICES IX), in Hakodate, Japan;

c. An NIES-hosted Symposium/Workshop on “North Pacific CO_2 data synthesis” (co-sponsored by PICES and JST/CREST), October 2000 (4 days, immediately prior to PICES IX), in Tsukuba, Japan;

d. A Planning Workshop on “Designing the iron fertilization experiment in the Subarctic Pacific” (co-sponsored by PICES and CRIEPI), October 2000 (2 days immediately prior to PICES IX), in Tokyo, Japan;

e. A CREAMS/PICES Workshop on “Oceanography of the East Asian Marginal Seas”, May 2000, in Vladivostok, Russia.

The following inter-sessional meetings were previously approved and will occur after PICES VIII (Decisions 98/S/2 and 98/S/7):

f. A CCCC/MODEL Workshop on “Lower trophic level modeling”, January 31-February 3, 2000, in Nemuro, Japan. (Note that this was originally proposed to occur January 24-31, 2000);

g. “Beyond El Niño: A conference on Pacific climate variability and marine ecosystem impacts, from the Tropics to the Arctic” (co-sponsored by PICES, IATTC, IPHC, ISC, NPAFC and SCOR), March 23-26, 2000, in La Jolla, U.S.A.;

h. A mini-workshop on “Zooplankton ecology of the North Atlantic and North Pacific” in conjunction with the meeting of the ICES Working Group on

Zooplankton Ecology, April 17-19, 2000, in Honolulu, U.S.A.

Travel support requests for year 2000 (Agenda Item 3b) (See Decision 99/S/2)

Three general categories of travel were discussed to determine their relative priority for financial support from PICES: (1) invited speakers to the Annual Meeting, (2) Working Group preparation, and (3) PICES representatives attending meetings of other organizations. Science Board agreed with the priority as amended. Travel requests within each of these categories were presented by each Committee and Program chairman. Science Board recommended that Governing Council approve the following travel support:

a. At least the equivalent of full support for one invited speaker per Scientific Committee or Program to attend the PICES Annual Meeting;

b. One Co-Chairman of the new MEQ Working Group on Ecology of Harmful Algal Blooms in the North Pacific to visit inter-sessionally the other Co-Chairman for developing a working plan;

c. Science Board Chairman to attend the 2000 ICES Symposium on "100 Years of Science under ICES" in Helsinki, Finland, August 1-4, 2000;

d. One person to attend the SCOR General Meeting in Washington, DC, U.S.A., October, 2000.

Proposed list of publications in 2000 and beyond (Agenda Item 3c) (see Decision 99/S/3)

Science Board reviewed the list of proposed publications and recommended that the following reports be published:

a. Final Report of WG 11 (Consumption of Marine Resources by Marine Birds and Mammals), the Japan/East Sea Bibliography, and Proceedings of the 1999 MONITOR and REX Workshops and the 2000 MODEL Workshop in the PICES Scientific Report Series;

b. Progress reports of WG 8 on Practical Assessment Methodology), WG 12 (Crabs and Shrimps), and WG 13 (CO_2 in the North Pacific) in the 1999 PICES Annual Report;

c. Selection of papers from the 1999 Science Board Symposium on "The nature and impacts of North Pacific climate regime shifts" in a special issue of Progress in Oceanography;

d. Selection of papers from the Beyond El Niño Conference in a special issue of Progress in Oceanography (part of BEN budget);

e. Selected papers from the MODEL Workshop on "Lower trophic level modeling" in Fisheries Oceanography in 2001;

f. Review and results from the PICES WG 13 Technical/CO_2 Intercalibration Workshop, in a bilingual (English/Japanese) report, published by the National Institute of Environmental Studies, Japan (at no cost to PICES).

Future of Working Groups and Scientific Programs (Agenda Item 4d) (see Decision 99/S/4)

Science Board recommended:

a. WG 8 on Practical Assessment Methodology continue for one more year to complete collation, editing and publication of results from the MEQ Practical Workshop (expected completion date: fall 2000);

b. WG 10 on Circulation and Ventilation in the Japan/East Sea be disbanded and the WG 10 report be published on the PICES website as a revisable document;
c. WG 11 on Consumption of Marine Resources by Marine Mammals and Birds be disbanded;

d. WG 12 on Crabs and Shrimps continue for one more year to complete collation, editing and publication of results (no further meetings of the Working Group are required);

e. WG 14 on Effective Sampling of Micronekton continue for at least two more years. Dr. Richard Brodeur (U.S.A.) replace the current Co-Chairman, Dr. Bruce Robison (U.S.A.).
e. To account for gaps in expertise and/or national representation, additional members from Korea and China are requested;

f. Adoption of revised terms of reference for MONITOR Task Team (see GC Appendix B (i)).

The following new PICES Groups were recommended (see Decision 99/S/5):

a. Advisory Panel on Marine Mammals and Birds (under BIO) with a life span of 5 years (see GC Appendix B (ii) for terms of reference);

b. Advisory Panel on Continuous Plankton Recorder Survey in the North Pacific (under CCCC/MONITOR) with a life span of 2 years (see GC Appendix B (iii) for terms of reference);

c. Working Group on the Ecology of Harmful Algal Blooms in the North Pacific (under MEQ) (see GC Appendix B (iv) for terms of reference);

d. Working Group on Climate Change, Shifts in Fish Production, and Fisheries Management (under FIS) (see GC Appendix B (v) for terms of reference).

Relations with other international organizations (Agenda Item 4e) (see Decision 99/S/6)

PICES maintains a Standing List of International Organizations and Programs (revised annually) to indicate which of these should be regularly attended by a PICES representative to facilitate interaction. Science Board endorsed a revised list and forwarded it to Governing Council for approval (see GC Appendix C (i)).

The Scientific Committees and CCCC Program identified the following as their highest priority:

CCCC:	GOOS, GLOBEC
MEQ:	GIWA, GOOS
FIS:	GOOS-LMR, AMAP/ACIA
BIO:	ICES WGZE, GLOBEC
POC:	ARGO, CREAMS, CLIVAR, GOOS, JGOFS, WESTPAC, NEAR-GOOS, SCOR, IOC

Science Board recommended that committees draft letters of interest to the following programs: CLIVAR (POC), NEAR-GOOS (POC), ARGO (POC), GIWA (MEQ), and ICES WGZE (BIO).

PICES relations with GOOS were highlighted as particularly important by most Scientific and Technical Committees and the CCCC Program. Science Board recommended that PICES strengthen its relationship with various GOOS components.

PICES IX Annual Meeting structure (Agenda Item 5a) (see Decision 99/S/7)

A proposal for enhancing the PICES Annual Meeting was discussed by Science Board. Topics included (1) the timing of the Science Board Symposium, (2) the role and visibility of posters, (3) Paper Sessions, and (4) the visibility of young scientists at PICES (See *SB Endnote 3* for the detailed proposal). The proposal was adopted after revision.

The proposal to discontinue the Paper Sessions was not approved but it was generally agreed that Paper Sessions could be considered optional, depending on the number of sessions proposed at each Annual Meeting. Some members of Science Board felt that the opportunity to give an oral presentation outside of themes identified by the committees is an important factor in attracting scientists and new ideas to PICES. The proposals to move the Science Board Symposium to the first day of the Annual Meeting, and to upgrade the visibility of poster sessions (which would also include electronic posters) were endorsed by Science Board. Rather than institute a new award for Best Student Presentation, Science Board recommended that the Chairman's Handbook be revised to reflect the importance of selecting a young scientist for the Best Presentation Award of each committee.

Science Board agreed that young scientists should be advised that some travel funds are available to support their involvement in PICES, and Science Board agreed that the Secretariat, in consultation with the Science Board Chairman, should identify the number of young scientists to receive travel support each year.

PICES Ninth Annual Meeting Topic Sessions and Science Board Symposium (Agenda Item 4c)

Science Board recommended that the following events be held at or in association with PICES IX:

1. Subarctic Gyre processes and their interaction with coastal and transition zones: physical and biological relationships and ecosystem impacts (3/4 day) (SB);

2. Prey consumption by higher trophic level predators in PICES regions: implications for ecosystem studies (1/2 day) (BIO);

3. Recent progress in zooplankton ecology study in PICES regions (1 day) (BIO/CCCC – CCCC agreed to co-sponsor this session in discussion following PICES VIII);

4. Short life-span squid and fish as keystone species in North Pacific marine ecosystems (1 day) (FIS);

5. Large-scale circulation in the North Pacific (1/2 day) (POC);

6. North Pacific carbon cycle and ecosystem dynamics (1 day). (POC/BIO – BIO agreed to co-sponsor this session in discussion following PICES VIII);

7. Results of GLOBEC and GLOBEC-like projects (1 day) (CCCC);

8. Environmental assessment of Vancouver Harbour: results of an International Workshop (1/2 day) (MEQ);

9. Science and technology for environmentally sustainable mariculture in coastal areas (1 day) (MEQ).

Science Board agreed that the duration or number of Topic Sessions could be reduced by Science Board in consultation with the Secretariat, if there are too many concurrent sessions.

Science Board recommended that CCCC Task Teams/Advisory Panels and the BIO

Technical Workshop on "The basis for estimating the abundance of marine birds and mammals, and the impact of their predation on other organisms" meet in the same facility just prior to PICES IX, to allow members to attend each other's sessions.

Science Board recommended that PICES co-sponsor the CREAMS Workshop on "Oceanography of the East Asian Marginal Seas" (May 2000, Vladivostok), and suggested that PICES collaborate with CREAMS in planning the workshop to assist CREAMS in becoming more ecosystem-oriented.

Other items (Agenda Item 4g)

Best Presentation Award winner

Dr. Nathan Mantua (U.S.A.) received the 1999 Science Board Best Presentation Award for his paper (co-authored with Dr. Steven Hare) entitled "On the assessment and identification of recent North Pacific climate regime shifts".

Strategic Workplan (Agenda Item 4a)

Science Board briefly discussed the importance of strategic plans and updating these on an annual basis. The following addition was made to the Science Board Strategic Plan:

- Approved new structure of PICES Annual Meeting ;
- Approved planning of PICES 10th Anniversary Symposium;
- Provided further guidance on implementing/advertising young scientists' travel grant;
- Renewed the practice of updating and prioritizing the list of international programs for PICES collaboration;
- Developed a list of possible topics for future Science Board Symposia (see *SB Endnote 4*).

Other business (Agenda Item 7)

PICES Bureau

Science Board endorsed the principle of the Secretariat's proposal to form a PICES Bureau to assist in the long-range planning of PICES.

PICES X

Science Board endorsed the proposal to hold the PICES Tenth Annual Meeting in Victoria, Canada, and to convene a special anniversary symposium at PICES X (rather than a special inter-sessional meeting for this purpose). Science and Technical Committee Chairmen and CCCC Program Co-Chairmen each nominated one person to an organizing committee for this symposium. The members of the organizing committee are: Patricia Livingston (SB Chairman), Tsutomu Ikeda (BIO), Douglas E. Hay (FIS), John E. Stein (MEQ), Susan E. Allen (POC), David W. Welch (CCCC), and Thomas C. Royer (TCODE).

Publication policy

Science Board discussed the report of the Publication Committee (see Publication Committee report in this Annual Report) and made the following observations and recommendations:

Science Board agreed with the concept that the Local Organizing Committee be responsible for arranging to have suitable numbers of copies of the extended abstracts of papers printed for distribution at the meetings and recommended that this practice be adopted every year.

Science Board discussed the proposal for submitting electronic versions of extended abstracts and mentioned several difficulties that might be associated with such a proposal (difficulty of accessing this on the

web for some scientists, extra work for the Secretariat, and size and format of the files). However, Science Board suggests the implementation of a pilot project (using POC papers) to assess the feasibility of this suggestion. The suggestion of CD-ROM publication of extended abstracts would be deferred to next year.

Science Board agreed with the recommendation that translation of scientific papers be handled on a case-by-case basis and only be endorsed for papers of exceptional merit.

Science Board required further discussion on the possibility of a PICES Tenth Anniversary Publication. Science Board did not want this publication to interfere with PICES present publication preparation and emphasized the need for such a publication to encompass the interests of all PICES scientific disciplines.

Science Board appointed Dr. Howard J. Freeland (Canada) as the Chairman of the Publication Committee.

Working Group nomenclature

Science Board recommended instituting the practice of referring to Working Group by number AND a short title.

Chairman's Handbook revisions (Agenda Item 6)

Science Board identified changes that should be made to the Handbook for Chairmen and Convenors (improving Best Presentation Award advice, definition of Advisory Panels, number of approved keynote speakers, etc.). The Science Board chairman agreed to draft these changes by the end of the year, for consideration by Science Board.

Scientific Committee Terms of Reference

Science Board agreed to review the terms of reference for Science Board and Permanent Committees by e-mail to determine if revisions are required.

Implementation of PICES VII decisions and Science Board recommendations (Agenda Item 4b)

Science Board reviewed progress on implementing of PICES VII decisions and Science Board recommendations (See *SB Endnote 5*).

Closing remarks (Agenda Item 9)

The Science Board Chairman thanked outgoing FIS Chairman, Dr. Chang-Ik Zhang, for his hard work and dedication to PICES over the last three years and welcomed the new FIS Chairman, Dr. Douglas E. Hay. The meeting was adjourned.

SB Endnote 1

Participation List

Patricia Livingston (Chairman, Science Board)*
Tsutomu Ikeda (Chairman, BIO)*
Chang-Ik Zhang (Chairman, FIS)*
Alexander V. Tkalin (Chairman, MEQ)*
Vyacheslav B. Lobanov (Chairman, POC)*

Other
Robin Brown (Chairman, TCODE)*
Suam Kim (Co-Chairman, CCCC/IP)*
David W. Welch (C-chairman, CCCC/IP)*

Warren S. Wooster (Interim Chairman, Publication Committee)
Richard J. Marasco (Chairman, F&A)*
Douglas E. Hay (Chairman-elect, FIS)*
Alexander S. Bychkov (Executive Secretary)
Stewart (Skip) M. McKinnell (Asst. Executive Secretary, PICES)*

*In attendance October 16, 1999

SB Endnote 2

Agenda

October 13, 1999

1. Welcome and opening remarks
2. Adoption of agenda
3. Reports of the SB Chairman, Scientific, Technical, and Publication Committees, CCCC IP, Working and Study Groups with regard to items having financial implications for 2000 and beyond:
   a. Inter-sessional meetings proposed for year 2000 and beyond;
   b. Travel support requests for year 2000;
   c. Proposed list of publications (PICES Scientific Report series and outside journals) for year 2000 and beyond;
   d. Other items.

October 13 and 16, 1999

4. Reports of the Science Board, Scientific, Technical, and Publication 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 workplan items);
   b. Completion of items that were PICES VII decisions by Science Board and Governing Council;
   c. Proposed titles for Topic Sessions and Symposia for the next Annual Meeting (that includes a short paragraph of the goals of the sessions suitable to be put in the first and final announcements and a list of potential convenors);
   d. Proposed list of any future groups along with terms of reference and a list of potential members;
   e. Relations with other International organizations;
   f. 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);
   g. Other items (including Best Presentation Award winner).
5. PICES IX Annual Meeting:
   a. Structure
   b. Topic Sessions and Science Board Symposium
6. Chairman's Handbook revisions
7. Other business
8. Summary of Science Board recommendations
9. Closing remarks

SB Endnote 3

Proposal for New Structure to PICES Annual Meeting

Comments and criticisms received over the last year with regard to the structure of the PICES meeting has led to the following proposal. This proposal seeks to streamline the PICES Annual Meeting, focus our efforts on promoting an interdisciplinary ecosystem approach, promote the participation of young scientists, and upgrade the visibility of poster sessions. The revised structure of the PICES Annual Meeting will include:

1. **Moving the Science Board Symposium to the afternoon of the first day**

Many comments have been made about having the Science Board Symposium last. Often people are in a rush to leave and participation is sporadic from year to year. Making this the first session of the meeting will bring everyone together for interdisciplinary talks that will highlight a key marine science issue (that may also be the focus of the keynote lecture given during the morning of the first day). Everyone

will be fresh and receptive to hearing talks on an important issue.

2. **Promoting more inter-committee topic sessions, removing the paper sessions, and upgrading the visibility of the poster sessions**

If we are to attract quality scientists and papers to the meetings and promote our interdisciplinary, ecosystem approach to North Pacific marine science we should focus on quality topic sessions for committees and promote inter-committee topic sessions. The paper sessions have tended to be the place to put things those do not fit and are sporadic in terms of the number, quality and session attendance. By removing the paper sessions, we will focus more on topic sessions and interdisciplinary sessions. Simultaneously, the poster sessions can be enhanced (and papers that might have gone to paper session can be put into the poster session) by having a formal poster viewing time near the end of each day in conjunction with a social hour. Posters to be focused on for each day can be summarized just prior to the poster session by a person appointed by each committee. This summary would consist of an overview of the posters for a particular topic/committee and it would be given to the attendees showing up for the social hour in the area of the posters. Poster presenters for that session would be required to stand by their poster for that social hour. We should institute an award for Best Poster Presentation. This award would be selected from all the posters presented at the meeting.

3. **Promote the participation of young scientists**

We can increase the participation of young scientists through a young scientists travel fund, which would come from the PICES Trust Fund. On an annual basis, we would put in our Annual Meeting announcements a call for nominations of young scientist's to participate in the annual meeting. Young scientists would be required to submit their abstract, a CV, and a request for travel support to the Secretariat. Selection of young scientists to participate in the meeting would be made on the basis of availability of funds and the amount of participation of the young scientist in the activities of the PICES Annual Meeting. Selection would be made by Science Board in consultation with the Secretariat. Finally, we should institute an award for Best Student Presentation. This presentation would be selected from among all the papers and posters at the meeting.

SB Endnote 4

Science Board Symposium Topic List

Science Board symposium topics may involve several scientific disciplines or highlight an important region or topic area of broad interest to the PICES scientific community. Sometimes topics are suggested by Scientific Committees or Programs or may be developed in consultation with the national committee organizing the PICES Annual Meeting if there are topics that may be of high regional interest. This list of possible topics should be reviewed and updated annually to reflect interdisciplinary topics that are of the greatest interest.

- Technological advancements in observing systems
- Mechanisms of interaction between the North Pacific subtropical and subarctic gyres
- Spatial dynamics of ecosystems
- Regional ecosystem programs of the North Pacific

- Japan/East Sea ecosystem
- East China Sea ecosystem
- Ecosystem dynamics of North Pacific Marginal Seas
- Present state and future directions of North Pacific marine policy
- Change indicators in North Pacific ecosystems (could also be Working Group)
- Conservation biology in marine ecosystems
- Introduction and distribution of exotic Species

SB Endnote 5

Progress on PICES VII decisions and Science Board recommendations

Part A. Decisions

98/S/1: Inter-sessional Workshops and Working Group Meetings

The following inter-sessional meetings were convened:

a. A 2-week MEQ Practical Workshop was held in Vancouver (Canada) in May 1999;
b. A 4-day WG 13 Technical Workshop was held in Tsukuba (Japan) in April 1999;
c. A 5-day WG 12 meeting was held in August 1999 in the People's Republic of China.

98/S/2: CCCC Program and CCCC-IP Task Teams

a. The BASS Task Team planned to convene a 2-day workshop on Development of a conceptual model for the Subarctic North Pacific Gyres immediately prior to the PICES Eighth Annual Meeting in Vladivostok. Due to the absence of one convenor and insufficient attendance at the workshop it was not held;

b. The MONITOR Task Team convened a 2-day Workshop immediately prior to the PICES Eighth Annual Meeting in Vladivostok. Co-convenors were Yasunori Sakurai (Japan) and Bruce A. Taft (U.S.A.);

c. The REX Task Team convened a 2-day workshop on Herring and euphausiids immediately prior to the PICES Eighth Annual Meeting in Vladivostok. Co-convenors were Douglas E. Hay (Canada), William T. Peterson (U.S.A.), Vladimir I. Radchenko (Russia) and Tokio Wada (Japan);

d. The MODEL Task Team should convene a 3-day workshop on Prototype lower trophic level ecosystem model for comparison of different marine ecosystems in the North Pacific, in Nemuro, Japan, in early 2000. Outside funding was obtained for this workshop from the Japanese Science and Technology Agency and Nemuro City. Dates for the workshop have now been fixed at January 24-27, 2000. (Dates have subsequently been changed to January 31-February 3, 2000).

98/S/3: Publications

The following reports were recommended for publication and publication status is as follows:

a. Progress reports of Working Groups 8, 11-14 and the report of the Publication Study Group were published in the 1998 Annual Report;

b. Revised PICES Handbook and Handbook for Chairmen and Convenors were published;
c. Selection of papers from the 1997 Science Board Symposium on "Ecosystem dynamics in the eastern and western gyres of the subarctic Pacific" was published in the special issue of Progress in Oceanography;
d. Selection of papers from the 1998 Science Board Symposium on "Impacts of the 1997/98 El Niño events on the North Pacific Ocean and its Marginal Seas" was published as PICES Scientific Report No. 10;
e. Proceedings of the MODEL, REX and MONITOR 1998 Workshops were published as PICES Scientific Report No. 11;
f. Proceedings of the Second PICES Workshop on the Okhotsk Sea and adjacent areas was published as PICES Scientific Report No. 12;
g. WG 10 report was recommended for publication in the PICES Scientific Report Series. Reviews of the draft report have been completed and publication is pending the receipt of a revised report. (At PICES VIII, POC recommended that this report be published on the PICES website only, as a revisable document.);
h. Review volume on "Dynamics of the Bering Sea" was published by University of Alaska Sea Grant (PICES VI decision).

98/S/4: Future of Working Groups

a. WG 10 on Circulation and Ventilation in the Japan/East Sea was proposed for disbanding in spring 1999 after the POC Committee's approval of the publication of the final report. POC committee approved this report at the PICES VIII meeting so WG10 is now disbanded;

b. WG 11 on Consumption of Marine Resources by Marine Mammals and Seabirds continued its work for one more year and produced a final report that was presented at PICES VIII. Simultaneously, a new Study Group to propose ways to incorporate marine birds and mammals expertise into the PICES structure and activity was established and prepared a new proposal that was accepted at PICES VIII by Science Board;

c. Terms of reference for WG 14 on Effective Sampling of Micronekton were expanded to include the ecological role of micronekton in addition to sampling methods.

98/S/5: New PICES groups

A new standing Publication Committee reporting to Science Board was established with membership consisting of one participant from each member country, selected by Science Board from among members of the PICES Scientific Committees, Working Groups, and Task Teams, together with an elected Chairman and a representative of the Secretariat. Members were nominated inter-sessionally and a letter seeking the support of national delegates for the members of the Committee was sent by the PICES Secretariat. The following members were appointed to the Committee:

Dr. Howard Freeland (Canada), Chairman
Prof. Qi-Sheng Tang (China)
Prof. Takashige Sugimoto (Japan)
Dr. Jang-Uk Lee (Korea)
Dr. Vyacheslav Lobanov (Russia)
Dr. Warren Wooster (USA)
Dr. Stewart McKinnell (Secretariat)

98/S/6: Travel support

a. PICES provided partial support for Dr. Chang-Ik Zhang (FIS Chairman) to attend a joint SCOR WG 105 and ICES symposium on "The Ecosystem Effect of

Fishing" in Montpellier, France, in March 1999;

b. PICES funded travel for two experts to provide a keynote demonstration and/or presentation at the TCODE Workshop on "The application of scientific visualization to marine ecosystem analysis" in conjunction with the PICES Eighth Annual Meeting in Vladivostok;

c. PICES provided financial support for three scientists to attend the REX Workshop on "Herring and euphausiids";

d. PICES funded travel of one invited speaker for the CCCC-related scientific session at the PICES Eighth Annual Meeting.

98/S/7: Co-sponsored meetings

a. PICES will co-sponsor a 4-day conference "Beyond El Nino: A conference on Pacific climate variability and marine ecosystem impacts, from the Tropics to the Arctic" to be held in La Jolla, U.S.A., March 23-26, 2000, with IPHC, IATTC, ISC, NPAFC, and SCOR. The Steering Committee, appointed by the co-sponsoring organizations, included Drs. Paul H. LeBlond and Warren S. Wooster who are serving as Co-Chairmen of the Steering Committee on behalf of PICES. Sections convenors have been selected and planning is proceeding.

b. PICES will participate in a 3-day meeting held with the ICES Working Group on Zooplankton Ecology from April 17-19 in Honolulu, Hawaii, U.S.A. Dr. Tsutomu Ikeda (BIO Chairman) represents PICES as a co-organizer of the joint ICES/PICES parts of the meeting. Discussions are proceeding regarding a mini-workshop on "Zooplankton production ecology of the North Pacific and North Atlantic" in conjunction with this meeting.

Part B. Progress on PICES VII Science Board Recommendations

Japan/East Sea Bibliography

Science Board recommended the publication of the Japan/East Sea Bibliography on the PICES Home Page pending author's (Dr. Mikhail A. Danchenkov, FERHRI, Russia) approval. This proposal was not accepted by Dr. Danchenkov. At PICES VIII, publication in the PICES Scientific Report Series was recommended.

Advisory Panel on Iron Fertilization Experiment

CCCC/IP established an Advisory Panel (under BASS) on "An Iron Fertilization Experiment in the Subarctic Pacific Ocean."

The group met at PICES VIII (see CCCC report in this Annual Report). Its present timetable is to have a planning meeting in conjunction with PICES IX and to write proposals to representative governments for submission by April-June 2000. Presently the iron fertilization experiment is planned for August 2002 in the eastern North Pacific and for 2001 or 2003 in the western North Pacific.

CCCC Best Presentation Award

An award for Best Presentation was given by the CCCC Program during PICES VIII and this will continue in future years.

Proceedings from Annual Meetings

The Korean proposal to publish proceedings from the PICES Annual Meetings was referred to the Publication Committee for consideration at PICES VIII. They agreed that proceedings of scientific sessions

would be too expensive to produce and unnecessary when PICES is moving toward putting extended abstracts on the web.

PICES – ARGO/GODAE relations

Science Board recommended at PICES VII that PICES member countries create appropriate structures (such as national committees, or GOOS sub-committees) to consider and prepare for participation in GODAE and ARGO, and that data from ARGO and assimilation results from GODAE originating from PICES member countries be made generally available to all scientists. These structures were established by many nations, and PICES scientists (Drs. Stephen C Riser (U.S.A.), Howard J. Freeland (Canada) and Takashige Sugimoto (Japan)) are playing leading roles in these activities.

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

The Biological Oceanography Committee met on morning of October 13, 1999. The Chairman, Dr. Tsutomu Ikeda, called the meeting to order and welcomed the members of the Committee and observers (see *BIO Endnote 1*). Dr. Paul J. Harrison served as rapporteur. The agenda for the meeting appears in *BIO Endnote 2*.

Old business (Agenda Item 3)

Dr. Ikeda informed the Committee that Dr. Takashige Sugimoto was representing BIO on the Publication Committee and Dr. Michael M. Mullin was acting as Chairman of the Local Organizing Committee for the Beyond El Niño Conference. BIO supports these nominations.

Report of Working Group 11 (Agenda Item 4)

The BIO Committee approved the final report of Working Group 11 on Consumption of Marine Resources by Marine Mammals and Seabirds and recommended its publication in the PICES Scientific Report Series. It was also recommended that the Working Group should present a report to all PICES scientists through a Topic Session and a Workshop at next year's PICES meeting *(BIO Endnote 3*).

Dr. Patricia A. Wheeler reported that at the PICES Seventh Annual Meeting in Fairbanks, Science Board established a Study Group to determine the best way to incorporate and maintain marine mammal and bird expertise in PICES activities. The Study Group recommends establishment of an Advisory Group with a life span of 5 years and terms of reference as listed (*BIO Endnote 4*). BIO supported this recommendation.

Report of Working Group 14 (Agenda Item 5)

Dr. Ikeda reported that two new members, Dr. David L. Mackas (Canada) and Naoki Iguchi (Japan) have been recruited to WG 14. Because of the absence of both Co-Chairmen of WG 14, discussion was limited to the modification of the report content. Dr. Vladimir I. Radchenko suggested that euphausiids should not be included as micronekton while other PICES participants thought that euphausiids are important and should be included. It was recommended that WG 14 make a decision and report next year to the BIO Committee. As for future aspects, it was suggested that dynamics and processes be included. Dr. Atsushi Tsuda reviewed the Micronekton Symposium held in Pusan.

BIO members discussed ways to strengthen the activities of WG 14 by nominating a new Co-Chairman and increasing its membership. Dr. Richard D. Brodeur (U.S.A.) was suggested to replace the current Co-Chairman, Dr. Bruce Robison (U.S.A.), and Dr. W.-D. Yoon was suggested as a new member from Korea by Dr. Woong-Seo Kim. Considering the slow development of the Working Group, BIO is requesting at least a 1-year extension of the lifespan of WG 14.

WG 14 proposed a one-day Working Group meeting just prior to the PICES Ninth Annual Meeting in 2000. BIO endorsed the proposal.

PICES/GOOS relations: Outcome of the MONITOR Workshop (Agenda Item 6)

Dr. Bruce A. Taft briefed the Committee on PICES/GOOS relations, noting that GOOS has paid little attention to the Subarctic

Pacific. Relevant to BIO was the Continuous Plankton Recorder (CPR) pilot project for living marine resources (plankton), and the inter-calibration of zooplankton sampling gear.

PICES Plankton Monitoring Program (Agenda Item 7)

Dr. David W. Welch reported on the PICES CPR program for the eastern North Pacific and southern Bering Sea (currently funded for two years through the North Pacific Marine Research Initiative). The rationale of the program is the face of global warming and its possible effect on the plankton community. As a relevant topic, Dr. Kim and Dr. Young-Shil Kang reported on the Korean monitoring project over the last 30 years, and the initiation of a new project also using the continuous plankton recorder.

ICES/PICES Zooplankton Ecology Workshop (Agenda Item 9)

BIO members discussed ways to participate actively in the ICES/PICES Workshop on Zooplankton Ecology, and recommended that Science Board request a formal letter of invitation from ICES, clearly stating the terms of reference, and the names of the scientists for the ICES Working Group. The BIO Committee was very positive about the participation of PICES in the workshop and the potential for active collaboration between PICES and ICES on monitoring and comparisons of the Pacific and Atlantic Oceans.

Arctic Monitoring and Assessment Programme (Agenda Item 9)

BIO members were in favour of involvement in the Arctic Monitoring and Assessment Program (AMAP), and would like to participate and be informed of their progress. The BIO Committee agreed that the CCCC/MONITOR Task Team should be the contact group for PICES.

Proposals for special topics for PICES Annual Meeting in 2000 (Agenda Item 10)

BIO agreed to a half-day Workshop (see *BIO Endnote 4*) and a half-day Topic Session as requested by the Working Group 11. BIO would also like to sponsor a Topic Session on Zooplankton Ecology (*BIO Endnote 5*), either as a 1-day session or co-sponsored with CCCC. Depending on whether CCCC is interested in the co-sponsorship, we may have to sacrifice the half day for BIO Paper Session.

Best Presentation Award (Agenda Item 11)

Nominations were tabulated for the Best Presentation Award. Based on these nomina-tions the BIO Committee selected a short list of four candidates and voted for Dr. Toru Kobari for his paper (co-authored with T. Ikeda) “Interannual variabilities in abundance and body size of *Neocalanus* copepods (Crustacea: copepoda) in the central North Pacific” as the 1999 best BIO presentation.

Other business (Agenda Item 12)

Dr. Harrison reported on the need to officially recognize and adopt the *ecozones* that were listed in the 1996 PICES Scientific Report No. 4 (CCCC Implementation Plan, p. 24). It was recognized that these zones may change interannually and for different trophic levels.

BIO agreed that a workshop on the utilization of fishing vessels for monitoring will be very useful. However, BIO felt that the title should be changed to “ships-of-opportunity” which would include training vessels. This workshop should be co-

sponsored by CCCC and the MONITOR Task Team and not by BIO.

BIO members were in favour of the proposed Working Group on the "Ecology of Toxic Algae", but the name should be changed to "Ecology of Harmful Algal Blooms in the North Pacific". The second task of the Working Group should be changed to – "seek links between bloom events and environmental factors and trophic interactions and possible anthropogenic stresses". The new Working Group should report to MEQ and BIO (and not just MEQ).

BIO Endnote 1

Participation List

Canada
Paul J. Harrison*

Japan
Tsutomu Ikeda* (Chairman)
Takashige Sugimoto*
Atsushi Tsuda*
Tokio Wada

Korea
Joong-Ki Choi
Young-Shil Kang
Woong-Seo Kim*

Russia
Vladimir I. Radchenko*

U.S.A.
David Checkley
William T. Peterson
Patricia A. Wheeler*

*BIO Committee member

BIO Endnote 2

Agenda

1. Welcome and introduction of members
2. Approval/modification of agenda
3. Business arising from last year's meeting
4. Report of Working Group 11 on Marine birds and mammals
5. Report of Working Group 14 on Micronekton
6. PICES/GOOS relations: outcome from MONITOR Workshop
7. PICES Plankton Monitoring Program
8. ICES/PICES Zooplankton Ecology Workshop
9. Discussion of possible involvement in the Arctic Monitoring and Assessment Programme (AMAP)
10. Proposals for the special topic for PICES Annual Meeting 2000
11. BIO Best Presentation Award
12. Any other business
13. Summary of BIO recommendations for Science Board

BIO Endnote 3

Working Group 11 on Marine Birds and Mammals: Topic Session and Workshop

Topic Session on Prey consumption by higher trophic level predators in PICES regions: implications for ecosystem studies (½-day)

1. Complete review of details of the scientific content of WG11 report and future problems.
2. Role and significance of higher trophic level predators in the PICES Region.

3. How to incorporate marine birds and mammal components to PICES ecosystem study.

Workshop to review the technical basis for estimating the abundance of marine birds and mammals, and the impact of their predation on other organisms (½-day).

BIO Endnote 4

Report of the Study Group incorporating Marine Mammal and Bird expertise into PICES

At PICES VII in Fairbanks, the Science Board recommended, and Governing Council approved (Decision 98/S/4), that WG 11 on Consumption of Marine Resources by Marine Mammals and Seabirds continue its work for one more year to prepare and present a final report at PICES VIII, and simultaneously, a new Study Group be established to propose ways to incorporate marine birds and mammals expertise into the PICES structure and activity. The following terms of reference were suggested:

1. Inter-sessional communication to formulate a plan for incorporation of marine birds and mammals into the PICES structure and activities.

2. Nominate 4 marine mammal and 4 marine bird experts to serve on CCCC Task Teams and be invited to attend PICES VIII.

3. Convene at PICES VIII to finalize recommendations and submit to BIO, CCCC and Science Board.

The Study Group corresponded by e-mail during the year and agreed on the following proposal regarding the formation of a special Advisory Group on Marine Mammals and Birds. Based on the past exchanges, it would seem valuable to have an appropriate marine bird and marine mammal person assigned to each of the CCCC Task Teams. This group of marine bird and mammal scientists could then be collectively joined in a special Advisory Group to the BIO Committee. This group would meet during the Annual Meetings, its members would be urged to participate in science sessions, and it would have a Chairman or Co-Chairmen to facilitate communication with BIO. The Advisory Group should have a lifespan of 5 years, and be renewed only by vote of BIO. If this effort to integrate bird and mammal scientists into the fiber of PICES is successful, in a few years having a special group for birds and mammals should not be necessary. This approach avoids setting up a permanent Working Group or a new Scientific Committee organized around taxonomic groups.

BIO Committee Advisory Panel on Marine Mammals and Birds

Purpose: To integrate marine mammal and bird research into PICES activities, particularly with regard to the BIO Committee and the CCCC Program. This group would correspond during the year and meet at the PICES Annual Meeting. A chairman for the group will be selected and will be the primary point of contact between the group and other PICES entities. Duration: 5 years, to be renewed only by vote of BIO.

Terms of Reference:

1. Provide information and scientific expertise to BIO, CCCC Program, and,

when necessary, to other scientific and technical committees with regard to the biology and ecology 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 reports and symposia.

4. Develop strategies to improve collaborative, interdisciplinary research with marine mammal and birds researchers and the PICES scientific community.

BIO Endnote 5

Topic Session: Recent progress in zooplankton ecology study in PICES regions

Objective: Although zooplankton is an integral component of marine ecosystem, past PICES symposia have largely focused on key species which form a large biomass and are known as important prey organisms for higher trophic level predators. One good example is *Neocalanus* in the subarctic Pacific. However, zooplankton includes diverse taxa about which relatively little is known. There may be unappreciated taxa of significant trophic importance (such as gelatinous zooplankton), about which there is little information currently available for the subarctic Pacific and marginal seas. This 1-day session invites zooplankton researchers from North Pacific rim countries to review the current status of such organisms within the PICES region, including topics like systematics, distribution, life cycle, production, trophic interaction, genetics, etc. The subject may also be of interest of CCCC.

Convenors: Tsutomu Ikeda (tentative), others to be determined.

REPORT OF FISHERY SCIENCE COMMITTEE

The Fishery Science Committee met on the morning of October 13, 1999, in Vladivostok. The Chairman, Dr. Chang-Ik Zhang, opened the meeting and welcomed new members, Drs. George W. Boehlert (U.S.A.) and Victor V. Lapko (Russia) (*FIS Endnote 1*). The agenda was reviewed and approved by all members (*FIS Endnote 2*). The Chairman appointed Dr. Douglas E. Hay as rapporteur.

Election of Chairman (Agenda Item 2)

As per the PICES Rules of Procedure, Executive Secretary Dr. Alexander S. Bychkov called for nominations. Dr. Tokimasa Kobayashi nominated Dr. Hay (Canada), and he was elected by acclamation as the new Chairman of the FIS Committee. The Committee unanimously expressed its gratitude for Dr. Zhang's leadership and efforts.

Report of Working Group 12 on Crabs and Shrimps (Agenda Item 4.1)

Dr. Robert S. Otto, Chairman of WG 12, summarized their activities. WG 12 convened its fourth and final meeting in Qingdao, China, from August 10-14, 1999. Dr. Otto presented an interim report (*FIS Endnote 3*), reviewed the activities of this meeting and briefly discussed problems related to the species diversity and assembly of data related to crabs and shrimps. Following the presentation there was discussion about the status and completion date for the final report. The FIS Committee noted that in the 1998 report (PICES VII) FIS requested "a completed, final report from WG 12 at PICES VIII in Vladivostok". Dr. Otto indicated that he was hopeful that the final report could be presented at PICES IX. This report will be submitted to the FIS Committee for their review.

Travel support (Agenda Item 4.4)

PICES provided partial support for Dr. Chang-Ik Zhang to attend a joint SCOR WG 105 and ICES Symposium on "The Ecosystem Effects of Fishing" in Montpellier, France, in March 1999.

FIS Strategic Plan: accomplishments and changes (Agenda Item 5)

The Committee reviewed the details of the FIS Strategic Workplan for Phase 3: PICES VII to X, as presented in the 1998 Annual Report, Section 5, pages 86-87. The Committee agreed to make changes to 4 sub-sections, as indicated below.

<u>Establishment of new Working Groups (revised)</u>

In the course of its work, the FIS Committee may identify specific research questions which may require further cooperative assistance. Working Groups may be established to address these issues. Approved Working Groups must establish terms of reference and a workplan to accomplish their goals, subject to review by FIS. Working Group meetings, topic sessions, or workshops should be developed as needed to complete the objectives. The FIS Committee should monitor the progress of its working Groups to ensure timely completion of their work.

<u>Scientific contribution from FIS (revised)</u>

In deliberations of its Working Groups, symposia, and special sessions, the FIS Committee should strive to maximize the

dissemination of work products to the broad scientific community. To the extent possible, consideration should be given to publication in established series of fisheries and ocean science.

Integration of biological interactions and physical impacts (new)

FIS will encourage the development of an integrated understanding of the interaction among species. This will include incorporating impacts of climate and physical oceanographic variability.

Coordination of research programs and data exchange

FIS will encourage the reporting of results of national research programs, and TCODE's work for collecting and distributing information for PICES nations on an annual basis.

Review the scientific activity in the CCCC program and the international GLOBEC (Agenda Item 6.1)

The inclusion of environmental indices in stock assessment processes was illustrated by several of the presentations at the PICES Eighth Annual Meeting. This was followed by a general discussion of how FIS can interact with CCCC. There may be opportunities for a joint FIS/CCCC workshop concerned with the biological/physical sciences that examine effects of climate on recruitment processes.

In subsequent discussion, it was suggested that FIS could play a role to assist with coordination between national activities connected with the CCCC Program. Specifically, FIS could (1) provide lists of research institutes which conduct CCCC programs; (2) determine the coordinator from each national institute; (3) present national research programs connected with fisheries; and (4) establish a Working Group on the coordination of stock assessment activities, inventory assessment methods and determination of priority of methodology development. It was acknowledged that these are useful suggestions; much of these activities is presently conducted by other groups, including TCODE, the CCCC Program and GLOBEC.

Participation in the CCCC and GLOBEC programs is highly encouraged.

SCOR WG 105 activity (Agenda Item 6.2)

SCOR WG 105 and ICES held a symposium on "The Ecosystem Effects of Fishing" on March 16-19, 1999, in Montpellier, France. A "Report of the Activity of SCOR Working Group 105" was submitted to PICES in February 1998, and introduced in PICES Press, Vol. 6, No. 1. The "Report on the ICES/ SCOR Symposium on Ecosystem Effect of Fishing" was published in PICES Press, Vol. 7, No. 2. SCOR WG 105 will complete its activity after the final summary report with a concluding paper presented at the coming SCOR Annual Meeting. Many of the papers presented at that meeting will be published in an issue of ICES Journal of Marine Science.

Relationship with regional fisheries organizations or commissions (Agenda Item 6.3)

The MOUs with the North Pacific Anadromous Fish Commission (NPAFC) and ICES were signed in November 1998 (see pp. 29-32 in the 1998 Annual Report).

The FIS Committee briefly discussed (1) the proposed UNDP-GEF North Pacific Transboundary Project and (2) the NPAFC/PICES Juvenile Salmon Workshop, and recommended that PICES endorse them.

Arctic Monitoring and Assessment Programme (AMAP) (Agenda Item 6.4)

The objective of this project is the assessment of climate change in Arctic regions. Although the focus of this project is narrow relative to the broader scope of PICES, there are a number of important species whose distributions extend into Arctic waters. For this reason, the FIS Committee endorsed the suggestion that a formal connection to this programme be established.

PICES/GOOS relations (Agenda Item 6.5)

The MONITOR Workshop provided a forum for PICES scientists to learn about GOOS and to develop recommendations for PICES future involvement. The Science Board Chairman, Ms. Patricia Livingston, reported that PICES could benefit from some GOOS activities, such as the attempt to determine the monitoring activities of various countries. Also many PICES activities should be of interest to GOOS. In particular, PICES may consider pointing out the existence and importance of fisheries data to GOOS. For these reasons the FIS Committee recommended sending a representative to the GOOS meeting in Chile.

New Working Group(s) (Agenda Item 6.6)

Three proposals for new Working Groups were presented at the meeting. Dr. Richard J. Beamish proposed a Working Group to examine "Climate change and shifts in fish production". Dr. Mikhail Stepanenko recommended a Working Group to examine "stock assessment and methodological development". Dr. Tokio Wada recommended a Working Group to examine "Climate change and fisheries management". In addition, there was a suggestion from Dr. Boehlert for a future Working Group to consider "Habitat selection and habitat utilization by migratory species in the North Pacific".

The Committee noted the close similarity of the proposals by Drs. Beamish and Wada, and recommended that these be unified with the title: "Climate change, shifts in fish production, and fisheries management", with Drs. Beamish and Wada as Co-Chairmen. The Co-Chairmen drafted the rationale and terms of reference as indicated below.

<u>Terms of reference for a new Working Group on Climate Change, Shifts in Fish Production, and Fisheries Management</u>

It was generally agreed that climate and ocean changes have a directed impact on the population dynamics of species of interest to the FIS Committee. The Working Group will identify key examples of species that have been affected by climate and ocean changes. The impact of these physical changes will be assessed in relation to fishing effects. The impact of inter-annual and decadal-scale physical changes will be investigated. Where possible, the mechanisms linking climate and ocean changes to changes in the populations dynamics will be described or hypothesized. Using these mechanisms and indices of climate change, the Working Group will investigate the possibility of long-term forecasting of changes in population dynamics and ecosystem structure.

FIS Topic Session for PICES IX (Agenda Item 7)

FIS supported a proposal by Dr. Yasunori Sakurai to hold a one-day Topic Session at the PICES Ninth Annual Meeting on "Short lifespan squid and fish as keystone species in North Pacific marine ecosystems". Recom-mended convenors are Drs. Yasunori Sakurai (Japan) and Richard D. Brodeur (U.S.A.).

FIS endorsed a proposal for a 2-day acoustic workshop, sponsored by Hokkaido University, to be held in Hakodate, in conjunction with the PICES IX.

FIS noted and endorsed the recommendation from the REX Task Team for a 2-day workshop with the first day examining trends in North Pacific herring populations and the second day examining trophodynamic interactions in ecosystems that support herring populations.

FIS endorsed the proposed joint REX-BASS Workshop/Symposium to examine linkages between the production in subarctic gyres and resulting impacts in coastal and transition zones.

Best Presentation Award (Agenda Item 8)

FIS voted for the Best Presentation Award from talks presented during the FIS Topic and Paper Sessions. The award went to Dr. Svetlana Davidova (Russia) for her excellent presentation titled "Spawning of subtropical species in Peter the Great Bay in 1991-1998".

FIS Endnote 1

Participation List

Canada
Richard J. Beamish
Douglas E. Hay
Gordon A. McFarlane

China
Qi Sheng Tang

Japan
Akihiko Hara
Tokimasa Kobayashi

Korea
Jin-Yeong Kim
Suam Kim
Chang-Ik Zhang (Chairman, FIS)

Russia
Victor V. Lapko
Mikhail Stepanenko

U.S.A.
George W. Boehlert

FIS Endnote 2

Agenda

1. Welcome and introduction of members
2. Election of new Chairman
3. Discussion and approval of agenda
4. Review of the implementation of PICES VII decisions
   - 4.1 Review and adopt the WG 12 Final Report (98/S/1c)
   - 4.2 Relations with other organizations and program (98/S/2c)
   - 4.3 Publications of reports (98/S/3a)
   - 4.4 Travel support (98/S/6a)
   - 4.5 Co-sponsored meetings (98/S/7a)
5. FIS Strategic plan: accomplishments and changes
6. Scientific items of the interests
   - 6.1 Review the scientific activity in the CCCC Program and the international GLOBEC
   - 6.2 SCOR WG 105 activity (98/S/6a)

6.3 Relationship with regional fisheries organizations or commissions
   a. UNDP-GEF North Pacific Transboundary Project
   b. NPAFC-PICES Juvenile Salmon Workshop
6.4 Discussion on involvement in Arctic Monitoring and Assessment Programme (AMAP)
6.5 PICES/GOOS relations: outcome from MONITOR Workshop
6.6 Possibility to establish new Working Group(s)
7. Proposals for the session topic for PICES IX
8. Discussion of Best Presentation Award from FIS
9. Discussion of any other arising issues
10. Draft of report and summary of FIS recommendations to Science Board

FIS Endnote 3

Interim Report of Working Group 12 on Crabs and Shrimps

Introduction

Working Group 12 (WG 12) held its interim meeting in Qingdao, China, from August 10 to 14, 1999. The main purposes of the fourth and last meeting were to consider:

1. Crab and shrimp fisheries of China including aquaculture.
2. Spatial structuring of crab and shrimp populations.
3. Effectiveness of marine sanctuaries and restrictions of fishing activities on crabs and shrimps.
4. Conclusion of WG 12 activities and provision of final report to FIS.
5. Recommending how various topics concerning crabs and shrimps might best be integrated into PICES for longer-term consideration.

Attendance was 8 of 15 members in 1999 as also occurred in 1998. This was the first meeting at which all six member nations were represented (WG 12 Annex 1). A comprehensive review of Chinese fisheries within the PICES area was the major undertaking of the meeting.

Members re-iterated their belief that it is desirable for scientists from North Korea to attend future PICES meetings since we were unable to receive information over the full range of some stocks.

Review of Terms of Reference

WG 12 considered terms of reference formally adopted by FIS in 1997 and again reviewed in 1998. It was agreed that they should be reconsidered depending upon the context in which crab and shrimp are to be included in future PICES deliberations. Accordingly, terms of reference were to:

1. Consider those crabs, shrimps and lobsters that are utilized in commercial, subsistence or recreational fisheries. This may include introduced species if they are directly important or impact human utilization of any other marine species.

2. Identify persons from each country that are performing scientific work on the distribution, recruitment, larval transport, migration, population dynamics, and influences of environmental conditions for crabs and shrimps.

3. Identify data that are available that would assist in the analyses of factors affecting abundance trends.

4. Review and exchange current knowledge and data concerning factors affecting abundance and survival of crabs, shrimps and spiny lobsters and identify key scientific questions regarding reasons for abundance fluctuations.

Consideration of Chinese crab and shrimp fisheries

A. Overview

The PICES Region contains all of the Northeast Pacific (FAO Area 61), the U.S. portion of the East Central Pacific (Area 71) and most of the Northwest Pacific (Area 67). Looked at in this way and making appropriate deductions for fresh water species, landings by Taiwan or various territorial possessions, the PICES Region contains approximately 43% of world crab resources and 23% of world shrimp resources according to 1991 - 1995 United Nations (FAO) landing statistics. Of these amounts, Chinese production would be 40% of crabs and 80% of shrimps over the same period. Until our meeting, it was not possible to deduce the importance of many individual resources from UN/FAO statistics or the contribution of aquaculture as opposed to harvest of wild stocks. Although the PICES Region encompasses most of Area 67, it was also unclear what portion of Chinese waters should be included in the PICES area and how much production was due to aquaculture rather than the harvest of wild stocks. Most of what follows concerning wild stocks is condensed from a report titled "Overview on the Crustaceans in the Chinese Waters of the PICES Region" by Zhi-Meng Zhaung and Jing-Yao Deng. Aquacultural information was provided by "History and Present Status of Shrimp Culture in China" by Sheng-Li Cai and Qing-Yin Wang. Both reports were delivered at the WG 12 meeting in Qingdao. Chinese waters of the PICES Region include the Bohai Sea, the Yellow Sea and the portion of the East China Sea north of 24ºN (Taiwan Straits). These waters contain about 300 species of crabs and shrimps if one excludes anomurans (mostly hermit crabs, Paguridae) but includes stomatopods (particularly *Squillidae*). Generally, the northern waters of China have fewer species of crabs and shrimps than southern waters. Since most Chinese shrimp fisheries exploit penaeid shrimps and most crab fisheries exploit Portunidae (the swimming or blue crabs) the following example suffices:

Table. *Average catch during the 1980s*

Area	Peneid Species	Portunid Species	Landings (t)
South China Sea	90	40	70,000
East China Sea	51	20	255,000
Yellow Sea	10	4	
Bohai Sea	3	2	98,300
Total commercial crabs and shrimps	30 species		465,800

While the decrease in taxa may reflect increasingly estuarine conditions as well as latitude, crab and shrimp species in Chinese PICES waters are largely derived from southern groups. These generally have shorter life spans than their northern counterparts. For example, most commercial shrimps in Chinese waters reach commercial size in six months and complete their life cycle in about one year, while pandalid shrimps in Russian waters complete there life cycle in about five years.

Crabs and shrimps in the Bohai and Yellow Seas have been fully exploited while those in the East China Sea still show considerable potential for expansion.

B. Consideration of Chinese crab fisheries

The gazami or blue crab (*Portunus trituberculatus*) is the most important species in China as a whole, and as well as in the PICES Region. This species and several other portunid crabs are intensively aquacultured in some areas of China including parts of the East China Sea coast, and it is not possible to separate aquacultural production from wild harvests. There are intensive Chinese fisheries for wild stocks of gazami crab in the Yellow and Bohai seas, where crab culture is absent. Important fisheries for this species also occur in Japan and Korea, making this the world's largest single species crab fishery. This is the only crab of any importance in the Chinese portion of the PICES Region.

Gazami crabs are frequently harvested as by-catch in trawl fisheries in the East China and Yellow Seas. They are abundant in the Bohai Sea where they are harvested with drift nets (a type of gill net) and bottom trawls. The species inhabits shallow waters in the summer months and migrates to deeper water as the sea cools in autumn. Females and later males migrate to spawning grounds in summer, peak mating occurs in September and there may be two incubations per year. Larvae are planktonic and have 6 larval stages. Incubation and larval development occur over a period of 20-30 days Gazami crabs may reach 650 g but most in commercial catches are from 140 to 340 g. Both males and females are harvested.

Catches have been stable or increasing overall but there is evidence of depletion in some areas. For example, the Wenzhou fishery landings were 6,800 t by 300 vessels in 1978 but 10,400 t by 2000 vessels in 1982. The combined Bohai and Yellow Sea catch ranged from 15,800 to 65,900 t and averaged 29,588 t from 1987 to 1997. In contrast, the catch in all Chinese waters rose from 104,535 t in 1987 to peak at 292,000 t in 1994, but has averaged 237,841 in the past five years of record. Various management measures such as closed seasons and protected areas are being considered to protect spawning stocks and reduce the catch of immature crabs.

C. Consideration of Chinese shrimp fisheries

Three groups of shrimps are important wild stocks in the PICES area of Chinese waters. These are the mantis shrimps (*Oratosquilla oratoria*, one species only), the penaeid shrimps (15 species of which *Penaeus chinensis*, *Metapeneaus joyneri* and *Trachypeneus curvirostris* dominate peneaid fisheries) and the akiami paste shrimp (*Acetes chinensis*). An additional six species of shrimps (four families) are considered major species but are either of small importance to fisheries or not distinguished in landings. Unlike crabs, shrimp are cultured in coastal areas within the PICES region. The major cultured species are all penaeids (*P. chinensis, P. monodon* and *P. japonicus* dominate). We were not able to report the species composition or production within the PICES Region at this time. For this reason and in the interests of brevity, consideration of shrimp aquaculture will be deferred to our final report.

Mantis shrimps are stomatopods of the family Squillidae and not closely related to the much more familiar decapod shrimps. We include them here as they are unique and interesting although of only small importance, except in the Bohai Sea. Mantis shrimps are widely distributed in Chinese waters and they are also found in Korea and Japan, where they were

historically more important than the present. Compared to decapod shrimps in the area, these are slow growing and reach 150 to 175 mm length at age 3. The maximum size is 210 mm (113 g) for females and 177 mm (68 g) for males. Mating occurs in September and October. They tend to live in burrows during the winter season (December to March) leading to low catch rates but catch rates are similar during other months. Larvae occur in plankton samples in May, and they persist in the plankton for 4-5 months. Larvae reach a maximum size of 26 mm as compared to 30 mm for the first benthic stages which are observed in November. In 1982 the spawning biomass was estimated at 2,500 t and overall abundance was estimated at about 5,000 t.

The blue shrimp (*T. curvirostris*) is extremely widely distributed from Africa to Australia as well as southern and eastern Asia, including China, Japan and Korea. Despite wide distribution, directed fishing occurs largely in China. In the PICES region, the blue shrimp is particularly abundant in the Bohai and Yellow Seas where the coastal waters of Shandong Province are major fishing grounds, as are certain Korean waters. It is also found in the East China Sea. Most fishing occurs during the reproductive and wintering seasons when dense schooling occurs. The habitat is generally 20 to 40 m in the Bohai and Yellow seas. Spawning begins in May and peaks in June and July. As is true of other penaeids, diet includes small molluscs and particularly planktonic polychaetes and crustaceans. Chinese landings from the Yellow and Bohai Seas have increased drastically over the past 20 years and averaged 48,018 t for 1988-1997, as compared to 15,557 t during the previous decade. While there is potential for further development in the South and East China Seas, the Yellow and Bohai Seas are considered over-exploited. Management measures being considered include catch quotas on the wintering population, time-area closures to protect spawning concentrations and effort limitation for both motorized trawling and fixed nets.

Economically, the fleshy prawn (*P. chinensis*) has been the most important commercial species in the Yellow and Bohai Seas. It has also been extremely important in China as a whole where landings averaged 167,527 t from 1986 to 1995. In the Yellow and Bohai Seas, fleshy prawns have been exploited by Korea and Japan as well as China. Japan stopped fishing in 1987. Landings from 1986-1995 were 14.7% Korean, 5.1 % Japanese and 80.2% Chinese while averaging 7,916 t. Landings in China as a whole as well as the Bohai and China Seas have declined in recent years. There are two populations in the Yellow-Bohai Sea area. One is found in the western coastal waters of Korea while the other is found in both Korean and Chinese waters. Although the two populations have separate migratory patterns, there is some overlap in the Yellow Sea wintering grounds. Fleshy prawns tend to follow the 6°C isotherm as they begin their shoreward migration in March. The summer months are a feeding period that culminates with mating in October-November. There is a massive mortality of males immediately after spawning that leads to large changes in sex ratio. The species has been well studied because of its importance to both aquaculture and fishing. Fishing, growth and mortality rates are well described as are diseases. Cohort analysis, yield per recruit modeling and stock-recruitment relationships are being used in stock assessment. Because hatchery techniques are available, enhancement through the release of post-larval juveniles is being used to augment natural reproduction and has shown some promise. Currently, trawling is forbidden in the Bohai Sea and that fishery is conducted with fixed nets and drift nets. Trawling is the usual means of fishing elsewhere by all nations involved.

The shiba shrimp (*Metapenaeus joyneri*) is distributed in shallow (< 20 m) waters of the Bohai, Yellow and East China Seas. Landings are about 5,000 t annually, but statistics are very imprecise. Shiba shrimp tend to be localized in distribution with little migration. Chinese catches are dominated by shrimps of 100-110 mm length and weights of 11-13 g. Spawning occurs in March-May and again in September-December. Landing data for China were not presented, but FAO data show Korean landings varying from 2,086 to 7,852 t from 1986 to 1995.

The akiami paste shrimp (*Acetes chinensis*) is a sergistid shrimp found in China, Korea and Japan and is among the northernmost species of the genus. Landings constitute the largest single species shrimp fishery in the world according to 1995 FAO statistics (409,995 t). The vast majority of world landings are taken in China with Korea a distant second according to FAO statistics. In China, they are the most important catch of various fixed (bag-like) nets. Chinese landings averaged 223,934 t from 1976 to 1997 with an average of 197,108 t (90.0%) coming from the PICES Region. In the Bohai Sea the fishery has a 300 year history and currently accounts for about one third of all landings there. They are also extremely important in the East China Sea. Within the Chinese PICES Region, 45.6% of landings are from the Bohai-Yellow Sea area and 54.7% are from the East China Sea (1976-1997). These production figures are nearly astounding considering that the body lengths of mature paste shrimp are 17-32 mm for males and 18-43 mm for females (A 43 mm female is approximately 0.5 g). Spawning occurs twice per year and both brood stocks die after reproduction.

We thank our Chinese colleagues for introducing us to shrimp aquaculture and particularly for including a trip to their experimental station.

Spatial structuring of crab and shrimp populations

This topic was considered briefly following our consideration of Chinese fisheries and aquaculture. Findings were similar to those concerning sampling structure during our 1998 meeting. The existence of discrete aggregations at fine spatial scales is well known for many crab and shrimp stocks. At large spatial scales, meta-population structure is often perpetuated by larval drift occasionally to the point that some geographical units may be non-functional from a reproductive standpoint. Further illustration of these problems is planned in the final report.

Effectiveness of marine sanctuaries and restrictions of fishing activities on crabs and shrimps

This topic was also briefly considered. There are apparently no marine sanctuaries that were established primarily to protect crabs and shrimps. Those that might be useful in this regard protect habitat for a multiplicity of purposes (e.g. no dredging, dumping, mineral exploration, removal of artifacts, etc) other than perpetuation fisheries. This does not preclude establishing sanctuaries for this purpose and we recognized that sanctuaries are being considered in management planning for a variety of fisheries. Most frequently, closures to fishing gear of certain types are used in the management of crabs and shrimps. These latter “sanctuaries” are best treated as individual cases in our final report.

Other matters

The Working Group noted with pleasure that the NAFO/PICES/ICES Symposium “Pandalid Shrimp Fisheries - Science and Management at the Millennium” was to take place in Dartmouth, Canada, September 8-10, with Jim Boutillier of WG 12 as the PICES Co-Convener. We were glad that

we could participate in its planning. As an afternote, the symposium was the first dealing with world-wide pandalid shrimps since the International Pandalid Shrimp Symposium held by University of Alaska Sea Grant in Kodiak, Alaska, in 1979. There were 96 participants including eight invited speakers to four sessions. Sessions included: 1) Environmental and Trophic Considerations) Stock Assessments, 3) Management, and, 4) Harvesting and Processing. There were 23 oral presentations and 15 posters. The symposium was attended by representatives of 15 nations.

WG 12 was also glad to note that the meeting of colleagues fostered by WG 12 has led to a cooperative Canadian-Korean project whereby Dr. Inja Yeon will be working in Nanaimo with Dr. Glen Jamieson and colleagues.

Conclusion of WG 12 activities and provision of final report

This was the last meeting of WG 12 and no further financial resources will be necessary to complete our work. It was the unanimous intention of WG 12 to publish a document as a PICES Scientific Report, over the course of the next year. Drafting is in progress and most statistical series are contained in our meeting documents. This would provide the first synoptic look at shrimp and crab stocks in the North Pacific. It is our intent that this be a living document.

Long-term PICES consideration of crabs and shrimps

Crab, shrimp and lobsters in the PICES Region simply encompass the conventionally exploitable crustacean resources in the North Pacific. This is how we have treated them in a first-time look. We felt it would be a mistake to allow this sort of effort to be eroded by time. We hence recommend continuation of WG 12 efforts by a "Committee on Crustacean Fisheries" that would convene every third year to update statistical series and research summaries and perhaps consider one special topic. This would be similar to the way some working groups have proceeded in ICES (eg., majid crabs). In general, the WG did not see the need for a committee to meet annually as most research topics would readily fit into the current FIS topic sessions.

How crustacean issues might best be integrated into PICES for longer-term consideration is not clear. We were reminded of the tremendous diversity of crustaceans during our deliberations and particularly concerned that we were not dealing with the tremendous trophic importance of the groups that provide fisheries as well as those that do not. We stopped short of recommending a Working Group concerned with crustacean trophodynamics. We do however recommend that a group be identified to integrate crustaceans in a regional experiment involving the Bohai/Yellow Sea area. In this regard we also recognized the need to develop a statistical system based on area of capture rather than area of landings.

We continue to recommend that a "Working Group on Introduced Species" be established.

WG 12 Annex 1

Participation List

<u>Canada</u>	Jim Boutillier

Glen Jamieson

China
Shen-Li Cai
Ji-Sheng Chen
Jing-Yau Deng
Ling Tong
Zhi-Meng Zhuang

Japan
Hideo Sekiguchi

Korea
Sung-Yun Hong

Russia
Boris Ivanov
Vitaly Rodin (Co-Chairman)

U.S.A.
Robert S. Otto (Co-Chairman)

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

Opening (Agenda Item 1)

The MEQ meeting was opened by the Chairman, Dr. Alexander V. Tkalin, on Wednesday, Oct. 13, and continued on Oct. 14. Members from all PICES member countries were present (*MEQ Endnote 1*). The proposed agenda for the meeting (*MEQ Endnote 2*) was adopted.

Working Group 8 report and assessment of the MEQ Practical Workshop (Agenda Items 2 and 3)

The report of WG 8 on Practical Assessment Methodology was presented by Dr. John E. Stein (*MEQ Endnote 3*). The MEQ Practical Workshop (organized by Drs. Stein and Colin D. Levings and Ms. Carla Stehr) was held in Vancouver, Canada at the West Vancouver Laboratory of Canada's Department of Fisheries and Oceans, and hosted by Dr. Levings. Over 20 participants from all PICES countries participated in sampling and analyzing of benthos, fish and inter-tidal biota. Some preliminary results of chemical and biological analyses had been compiled, and the organisers are confident that the Workshop had yielded valuable scientific data and had provided a unique opportunity for PICES scientists to collaborate and to establish good working relationships. Dr. Richard F. Addison summarized the Workshop activities at the Opening Session of the PICES Eighth Annual Meeting in Vladivostok, and Ms. Stehr provided a more detailed description, illustrated with slides, to the Committee. Some recent data describing metal concentrations in various samples collected at the Workshop was distributed to the Working Group members by Dr. Tkalin.

It was recommended that Working Group 8 continue for one more year to oversee the assembly and publication of data from the Workshop, and that the final data set be published as a PICES Scientific Report in a format that could be cited in primary publications resulting from the Workshop. These recommendations were endorsed by the MEQ Committee. The MEQ Committee also recommended that a session be convened at the PICES Ninth Annual Meeting in Hakodate to present and discuss the Workshop results.

Relations with other inter-governmental bodies and programs (Agenda Items 4-6)

Dr. Tkalin reported that PICES was asked to co-operate with the Arctic Monitoring and Assessment Program (AMAP), of which Russia, Canada and the U.S.A. are already members. The Committee agreed to this proposal.

Dr. Tkalin also described the relationship between PICES and GOOS (Global Ocean Observing System). GOOS currently has several components: Living Marine Resources (LMR), Health of the Oceans (HOTO) and Coastal GOOS, all of which will eventually be merged. Within the North East Asian Region of GOOS (NEAR-GOOS), China, Japan, Korea and Russia have already agreed to exchange data on physical oceanographic variables. These data will be held in national data bases and also at the Japan Oceanographic Data Centre (JODC) and at the Regional Real Time Data Base (RRTDB) operated by the Japan Meteorological Agency (JMA). PICES' involvement with GOOS will be coordinated through the MONITOR Task Team and there will be no direct involvement of MEQ at the moment, though this may come later.

Dr. Addison tabled correspondence with Dr. Matthiessen (Chairman, ICES Working Group on Biological Effects of Contaminants: WGBEC) concerning future joint activities with the MEQ Committee. ICES - WGBEC will propose a meeting to be held in Seattle in spring, 2001, to discuss the application of artificial intelligence to the manipulation of large data sets, probably jointly with SETAC. The MEQ Committee recognised that this was a highly specialised topic which may not appeal to many members, but agreed to support the proposal, provided that an additional day could be added to address more general aspects of PICES-ICES cooperation in the area of MEQ scientific interests.

Drs. Tkalin and Addison re-introduced the topic of PICES' interactions with GIWA (Global International Water Assessment). GIWA had made some preliminary proposals to PICES (see the PICES 1997 Annual) but had not followed these up. However, in a recent GIWA brochure, PICES was identified as a partner with GIWA Dr. Addison undertook to work with the PICES Secretariat to clarify future connection between PICES and GIWA.

Establishment of a new Working Group (Agenda Items 7 and 10)

Dr. Tatiana Orlova introduced this topic, which followed the successful joint MEQ-BIO Topic Session on Coastal Eutrophication, Phytoplankton Dynamics, and Harmful Algal Blooms. It was recognized that there was a need for a Working Group on harmful algal bloom and that its terms of reference would reflect concerns of the MEQ, BIO and POC committees. For administrative reasons MEQ considered that it would be simpler for the Working Group to report to only one committee (MEQ) but its terms of reference would recognize the need to links concerns of the other committees. Draft terms of reference were provided by an *ad hoc* group. Membership of the Working Group on Ecology of Harmful Algal Blooms in the North Pacific was discussed briefly prior to their presentation to Science Board. MEQ also recommended to Science Board that travel funds be allocated to allow one of the two Co-Chairmen of the proposed Working Group to travel to meet the other Co-Chairman for one inter-sessional meeting. (See MEQ recommendations to SB.)

The MEQ Strategic Plan (Agenda Item 8)

Dr. Tkalin presented a draft MEQ Strategic Plan. The document was approved by the MEQ Committee (*MEQ Endnote 4*).

Review of Scientific Sessions at PICES VIII (Agenda Items 9 and 12)

The Committee reviewed the scientific sessions at PICES VIII. A joint MEQ/BIO Topic Session on Coastal Eutrophication, Phytoplankton Dynamics, and Harmful Algal Blooms (with thirteen invited or contributed papers) was extremely successful and well attended. The MEQ Topic Session on Eco-logical Impacts of Oil Spills and Exploration (with twelve invited or contributed papers) was also very successful and attracted overflow attendance. A further eleven papers were presented at the MEQ Paper Session. Finally, the Committee noted with pleasure the high standard of presentations at all sessions, including that for contributed papers. This made the choice of the Best Presentation Award at the meeting extremely difficult, but after prolonged discussion, and two rounds of voting, the Committee nominated Dr. Tatiana Orlova (Russia) for the award for her paper entitled “Harmful algal blooms on the Pacific coast of Russia”.

Future scientific sessions (Agenda Item 11)

The MEQ Committee discussed activities for the PICES Ninth Annual Meeting in Hakodate. In addition to the session on the MEQ Practical Workshop, to be co-convened by Ms. Carla M. Stehr (U.S.A.) and Dr. Toshihiro Horiguchi (Japan), agreed to sponsor a Topic Ssession on Science and Technology for Environmentally Sustainable Mariculture in Coastal Areas. Proposed Co-Convenors are Drs. John E. Stein (U.S.A.) and Colin D. Levings (Canada).

Other business (Agenda Items 13 and 14)

The Committee discussed various business items referred by the Science Board Chairman, Ms. Patricia Livingston. The Committee agreed to nominate Dr. Stein as its representative on the Steering Committee for the PICES 10th Anniversary Symposium.

The Committee also agreed with the suggestion that the Science Board Symposium should be moved to an earlier "slot" during the Annual Meeting, and with the proposal to encourage further inter-committee sponsored sessions.

The suggestion to eliminate the Paper Sessions excited strong disagreement: members felt that the opportunity to offer papers outside the themes identified by the committees was an important factor in attracting younger scientists, and new ideas, to PICES. The Committee recognized the value of enhancing the status of the poster sessions, and agreed with the mechanisms proposed to achieve this. However, it felt that poster presentations were still viewed in some areas as being less significant than oral presentations, and until this way of thinking changed, the Committee agreed unanimously that it was desirable to retain the Paper Sessions in addition to enhancing the poster sessions.

The proposed amendments to the PICES Handbook were discussed: the Committee was reluctant to remove the guarantee that each Committee could invite one speaker (at PICES' expense) to the Annual Meeting, and it proposed an alternative wording which would provide the flexibility for a committee to invite more than one speaker if that were justified.

The MEQ meeting was formally closed with an expression of thanks to Dr. Tkalin for convening a very successful scientific session.

MEQ Endnote 1

Participation List

Canada
Richard F. Addison (Rapporteur)
Steve C. Samis
F.J.R. (Max) Taylor

China
Ming-Jiang Zhou (Co-Chairman, WG 8)

Japan
Makoto Shimizu
Yoichiro Ishibashi
Yasuwo Fukuyo

Korea
K.H. Kim

Russia
Alexander V. Tkalin (Chairman, MEQ)
Irina G. Agafonova
Dmitry L. Aminin
Tatiana Orlova
Lev M. Gramm-Osipov

U.S.A.
John E. Stein (Co-Chairman, WG 8)
Carla M. Stehr

Observer
Evgeny Shumilin (Mexico)

MEQ Endnote 2

Agenda

1. Opening and introduction of members, adoption of the agenda (All).
2. Review of WG 8 report (J. Stein, M.J. Zhou).
3. Report on the MEQ Practical Workshop (C. Stehr).
4. Discussion of possible involvement in Arctic Monitoring and Assessment Program, AMAP (A. Tkalin).
5. PICES-GOOS relationships: outcome from discussion at MONITOR WS (A. Tkalin, B. Taft).
6. PICES-ICES relationships: plans for the PICES MEQ – ICES WGBEC WS (R. Addison).
7. Discussion on establishing new Working Group (All).
8. Review and adoption of MEQ Strategic Plan (R. Addison, A. Tkalin).
9. Report on MEQ Scientific Sessions (K.W. Lee, A. Tkalin, T. Orlova).
10. Proposals on publications/travel support (A. Tkalin).
11. Proposals for future MEQ Scientific Sessions (All).
12. Best Presentation Award.
13. Draft report to Science Board.
14. Other matters.

MEQ Endnote 3

Report of Working Group 8 on Practical Assessment Methodology

The meeting of WG 8 was convened at 0900 on October 10, 1999 (see Annex 1 for list of participants. Ms. Carla M. Stehr agreed to serve as rapporteur.

The meeting agenda (Annex 2) was reviewed and approved. The objective of the meeting was to review status of sample analyses collected during the MEQ Practical Workshop, which was conducted in May and June of this year in Vancouver Harbour, Canada, and to begin planning for the publication and presentation of the Workshop results.

Dr. Alexander V. Tkalin presented preliminary results from analyses of sediment, mussels and fish muscle tissue for trace metals. Prof. Makoto Shimizu presented preliminary results for imposex studies of snails and analysis of mussel tissue for tributyl tin, and Ms. Carla Stehr presented results of analysis of fish bile for exposure to polycyclic aromatic hydrocarbons and histopathological analyses of fish liver. The draft activity report was discussed, reviewed and accepted with minor revisions (Annex 4).

The other major topics were: a) presentation of the results from the MEQ Practical Workshop at the PICES Ninth Annual Meeting in Hakodate, Japan; and b) publication of data and findings.

a. Presentations: Dr. John E. Stein suggested that individual researchers or each team prepare a poster on their findings. During the proposed session there would be a short presentation (5 minutes) on each poster to brief the objective of the work, the analytical approach, and the major findings. The posters could then be viewed during the

break. The session would also include presentations of particularly interesting findings (abstracts submitted to PICES for oral presentation). To open the session, an overview presentation on the Workshop would be given.

b. Publications: The Working Group members discussed compiling the data into a series of files, with a preface of 3-5 pages of text consisting of an introduction, materials and methods, and a brief synopsis of the results. This could be published as a PICES Science Report. Possible title for the report is "Environmental Assessment of Vancouver Harbour: Data Report for the PICES MEQ Practical Workshop". The Working Group should approach a journal editor about publishing a special issue on the Practical Workshop. Journals such as Marine Environmental Research, or Marine Pollution Bulletin were suggested as possibilities. Potential title for a special issue is "Environmental Assessment of Vancouver Harbour: Proceedings of an International Workshop".

c. The data report would build on the format of the database developed for English sole sampled during the workshop. Additional databases would be prepared for the following samples: 1) benthos, 2) clams/mussels, 3) fish community, 4) harmful algae, 5) imposex in *Nucella spp*., and 6) sediment chemistry. It will be important to cross reference files such as sediment chemistry with fish data.

The Working Group members approved the draft meeting report and the recommendations to the MEQ Committee (Annex 3).

The meeting was adjourned at 1200 h on October 10, 1999.

WG 8 Annex 1

Participation List

Canada
Richard F. Addison (WG 8, MEQ)*
Steve C. Samis (MEQ)

China
Ming-Jiang Zhou, (WG 8 Co-Chairman)*

Japan
Makoto Shimizu (MEQ)
Yoichiro Ishibashi (observer)

Russia
Lev M. Gramm-Osipov (WG 8, MEQ)
Alexander Tkalin (WG 8, MEQ Chairman)*

U.S.A.
John E. Stein (WG 8 Co-Chairman, MEQ)*
Carla Stehr (U.S.A., observer, participant in Practical Workshop)

*Member of WG 8 Implementation Group for Practical Workshop

WG 8 Annex 2

WG 8 Meeting Agenda

Goal of meeting: Review progress in analyses of samples collected during Practical Workshop and determine next steps in presenting findings to PICES and for publishing data and findings.

Start date/time: 09:00, October 10, 1999

1. Welcome and logistics
2. Introductions of members and observers
3. Discuss and adopt agenda
4. Appoint Rapporteur
5. Review progress of analysis of samples from Practical Workshop
6. Review and revise draft report on activities during Practical Workshop
7. Discuss PICES IX Session for presenting results of Practical Workshop
8 Discuss Workshop Technical Report
9 Other business
10. Consideration, review and approval of recommendations to MEQ
11. Closure of the meeting

WG 8 Annex 3

Recommendations to MEQ Committee

1. It was the conclusion of WG 8 that the first objective WG 8, to plan and hold the MEQ Practical Workshop, was achieved, and that the Workshop was a success. The publication of the data and findings from the Workshop is warranted. We therefore recommend that WG 8 continue for one more year to oversee the publication of the results.

2. WG 8 also recommends that the full data set from the MEQ Practical Workshop be published as a PICES Scientific Report, and that PICES consider archiving the data from the Workshop in electronic form as permanent record of PICES activities. It is anticipated that the Scientific Report could be more then 100 pages.

3. All analyses of samples collected during the MEQ Practical Workshop will be completed by June 2000. The WG 8 recommends a one half-day or a whole day special session at the PICES Ninth Annual Meeting on findings from the Workshop. The recommended session title is: Environmental Assessment of Vancouver Harbour Canada: Results from the PICES Practical Workshop.

WG 8 Annex 4

PICES Practical Workshop Interim Report

Part A – Minutes of meetings and summary of field activities during the MEQ Practical Workshop

***Day 1**, May 24, 1999, 1300 h*

Agenda

1. Introductions of workshop participants;
2. Safety video (Workplace Hazardous Materials Information System video);
3. Laboratory tour;
4. Description of geographic and oceanographic features of Burrard Inlet.

Minutes

1. Colin Levings and John Stein thanked Carla Stehr, Christine Elliott, and Beth Piercey for their efforts to date on logistics, daily work planning, and acquisition of workshop supplies. Their efforts have been key to implementing the MEQ Practical Workshop. Each participant then gave a brief introduction of his or her professional associations, scientific expertise, and objectives for the workshop. Those in attendance were: Colin Levings, Canada;

   Christine Elliott, Canada; Beth Piercey, Canada; John Stein, US; Carla Stehr, US; Alexander Tkalin, Russia; Makoto Shimizu, Japan; Munetaka Shimizu, Japan; Tatyana Belan, Russia; Tatyana Lishavskaya, Russia; Michael Watson, U.S.A.; Toshihiro Horiguchi, Japan; Seiichi Uno, Japan; Tian Yan, China; Zhengyan Li, China; and Jihyum Yun, Korea.

2. Ms. Christine Elliott discussed laboratory safety and showed the WHMIS video, demonstrating the safe use of chemicals. She emphasized that there is no eating, drinking or smoking in any of the laboratories. It was also noted that Material Safety Data Sheets (MSDS) are available for all chemicals

used in the laboratories or on the R/V *Harold W. Streeter*.

3. Ms. Elliott and Piercey conducted a tour of the laboratories available to the participants for the duration of the workshop.

4. Colin Levings gave a short presentation on the general geography and oceanography of the Burrard Inlet to acquaint the participants with features of the sampling sites. He explained that intertidal collections would be done from an 8m outboard-powered launch (boat operator provided by DFO Habitat and Enhancement Branch) that could put scientists on the beach for collecting.

***Day 2**, May 25, 1999, 0830 h*

Agenda

1. Introductions of participants;
2. National Presentations (1 hour each):
   Canada - Richard Addison, Janice Boyd, Darcy Goyette, Environment Canada.
   China - Tian Yan, Zheng-Yan Li
   Japan - Makoto Shimizu
   Russia - Alexander Tkalin
   United States - John Stein

   Dr. Jong Geel Je will give the formal presentation by Korea after he arrives on May 28, 1999. Dr. Sung-Bum Hur of Korea (in the group as an observer) kindly agreed to give a short presentation on current issues associated with aquaculture in Korea. Dr. Hur is a visiting scientist at IOS in Sidney, B.C., Canada.

3. Overview of Puget Sound Protocols: sediment and fish collection - Carla Stehr, U.S.A.;
4. Discussion of previous contaminant monitoring studies in Burrard Inlet. Darcy Goyette, Environment Canada;
5. Specific discussion of workshop sampling plan and greater detail on sampling site characteristics;
6. *R/V Harold W. Streeter* arrives from the U.S.A.

Minutes

1. For the benefit of participants arriving today there were brief introductions
   Additional scientists joining the Workshop for the day were Sung-Bum Hur (Korea), Tracy Collier (U.S.A.), Janice Boyd (Canada) and Darcy Goyette (Canada). Additional scientists present today for the rest of the Workshop were Richard Addison (Canada) and Stelvio Bandiera (Canada).

2. Summary of presentations

Canada:

Richard Addison presented an overview of marine environmental monitoring by federal and provincial agencies, and presented representative results from research projects that were pertinent to subjects of interest at the workshop, e.g., TBT and dioxin and furans. There was also a presentation on the BC Environmental Effects Monitoring (EEM) Program. This program is addressing minimizing effects of pulp mill discharges on biota in receiving waters.

China:

Tian Yan described Chinese programs on marine environmental monitoring of pollution and seafood safety (biotoxins) and briefly discussed a marine reserves program. She followed with highlights of research on effects of TBT on marine species and of studies to measure effects on marine species from marine phycotoxins.

Zheng-Yan Li presented a chronology of the development of marine pollution regulations and programs in Hong Kong. Monitoring efforts are directed towards assessing water quality, the impacts of dredging, and disposal of dredged material. Li also described briefly some of the techniques being used to assess sediment quality and recent results of water quality compliance monitoring.

Japan:

Makoto Shimizu gave a complete overview of marine environmental monitoring in Japan. He presented information on individual projects, the responsible agency, project objective, survey areas, frequency of sampling, and measurements made in water, sediment and biota. Janice Boyd (Canada) initiated discussion on the differences in what is classified as ocean disposal in the different PICES countries. For example, disposal in Japan is predominantly in deeper water, while in North America, disposal has occurred in more shallow water.

Korea:

Workshop participants appreciated the willingness of Dr. Hur to give, on short notice, brief comments on Korean aquaculture programs and his related research. Currently there are concerns about the degradation of coastal environmental quality and its effect on aquaculture productivity. Specifically, an important cultured molluscan shellfish species is declining and the cause is currently unknown. Research is underway to identify the cause.

Russia:

Alexander Tkalin presented a description of the organizational structure of the Far Eastern Regional Hydrometeorlogical Research Institute in Vladivostok, Russia and the relationships between monitoring and research activities. He also introduced results of selected research projects that highlighted marine environmental quality.

United States:

John Stein started with a brief overview of the federal, state and local (county) agencies with regulatory and monitoring responsibility along the West Coast of the United States. He presented highlights of findings from coastwide and more local (e.g., Puget Sound) monitoring and research studies assessing linkages between marine contamination and effects on marine and anadromous fish species. He emphasized how monitoring results are being used in support of environmental management actions.

3. Carla Stehr presented an overview of the relevant fish and sediment sampling protocols from the "Puget Sound Protocols" and background information on choosing fish species as indicators. She also described, with appropriate photos, how sediment and fish tissues are collected using the R/V *Harold W. Streeter*. The Puget Sound Protocols were developed from inter-agency efforts in the United States to standardize sampling and analysis methodology to improve Puget Sound environmental monitoring data quality.

4. Darcy Goyette, Environment Canada, discussed post-monitoring activities in Burrard Inlet, including information on physical and biological characteristics that proved valuable in fine-tuning the sampling protocol for the workshop.

5. Colin Levings led a discussion of the biota and sediment sampling issues, and answered questions on the sampling sites. The discussion was initiated by a presentation of a table showing the types and numbers of sediment and fish tissue samples to be

taken (necropsy procedure). The table was generated from email exchanges on samples of interest for each investigator.

It was agreed to focus chemistry analyses on fish tissues, rather than a surrogate (e.g. crab hepatopancreas) even though crabs may also be available. Fish age will be determined at the Pacific Biological Station, Nanaimo.

For sediment, it was agreed to follow Puget Sound protocols for chemical analyses. A sediment sample for chemistry will be taken from each of 3 Van Veen grabs to be collected at each site. These grabs will be taken in the same location and at the same time as the benthos sediment grabs. Five grabs per site will be taken for benthos. Five samples for meiofauna will be taken from one grab at each site. Three samples for toxic algae will also be collected.

6. R/V *Harold W. Streeter* arrived from the United States at approximately 1430. Scientists who accompanied the *Streeter* and participated in the first few days of the workshop included Paul Plesha, Dan Lomax, Bernadita Anulacion, and Sean Sol; all research scientists/field biologists from the National Marine Fisheries Service (NOAA) in Seattle.

***Day 3**, May 26, 1999, Intersessional MEQ Meeting*

The opportunity was taken to hold an intersessional meeting of the MEQ Committee, because several committee members were present for the Workshop.

Attendees - Committee members: R. Addison, M. Shimizu, J. Stein, A. Tkalin, and M. Watson; observers: C. Levings.

Agenda

1. MEQ Strategic Plan;
2. Publication of MEQ Practical Workshop results;
3. MEQ Sessions;
4. New MEQ Working Group;
5. MEQ interactions with GIWA, ICES, GOOS.

Minutes

1. The draft MEQ Strategic Plan prepared by Drs. Addison and Tkalin was reviewed. The major components of the plan were briefly discussed. There was agreement on the content. Dr. Stein offered a set of potential broad topic areas for consideration for consideration for inclusion in the plan. Suggested topics included: long range transport of contaminants, contaminate effects in highly migratory species, trophic transfer of contaminants, and impact of natural toxins on marine species.

2. Each country agreed to draft a short report for the 1999 Annual Report describing their participation in the workshop and schedule for analyses. Drs. Levings and Stein agreed to draft a short article for PICES Press on the Workshop; the article will include, perhaps, one group photo of the participants and one photo of sampling.

3. Dr. Tkalin reported that satisfactory progress in identifying keynote speakers for the MEQ Topic Sessions at PICES VIII. Dr. Bruce Wright of U.S.A. and Prof. Kazuichi Hayakawa of Japan have agreed to give talks at the session on Ecological Impacts of Oil Spills and Exploration. Dr. David Garrison of U.S.A. has agreed to co-convene the joint MEQ/BIO session on Coastal Euthropphication, Phytoplankton Dynamics, and Harmful Algal Blooms.

4. There was discussion of potential new topics for a new Working Group to be sponsored by the MEQ Committee. Two possible topics for consideration at PICES VIII are harmful algal blooms, and long-range transport of contaminants. It was agreed that topic(s) for new working group(s) will be an agenda item for the MEQ Committee at PICES VIII.

5. There was considerable discussion of potential interactions between the MEQ Committee and other Organizations and Programs. A few possibilities currently before the Committee are: 1) continuing to explore interactions with GIWA, 2) more formal coordination with GOOS, and 3) a joint meeting with the ICES Working Group on Biological Effects of Contaminants.
   Dr. Addison will continue communication on potential interactions with GIWA. Presently GIWA has an Executive Secretary and is apparently hiring secretarial staff.

   Several members of the MEQ Committee have attended variously GOOS meetings or workshops, and there was agreement that there is a potential for collaboration between the MEQ Committee and the coastal oriented GOOS projects [e.g., North East Asia Regional – GOOS, (NEAR-GOOS)]. Further discussions will be needed at the PICES VIII meeting on interactions with GOOS.

***Days 3 – 14**, May 26 - June 6, 1999, MEQ Practical Workshop field activities*

May 26 - Prepared supplies and equipment for sample collection. Received safety training concerning the research vessel.

May 27 - Sample collection at trawl and sediment site 49, and intertidal site I-1 (West Vancouver Lab).

May 28 - Sample collection at trawl and sediment site 11B and intertidal site I-3 (Longsdale Quay). DFO launch operator Bruce Clark and Beth Piercey briefed intertidal collectors on small boat safety and issued PFDs (lifejackets).

May 29 - Sample collection at trawl and sediment site 38, intertidal site I-5 (Port Moody), sediment site 41B (Ioco) and intertidal site I-6.

May 30 - Sample collection at trawl and sediment site 48 and intertidal site I-4 (Indian Arm).

May 31 - free day except for scientists Horiguchi and Li, who traveled to Victoria to look for snails for imposex research since none have been observed at any of the planned sites. Snails were successfully located at four sites in Victoria.

June 1 - Sample collection at sediment sites 3A (Sulfur Dock), intertidal site I-2, and return to site 11B for additional trawls for length/weight flatfish community data. Dr. Jong Jeel Je arrived from Korea.

June 2 - Sample collection at trawl and sediment site 50 (Gibsons) and intertidal site I-7, and snail collection at Mission Point, near Sechelt. Part of the group traveled by ferry/van, others via the R/V *Streeter*.

June 3 - Return to site T-49 to get additional length/weight data for fish community research. Additional sediment grabs and fishing operations were conducted for interested scientists. Research vessel departed for return transit to Seattle.

June 4-6 - Sample processing in the laboratory, and preparation of samples for shipping to the participants laboratories.

June 7 - Final meeting and barbecue at Co-Chairman Colin Levings' house.

Sample collection Synopsis:

- Seven sites were sampled for sediment and benthic invertebrates;
- Five sites were sampled for fish;
- Seven sites were sampled for intertidal invertebrates and algae;
- Four sites on Vancouver Island and one near Sechelt (north of Howe Sound) were added for snail imposex determinations;
- The total number of samples collected are summarized in the minutes of June 7, 1999.

***Day 15**, June 7, 1999, Review of field activities and plans for sample analysis and overview of Practical Workshop activities*

Agenda for morning session: Review of field activities and plans for sample analysis:

1. View photos/slides of Practical Workshop activities;
2. Data review: - list samples taken
3. Preliminary discussion of next steps
   - Analyses - deadlines
   - Where do we go from here?
   - MEQ Strategic Plan

Minutes

1. Ms. Stehr, who had been photographing the workshop activities, showed 35 mm slides from the previous 2 weeks. These slides provided documentation of workshop activities.

2. A list of samples collected during the Practical Workshop:

Fish

162 Otoliths (Canada)
152 Histology (liver, kidney, gonads) (US)
35 Plasma for vitellogenin (US & Japan)
143 Bile for fluorescent aromatic compound (FACs) analyses (some fish did not have bile) (US)
150 Liver for organic analyses (US)
93 Liver organic analyses (Japan)
25 Muscle for trace metals analyses (Russia)
49 Muscle for organic analyses (Japan)
150 Gonads for organic analyses (Japan)
60 Liver for Cytochrome P450 1-A (CYP1A) (Canada)
60 Liver for DNA adducts (US)
95 Stomachs for taxonomy of contents (Canada)
500 Length/weight of English sole (Canada)
25 (trawls) species composition, biomass data collected (Canada)

Sediment

Benthos

35 grabs (0.1 m 2), Benthic community (Russia & Korea)

Sediment Chemistry

21 sediments for trace metals (Russia)
21 sediments for TOC, TN (US & Canada) (C,H,N - need to discuss who will do total nitrogen)
21 sediments for organic (US)

Meiofauna & grain size

245 sediment samples (one grab at each site, 5 samples/grab, 7 slices from each sample with 4 for meiofauna, 3 for grain size) (Canada and Korea).

Microalgae

9 sediment samples (3 sites, 3 reps/site) to culture microalgae from surficial sediments (China and Canada).

Intertidal

Mussels - 7 sites

- 30/site trace metal (Russia)
- 500 g/site whole mussel for algal toxin. (China)
- 50 animals/site (9 sites) for organotin* (Japan) (2 extra sites: Clover Point, Victoria, and Sechelt)

- 50 animals/site for OCs and PAHs and lipids (8 sites) (Japan)
- 4 sites sampled for mussel community using quadrates (Korea)
- 100 random mussels from 7 sites for condition factor, lipid (Korea)

* composites will be analyzed

Molluscs for organotin analyses (Japan)

site	Bivalve collected
I-1	mussel, oysters
I-2	mussel, littleneck, butter, pointed macoma
I-3a	mussel
I-3b	mussel
I-3c	mussel
I-4a	mussel, littleneck, butter, pointed macoma, cockle
I-4b	littleneck, butter, pointed macoma, cockle, horse clam
I-5	mussel
I-6	mussel, mya, littleneck, butter clam, oyster
I-7	mussel, softshell, dark mahogany clam, oyster

Oyden Pt. - Nucella spp.
Clover Pt. - Nucella spp., mussel
10 Mile Pt - Nucella spp.
Missions Pt. - Nucella spp

(mussel = Mytilus trossulus)
(oysters = Crassostrea gigas)
(native littleneck clam = Protothaca staminea)
(butter clam = Saxidomus giganteus)
(cockle = Clinocardium nuttali)
(horse clam = Tresus capax)
(softshell clam = Mya arenaria)

Snails for imposex analyses (Japan and China)

300-400 snails were collected at 3 sites in Victoria including: Ogden Pt., Clover Pt., and Ten-mile Pt., and one site at Mission Pt. Sechelt. Of those collected, approximately 80 were Nucella e., 80 were Nucella l., and 100 were Nucella c. The Nucella c. could also be Nucella lima; Jong will do chromosome test for species ID.

3. The following tentative analysis deadlines were established:

Otoliths, length frequency, fish community analyses – September 1999 (Canada)
Vittellogenin - September 1999 (Japan), June 2000 (US)
Bile - September 1999 (US)
Liver organics - June 2000 (US, Japan)
Fish muscle trace metals - December 1999 (Russia)
Fish muscle organics - June 2000 (Japan)
Fish gonad organics - June 2000 (Japan)
Fish liver CYP1A - September 1999 (Canada)
Fish liver DNA adducts - December 1999 (US)
Benthos species list - September 1999 (Korea and Russia)
Benthos statistics - December 1999 (Korea and Russia)
Sediment metals - September 1999 (Russia)
Sediment organics - June 2000 (US)
Sediment Total Organic Carbon - June 2000 (US)
Meiofauna and sediment grain size - June 2000 (Canada)
Grow out cysts from sediment - December 1999 (Canada)
Biotoxin analyses of molluscs - June 2000 (China)
ARTOX analyses of microalgae - September 2000 (China)
Mussel trace metals - December 1999 (Russia)
Mollusks - TBT June 2000 (Japan)
Snails, imposex - June 2000 (Japan, China)
Bivalve organics - June 2000 (Japan)

Mussel community data, condition factor - June 2000 (Korea)

Agenda for afternoon session: Overview of Practical Workshop activities

1. Report on Workshop activities
2. Sampling overview
3. Publications
4. Future – Strategic Plan discussion

Minutes

1. Carla Stehr presented the workshop slide show again as a visual aid to describe workshop activities for Dr. Alexander Bychkov, PICES Executive Secretary.

2. Richard Addison provided a summary of sampling sites, samples taken, and anticipated completion dates for analyses.

3. Discussion on publications from the MEQ Practical Workshop resulted as follows:

   John Stein and Colin Levings will draft an article for PICES Press. The article is due to the Secretariat in late September 1999. A lead scientist was delegated to develop a 1-2 page summary of samples and analyses to date. The summary is due to Levings and Stein on September 20, 1999. The teams and team leads are:

Team	*Lead Scientists*
Fish	Stehr
Benthos	Je
Imposex	Horiguchi
Algal Toxins	Yan
Mussels	Tkalin
Clam	Uno

   Participants also consider developing a PICES Scientific Report. A final decision will be made at PICES VIII in Vladivostok, in October 1999. This would be a possible venue for presenting the full data sets from the Practical Workshop. Data sets are to be completed by June 2000.

   A "primary" publication in a special issue of a scientific journal was discussed. Whether a special issue will be possible will depend on the findings from the workshop. Potential journals to consider: Marine Environmental Research, Marine Pollution Bulletin, Environmental Pollution.

4. Future MEQ activities were also a topic of discussion. Alexander Tkalin discussed in general terms the potential interactions with other scientific organizations. Alexander Bychkov presented current status of interactions between ICES and GOOS and possible discussions between PICES and GOOS to consider a more specific relationship. The discussions may be initiated in the MONITOR Task Team Workshop at PICES VIII.

   The former MEQ chairman, Richard Addison, has also been contacted by ICES members to explore possible interactions with MEQ on a novel approach to evaluate environmental monitoring data. The possibility of holding a joint PICES, ICES and SETAC workshop will be discussed in the near future. The workshop could be held in the Pacific Northwest.

   Colin Levings proposed consideration of pursuing contacts with LOICZ, because of the similarities with the goals of MEQ. No conclusion was reached on the next step for external relations. Alexander Bychkov will keep us informed of discussions taking place at the level of the Secretariat.

There are other possibilities for interactions of MEQ with a range of organizations. This will be a major topic for the MEQ Committee to work on at PICES VIII.

Alexander Tkalin then gave an overview of discussions within MEQ on topics to be considered for new Working Groups to be sponsored by MEQ. The possible Working Groups are:

- HABs: atlas and training workshop organization;
- Long range transport of contaminants and nutrients.

The status of WG 8 was discussed. The question is whether to continue WG 8 until the results are published. It was agreed that this item will be formally discussed at PICES VIII, in regard to overseeing the publication of the Practical Workshop findings.

Alexander Bychkov provided his view on the success of the Practical Workshop and expressed thanks for the efforts of Colin Levings in organizing the Workshop and being a very good host. Bychkov said, clearly, the Workshop was a great success. Alexander Tkalin also thanked Carla Stehr and John Stein and the other US participants for providing the R/V *Streeter* and their expertise in sampling. Colin Levings expressed his thanks to all participants for attending the workshop and making it a great success. The Practical Workshop was formally adjourned at 1500.

Part B - Status reports on sample analyses

1. Summary of status of analyses of samples

<u>Benthos Team</u>

Korea and Russia - Benthic community data: species list and statistics expected December 99.

Canada – Mieobenthos: data expected June 2000

<u>Sediment Chemistry</u>

Russia - Metals analyses of sediment complete.

US - Aromatic and chlorinated hydrocarbon analyses of sediment are in process: data expected Jan. 15, 2000.

US - Total organic carbon analyses of sediment complete.

<u>Mussel Team</u>

Russia - Metals analysis on mussels have been completed. One site had particularly high concentrations of Al, Cu, Pb and Fe compared to the reference sites.

Japan - Organic chemical analyses and lipid content in mussels expected to be complete in June 2000.

Japan - Organotin compounds in *Mytilus trossulus* has been completed, with the highest levels evident at all of the non-reference sites in Vancouver Harbor.

Korea - Condition factor and community analyses expected June 2000.

<u>Clam Team</u>

Japan - Analyses for organotin compounds clams expected to be completed in the next few months.

Japan - Organic chemical anlayses expected June 2000.

<u>Harmful Algal Team</u>

China - Harmful Algae. Standard Artemia Toxicity Test (ARTOX) was performed during the workshop to detect harmful microalgae in Vancouver Harbor. Microalgal cells were scraped from macroalgae and concentrated. Positive results of samples from Lonsdale Quay suggested that Heterosigma or the DSP

producer Prorocentrum might be present.

China - Shellfish samples (both intertidal and species) collected and frozen during the workshop will be analyzed for Paralytic Shellfish Poison using HPLC in the next few months.

Canada - surficial sediment was incubated for 3 weeks, and samples collected every few days and preserved. These samples will be analyzed for phytoplankton abundance and composition over the next few months.

Imposex Team

Japan - Two species of dogwinkle were examined for imposex. 72 to 100% of the snails examined at all four sites (three sites near Victoria, and one site in Howe Sound) were affected. Additional species of snails will be examined in the next few months.

China - Imposex data expected in the next few months.

Japan - Analyses for Organotin compounds in Nucella will be completed soon.

Fish Team

US - Fish histopathology. Most of slides read - preliminary data available. Liver lesions were not observed in fish examined at the reference sites, however 24 % of fish at the three test sites had one or more types of lesions known to be associated with contaminant exposure.

Canada - Fish age. Otoliths have been read. Results suggest that there is some density dependence, possibly because this is an unfished population. Fish are older than expected based on size.

Canada - Sites were plotted and charted by GIS. Tables of trawl and grab location data are complete.

Canada - Fish community data are expected to be complete by March 2000.

Russia - Metals analyses of fish muscle are complete.

Japan - Vitellogenin analyses (2 sites). Blood plasma collected from English sole at two sites was analyzed during the workshop. No vittelogenin was observed in any of the samples, except for one individual from the reference site. Reconfirmation of the sex (histology), and check for cross reactivity by immunoblotting needs to be done to rule out an error in sex determination or non-specific cross reactivity.

US - Vitellogenin analyses (2 sites). Data expected December 1999.

Canada - CYP1A in fish liver data are expected December 1999.

Japan - Organic chemical analyses of fish muscle, liver and gonad are expected June 2000.

US - Chlorinated hydrocarbon analyses of fish liver are expected January 2000.

US - PAH metabolites in bile, the data are available.

US - DNA adducts in liver (2 sites) data are expected in June 2000.

2. Individual Status Reports

Benthos Team Status Report

Benthic community identification and statistical analysis (Russia and Korea) are in process and expected December 99.

Meiobenthos (Canada) are in process and are expected June 2000

Sediment Chemistry Status Report

Dr. Stein's Lab: TOC analyses (seven sites) - data completed and available at the PICES VIII meeting.

Dr. Stein's Lab: AH and CH analsyses: Samples from all 7 sites have been extracted and are in the process of being analyzed, estimated data availability is January 15, 2000.

Dr. Tkalin's Lab: Metal analyses are completed.

Mussel Team Status Report

Mussel collecting group consisted of Beth Piercey (Canada), Seiichi Uno (Japan), Ji-Hyun Yun (Korea), Alexander Tkalin and Tatiana Lishavskaya (Russia). During the Workshop, mussels *Mytilus trossolus* were collected at low tide at seven locations (Table 1). Collected samples were used to characterize community structure (Beth Piercey and Ji Hyun Yun). Content of organic pollutants (PAHs, organochlorines, butyltin compounds, etc.) will be analyzed in Japan (Seiichi Uno) and trace metal concentrations will be determined by a few labs in Vladivostok, Russia. Metals analyses of mussels by Dr. Tkalin's Lab and TBT analyses of mussels by Dr. Horiguchi are complete.

Table 1. Sampling locations (I=intertidal)

Sample code	Date	Location	Additional information
I-1	May 27	PEI site, West Vancouver Lab.	Reference site
I-3A	May 28	Lonsdale Quay, Seaboard Int.	
I-5B	May 29	Port Moody	
I-6	May 30	Port Moody (Ioco)	
I-2A	May 30	Sulphur Dock, Brockton Pt.	
I-4	June 1	Indian Arm, Cates Park	
I-7	June 2	Howe Sound	Reference site

Clam Team Status Report

Japan - organic chemical analyses and lipid analyses expected by June 2000.

Japan - TBT analyses to be completed in the next few months.

Harmful Algal Team Status Report

Tian Yan: Shellfish samples have been collected during the workshop for algal toxin analysis, including intertidal and benthic species. About 500g whole mussels *Mytilus edulis* were collected at each intertidal sampling site to study algal toxin distribution in Vanvouver Bay. Clam samples were also got from some interdital beach (*Ruditapes philippinarium*, *Venerupis staninea*)and from benthic trawl sampling (*Clinocardium nuttallii*, *Yoldia sp*.). Samples were processed immediately after collected and put into deep freezer for later lyophilizing. Paralytic Shellfish Poison (PSP) of each sample will be analyzed using HPLC.

Tian Yan: Standard Artemia Toxicity Test (ARTOX) has been performed during the workshop to detect harmful microalgae in Vancouver Bay. Main species of macroalgae including *Ulva lactuca*, *Fucus gardneri*, *Laminaria saccharina*, *Iridaea cordata*, *Dilsea californica*, *Gigartina exaparata*, *Saragassum muticum*, *Pylaiella littoralis* at each sampling site were collected. Attached microalgal cells were scraped from macroalgae and concentrated for ARTOX. Positive results of sample from Lonsdale Quay indicated that toxic algae such as *Heterosigma* or DSP producer *Prorocentrum lima* might be present in the water.

Terri Sutherland: Replicate sediment core samples have been collected from three sampling sites within Vancouver Harbour. The surficial sediment of each core was incubated using phytoplankton growth medium and optimal light conditions for approximately 3 weeks. Subsamples were collected every few days and preserved in Lugol's Solution. These samples will be analyzed for phytoplankton abundance and composition over the next few months. The germination of potentially harmful phytoplankton will be documented.

Imposex Team Status Report

A list of specimens taken around Vancouver, May 24 - June 7, Dr. Toshihiro Horiguchi:

May 27
I-1 Foolish Mussel(*Mytilus trossulus*)
Pacific Oyster (*Crassostrea gigas*)

May 28
I-3-A Foolish Mussel (*Mytilus trossulus*)
I-3-B Foolish Mussel (*Mytilus trossulus*)
I-3-C Foolish Mussel (*Mytilus trossulus*)

May 29
I-5-B Foolish Mussel (*Mytilus trossulus*)
I-6 Foolish Mussel (*Mytilus trossulus*)
Softshell-Clam (*Mya arenaria*)
Japanese Littleneck (*Venerupis philippinarum*)
Pacific Littleneck (*Protothaca staminea*)
Butter Clam (*Saxidomus gigantea*)
Pacific Oyster (*Crassostrea gigas*)

May 30
I-4-A Foolish Mussel (*Mytilus trossulus*)
Pacific Littleneck (*Protothaca staminea*)
Butter Clam (*Saxidomus gigantea*)
Pointed Macoma (*Macoma inquinata*)
Nuttall's Cockle (*Clinocardium nuttallii*)
I-4-B Pacific Littleneck (*Protothaca staminea*)
Butter Clam (*Saxidomus gigantea*)
Pointed Macoma (*Macoma inquinata*)
Nuttall's Cockle (*Clinocardium nuttallii*)
Horse Clam (*Tresus capax*)

May 31
VictoriaOgden Point
File Dogwinkle (*Nucella lima*)
Frilled Dogwinkle (*N. lamellosa*)

Clover Point
Striped Dogwinkle (*Nucella emarginata*)
File Dogwinkle (*N. lima*)
Frilled Dogwinkle (*N. lamellosa*)
Foolish Mussel (*Mytilus trossulus*(?))

Ten-mile Point
File Dogwinkle (*Nucella lima*)
Frilled Dogwinkle (*N. lamellosa*)

June 1
I-2 Foolish Mussel (*Mytilus trossulus*)
Pacific Littleneck (*Protothaca staminea*)
Butter Clam (*Saxidomus gigantea*)
Pointed Macoma (*Macoma inquinata*)

June 2
Wilson Creek, Mission Point
File Dogwinkle (*Nucella lima*) (?)
Frilled Dogwinkle (*N. lamellosa*)

I-7 Foolish Mussel (*Mytilus trossulus*)
Softshell-Clam(*Mya arenaria*)
Dark Mahogany-Clam (*Nuttalia obscurata*)
Pacific Oyster (*Crassostrea gigas*)

June 3
T-49 Milky Venus (*Compsomyax subdiaphana*)

Imposex examinations on *Nucella lima* and *Nucella lamellosa* are complete. Organotin analyses in tissue of the foolish mussel, *Mytilus trossulus* are also complete.

Future studies:

1.1 Examination of imposex symptoms in a few species of *Nucella*
1.2 Comparison of imposex symptoms among *Nucella* species
1.3 Determination of organotins in tissue of *Nucella* species
1.4 Comparison of organotin contamination and imposex symptoms in *Nucella* species with those in Japanese gastropods, such as the rock shell, *Thais clavigera*

2.1 Determination of organotins in tissue of other bivalve molluscs
2.2 Comparison of organotin accumulation among the bivalve species
2.3 Comparison of organotin contamination levels observed in bivalves around with those in Japan

Fish Team Status Report

Tissues were sampled from English sole at 5 sites during the workshop. The sites were: T-49, West Van. Lab; T-11B, Lonsdale Quay; T-38, Port Moody; T-48, Indian Arm; T-50, Gibsons, Howe Sound.

Status of fish tissue analyses:

Dr. Uno:
CHs and AH metabolites in fish tissues (liver, gonad, muscle) to be completed by June 2000

Dr. Stein's group:
CH analyses of fish liver (5 sites) original deadline was June 2000. Revised date of data availabilty estimated to be Jan 15, 2000.

PAH metabolites in bile (5 sites) - complete data will be available at the PICES VIII meeting.

Histopathology (5 sites) of English sole liver, kidney and gonad: tissues have been embedded and sectioned, most slides have been read. Preliminary data summary will be available at the meeting.

Plasma Vitellogenin (2 sites) - expect to be completed in December 1999.

DNA adducts in liver (2 sites) - expect to be completed in March 2000.

Dr. Tkalin's group:
Metals analyses of fish muscle (5 sites) - complete; data will be presented at the PICES VIII meeting.

Drs. Addison and Bandiera:
CYP1A of fish liver (5 sites) expect to be completed in November or December 1999.

Dr. Munetaka Shimizu:
Vittelogenin (2 sites) - analyses were completed during the workshop, a preliminary report will be available at the workshop.

Dr. Levings' group:
Otoliths (age) - otoliths have been read, and data is being entered into a database.

MEQ Endnote 4

MEQ Strategic Plan

1. Review of activities

The first MEQ meetings at Victoria, Canada (1992) and Seattle, U.S.A. (1993), were largely focused on identifying common

problems of marine pollution in the North Pacific. It was decided that MEQ should concentrate its efforts on coastal pollution problems (instead of open ocean processes). The preliminary focus was on “Interdisciplinary methodology to better assess and predict the impacts of pollutants on structure and function of marine ecosystems”. Two areas were mentioned as particularly important: algal blooms and chemical and biological contaminants. In 1992, Working Group 2 (WG 2) on Development of Common Assessment Methodology for Marine Pollution was established under the leadership of Dr. Richard F. Addison, Canada. Prof. Jia-Yi Zhou, China, was elected MEQ Chairman in 1992.

At PICES III (1994), MEQ held a symposium on "Interdisciplinary methodology to better assess and predict the impact of pollutants on structure and function of marine ecosystems." It was decided also to organize a Practical Workshop at one of the impacted coastal ecosystems of the western North Pacific to work on common methodology of marine environment quality assessment. The proposed preliminary workshop site was the Yangtze estuary, East China Sea. After the meeting, Working Group 2 was disbanded and Working Group 8 on Practical Assessment Methodology was established to prepare and organize the Practical Workshop.

At PICES IV (1995), MEQ held a symposium on "Sources, transport, and impact of chemical contaminants." WG 8 recommended organizing Practical Workshop in Jiaozhou Bay, China (instead of Yangtze estuary) to trace the ecological impacts along the gradient of chemical contamination. Dr. Addison was elected the new MEQ Chairman.

At PICES V (1996), MEQ held a session on "Processes of contaminant cycling." WG 8 developed a Scientific Workplan to hold the Practical Workshop in Qingdao, China, in 1997. Harmful algal blooms and environmental impacts of aquaculture were considered as possible topics for future MEQ sessions.

At PICES VI (1997), MEQ held a session on "Processes of contaminant cycling." Three priority areas were identified for inter-sessional activities: 1) Environmentally sound mari-culture: status and technology needs; 2) Harmful algal blooms; and 3) MEQ/PICES interactions with GIWA (Global Assessment of International Waters): a feasibility study. The WG 8 report on preparation of Practical Workshop in Jiaozhou Bay, China, was also approved. Following the WG 8 meeting, the Chinese authorities informed PICES that “… the present situation in Jiaozhou Bay is not suitable to hold the workshop…”, and after some discussion within MEQ, the proposed site was moved to Vancouver.

At PICES VII (1998), MEQ discussed the report of WG 8 on preparation for the Practical Workshop in Vancouver Harbor in May-June 1999. The MEQ topic session was on “Science and technology for environmentally-sustainable mariculture”. Joint MEQ/BIO Session was devoted to “Contaminants in high trophic level biota - linkages between individual and population responses”. Dr. Alexander V. Tkalin was elected as new MEQ Chairman.

In summary, over the past years, the Marine Environment Quality Committee of PICES has focused its activities on coastal pollution problems and common methodology to estimate the state of marine ecosystems under anthropogenic pressure. Closer links between marine chemists and marine biologists working on pollution problems in PICES member countries have been established.

2. The future

The main goal of MEQ, as part of PICES, is to improve "scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities". Increasing information exchange and collaboration between scientists of PICES countries will be of mutual benefit to their people and will help to sustainable development of these countries.

For the coming years, the following scientific themes are considered of high priority to MEQ:

Coastal pollution: eutrophication, phytoplankton dynamics and harmful algal events (joint MEQ/BIO session to be held at PICES VIII in Vladivostok);

Ecological impacts of oil spills, oil exploration, land reclamation and other man-made activities (aspects addressed in MEQ topic session, PICES VIII, Vladivostok);

Science and technology for environmentally sustainable mariculture: impacts and mitigation in coastal areas (MEQ topic session, PICES IX, Japan);

Impacts of climate change on coastal ecosystems;

Biological and physical transport of anthropogenic substances in the North Pacific;

Assessment of the impacts of human activities on marine ecosystem integrity and harmonization of existing methodologies used in PICES countries.

Diseases in marine species: population level effects and the role of human activities in their occurrence.

MEQ should work to establish links with relevant international organizations/programs (GIWA, GOOS, ICES, NOWPAP). Preliminary discussions with GIWA have not been productive: although a presentation on behalf of GIWA was made at PICES VI (Pusan). The GOOS program may be of more direct relevance to PICES interests, especially as some member countries already have developed GOOS components, and in the short term, GOOS may be a more appropriate vehicle for PICES to use to establish international connections. In addition, Dr. Addison has been contacted by the Chairman of the ICES Working Group on the Biological Effects of Contaminants (WGBEC), which is the ICES “equivalent” to PICES MEQ, with the aim of establishing common interests of the two groups, which could lead to future joint meetings. It is also important to broaden interest in MEQ within PICES countries and through the scientific disciplines (e.g., marine mammals, birds, etc.) by bringing new people to PICES meetings and inviting prominent scientists from all over the world.

As a forum of international experts, MEQ should identify priorities for interdisciplinary research in the PICES area for a better understanding of structure, function, and health of marine ecosystems under anthropogenic pressure.

MEQ Endnote 5

MEQ Recommendations to Science Board

1. WG 8 should remain established for one more year to complete collation, editing and publication of results from the MEQ Practical Workshop (expected completion date fall 2000). (Recommendation forwarded from WG 8).

2. At the PICES Ninth Annual Meeting in Hakodate MEQ should

   - sponsor one half- or full- day session, co-convened by Dr. Toshihiro Horiguchi (Japan) and Ms. Carla M. Stehr (U.S.A.) for detailed presentations of results from the MEQ Practical Workshop. (Recommendation forwarded from WG 8);

   - co-sponsor with BIO a topic session entitled “Science and technology for environmentally-sustainable mariculture in coastal areas” (Co-convenors: Drs. Colin D. Levings (Canada) and John E. Stein (U.S.A.)).

3. PICES should publish the full data set from the MEQ Practical Workshop as a PICES Scientific Report, in which data would be available for citation in publications in the primary refereed literature. PICES consider archiving the data from the Workshop in electronic form as permanent record of PICES activities. (Recommendation forwarded from WG 8).

4. PICES should provide travel support to allow one of the two Co-Chairmen of the new Working Group on Ecology of Harmful Algal Blooms in the North Pacific to visit the other Co-Chairman for one inter-sessional meeting before PICES IX.

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

The meeting began at 8:45 am on October 13. The Chairman, Dr. Vyacheslav B. Lobanov (Russia), welcomed the POC members and observers (*POC Endnote 1*). Dr. Howard J. Freeland was elected as rapporteur. The agenda appears in *POC Endnote 2*.

Old business

Dr. Lobanov reviewed the 2nd PICES Workshop on the Okhotsk Sea and Adjacent Areas which was held in Nemuro, Japan on November 9-12, 1998. A volume of proceedings was issued in the PICES Scientific Report series (No. 12) and is available at the Secretariat.

There was discussion about whether the annotated bibliography on the Japan/East Sea, prepared by Dr. Mikhail A. Danchenkov, should be available in hard copy or on the internet. It was decided to leave this to the Secretariat to discuss with the author.

POC Strategic Plan: accomplishments and changes (Agenda Item 3)

Dr. Takeshi Uji suggested an addition to the POC strategic plan "Considering the important role of the ocean on the climate system and the shortage of data, POC should encourage and endorse the ARGO project, an important ocean observing component of GOOS and GCOS, to provide subsurface T and S data by a global array of ocean profiling floats for studies of climate variability and climate predictions." Dr. James E. Overland suggested inserting a specific reference to North Pacific and the suggestion was endorsed.

Final Report of Working Group 10 (Agenda Item 4)

Dr. Lobanov summarized the status of the final report of Working Group 10 on Circulation and Ventilation in the Japan Sea (East Sea) and its Adjacent Areas. It was completed this summer and distributed among POC members with a request to submit comments by August 20. Dr. Christopher N.K. Mooers, Co-Chairman of WG 10, submitted a new set of recommendations, and mentioned the difference in expectations between POC and the Working Group. Dr. Mooers agreed that there is a large body of new literature that can be accommodated in the report bibliography and some correction of the report would be done.

The POC thanked Dr. Mooers and the Working Group members for their very productive work and noted that the most serious problem of the report is that it does not read as a review, but rather as proceedings of a meeting. One of the reasons for this is that the Japan/East Sea is currently an area of very intensive studies, so it is difficult to set a cut off date for a review coverage. The POC members agreed that although this Working Group will be disbanded, PICES should stay interested in the Japan/East Sea studies and have a coordinating role in developing a multidisciplinary program in the area.

Regarding publication, POC asked that editorial criticisms be addressed by January 1, 2000, and that the report be published on the PICES web site. The report becomes a "living document" and may be revised at a later stage to accommodate new findings. It is recommended that PICES maintain contact with the CREAMS and ONR programs on the Japan/East Sea which are currently implementing large observational and data synthesis projects, and that PICES organize a joint symposium with ONR and

CREAMS on the Japan/East Sea in 2002, with a proceedings to be published as a review of a current knowledge.

Progress report of Working Group 13 (Agenda Item 5)

In the absence of the Co-Chairmen, the progress report of the Working Group 13 on CO_2 in the North Pacific was presented by Dr. Andrew Dickson (*POC Endnote 3*). He noted that three activities had taken place during the last year:

a. A method intercomparison study;
b. Sample exchange from WOCE line P-1 crossing the N/S lines;
c. Attendance at the SEATS (Southeast Asian Time Series) planning meeting.

Activities planned for next year include compiling data into a coherent synthesis. This is a joint activity together with TCODE and JGOFS North Pacific Task Team. For this purpose, a symposium and a workshop on CO_2 data synthesis for the North Pacific, and an intercomparison of alkalinity measurement techniques are planned for October 2000, in Tsukuba, Japan, just prior to the PICES Ninth Annual Meeting. These meetings would be co-sponsored by PICES and the CREST program of the Japan Science and Technology Agency. It is recommended that PICES support some of the logistics of the intercomparison exercise and provide travel support for attendees. The Working Group proposed to arrange a topic session for PICES IX, jointly with BIO, entitled "North Pacific carbon cycle and ecosystem dynamics". It was also recommended that PICES continue to co-ordinate carbon cycle research in the North Pacific. Dr. Lobanov expressed thanks to Dr. Dickson. POC supported these recommendations and will address them to the Science Board.

CREAMS/PICES relations and co-sponsorship for CREAMS Workshop (Agenda Item 6)

Dr. Lobanov outlined the progress of CREAMS/PICES relations and proposed that POC support the idea that PICES co-sponsor the CREAMS Workshop on "Oceanography of the East Asian Marginal Seas" to be held in May 2000, in Vladivostok, Russia. Dr. Danchenkov, a representative of the local organizing committee, provided brief information about the workshop and supported the proposal. POC supported the recommendation to co-sponsor a joint CREAMS/PICES Workshop.

Status of ARGO (Agenda Item 7)

Dr. Freeland briefed the Committee on recent developments towards the design and implementation of ARGO. Dr. Kensuke Takeuchi reported that in Japan, the situation is still liquid but will be more solid early next year; full operation will not start before 2001. The main funding would be provided by the Millennium Budget, SODA (Study for Optimum Design of ARGO) and Frontier Observational Research System. SODA is examining the behaviour of floats in 3 typical areas: a weak current region, an eddy-rich region (Kuroshio Extension) and a strong frontal region, Kuroshio.

Cooperation with CLIVAR (Agenda Item 8)

Dr. Freeland reviewed the current state of development of CLIVAR following discussions on this matter with Dr. John Gould, the Chief Scientist of CLIVAR. PICES should be an integral part of the planning for CLIVAR and should be represented, probably, by the Chairman of POC.

Dr. Overland recommended strongly that POC try to influence CLIVAR to take a stronger role in the northern North Pacific, rather than maintaining its focus on equatorial and El Niño dynamics. A letter will be written to CLIVAR.

PICES and GOOS (Agenda Item 9)

Dr. Bruce A. Taft briefly reported the results from the MONITOR Workshop that was held immediately prior to the PICES Eighth Annual Meeting. It included a discussion of the GOOS program and its various components and focused on PICES relationship with these components. The ARGO program was identified as a very effective one for PICES. The MONITOR Task Team endorsed the idea of supplying platforms for the deploying of floats. It was recommended that PICES have representation and a leading role in coordinating the North Pacific area implementation of the LMR component of GOOS and the Data Buoy Cooperation Panel.

Dr. Lobanov thanked Dr. Taft for the update on MONITOR activities. Dr. Lobanov also informed POC about the development of the NEAR-GOOS (North East Asian Regional) component of GOOS. It is one of the most advanced components of GOOS which is providing (through the internet without charge) operational and delayed-mode data on physical and hydrochemical parameters in the Japan/East Sea, East-China Sea and Yellow Sea. It is recommended that PICES develop closer collaboration with NEAR-GOOS. Dr. Taft strongly supported this suggestion.

Results of La Perouse/Soya project (Agenda Item 10)

Dr. Gennady Kantakov outlined the development of the project which is observing water exchange and ecological response in the La Perouse/Soya Strait area. It is a good example of fruitful international cooperation among the PICES member countries. A letter will be written expressing the desire of PICES/POC in seeing this program continue.

Arctic Climate Impact Assessment Program (Agenda Item 11)

Expressing a general support for the Arctic Climate Impact Assessment Program, the Committee noted that this is out of the normal line of interest for PICES. So it is expected that PICES will not become significantly involved in arctic research.

Future symposia (Agenda Item 12)

POC discussed a suggestion to have a symposium on ARGO at the PICES Ninth Annual Meeting in 2000, in Hakodate. However, it was agreed to expand the focus to climate science and long-term observations in the North Pacific using the scientific foundation for ARGO, and sponsor a topic session on "Large-scale circulation in the North Pacific". The session should have an emphasis on new techniques and new data sources, and how these will be used in the future. Convenors are Dr. Takeshi Uji (or alternate) (Japan) and Dr. Freeland (Canada).

POC endorsed the suggestion of Working Group 13 to co-sponsor a joint session with BIO on "North Pacific Carbon Cycle and Ecosystem Dynamics" for PICES IX.

Publications/travel support (Agenda Item 13)

POC recommended that the progress report of the Working Group 13 on CO_2 in the North Pacific be published in the 1999 Annual Report, and the final report of the Working Group 10 on Circulation and Ventilation in the Japan/East Sea and its Adjacent Waters be made available on the PICES web site. Travel requests are reported under Recommendations to Science Board (Agenda Item 15).

Other business (Agenda Item 14)

<u>PICES 10th Anniversary Symposium</u>

POC supported the idea of the PICES 10th Anniversary Symposium and nominated Dr. Susan E. Allen to represent POC on the steering committee for this event.

<u>Restructuring PICES Annual Meetings</u>

POC endorsed:

a. moving the Science Board Symposium to the beginning of the Annual Meeting agenda;
b. promoting inter-committee topic sessions and to upgrade the visibility of the poster sessions (however, it is recommend that the Secretariat set standards for poster presentations, both the nature of the poster and how it is handled by sessions);
c. supporting ventures that would encourage the participation of young scientists.

Best Presentation Award

The nominee receiving most votes for the Best Presentation Award is Dr. Josef Chernyawsky (Canada) for his paper (with W. R. Crawford and M. G. G. Foreman) entitled "Long-lived meanders and ocean eddies in the Alaskan stream".

POC discussed the question of the Best Presentation Awards and recommended that PICES drop all awards except for two: for best student presentation – oral, and best student presentation – poster.

Standing list of organization and programs

In reviewing the PICES standing list of organizations and programs for collaboration with PICES, POC endorsed adding ARGO and CREAMS.

Workshop on utilization of fishing vessels to advance marine ecosystem research

POC discussed a suggestion concerning a workshop on "Utilization of fishing vessels as monitoring, tracking and data collection systems to advance marine ecosystem research" and recommended that the proponents present the material at a MONITOR Workshop in Hakodate, in 2000, but not as a separate symposium.

Working Group numbers and names

POC requested that the Secretariat discontinue the practice of identifying Working Groups by number only and use words (short title) or acronyms instead.

Recommendations to Science Board (Agenda Item 15)

Financial requests

- PICES provide support some of the logistics of the alkalinity intercomparison exercise;

- PICES provide travel support for two participants from North America and for one from Russia to attend a Symposium and a Workshop on CO_2 data synthesis in the North Pacific, and a Technical Workshop on alkalinity measurements in Tsukuba, in October 2000;

- PICES co-sponsor a joint CREAMS/PICES Workshop on "Oceanography of the East Asian Marginal Seas" in Vladivostok, in May 2000.

Symposia at PICES IX

- POC sponsor a session on "Large scale circulation in the North Pacific", with an emphasis on new techniques and new data sources, and how these will be used in the future. (Co-Convenors: Howard J. Freeland and Takeshi Uji (or alternate));

- POC co-sponsor, with BIO, a session entitled "North Pacific carbon cycle and ecosystem dynamics" (Co-Convenors to be determined).

POC Endnote 1

Participation List

Canada — Susan E. Allen

Howard J. Freeland

Japan
Nobuo Suginohara
Takeshi Uji
Kensuke Takeuchi

Russia
Sergey V. Gladyshev
Gennady A. Kantakov
Gennady V. Khen
Vyacheslav B. Lobanov (Chairman, POC)

U.S.A.
Andrew Dickson
Christopher N.K. Mooers
David L. Musgrave
James E. Overland

POC Endnote 2

Agenda

1. Opening remarks and introduction
2. Approval/modification of the agenda
3. POC Strategic Plan: accomplishments and changes (V. Lobanov)
4. WG 10 final report (C. Mooers)
5. WG 13 progress report (Y. Nojiri)
6. PICES/CREAMS relations and co-sponsorship for the CREAMS 2000 Workshop (V. Lobanov)
7. ARGO/GODAE recent progress (H. Freeland/K. Takeuchi)
8. PICES/CLIVAR: how to establish close links? (H. Freeland)
9. PICES/GOOS: outcome from discussion at the MONITOR 1999 Workshop (V. Lobanov/ B. Taft)
10. Results of the LaPerouse/Soya project (G. Kantakov)
11. Arctic Climate Impact Assessment program (V. Lobanov)
12. Future symposia
13. Publications/travel support
14. Other business
15. Summary of POC recommendations for Science Board

POC Endnote 3

Report of Working Group 13 on CO_2 in the North Pacific

Meeting Summary

The Working Group was attended by representatives from Japan, Russia, and the United States of America. After a brief welcome by the Chairmen (Dr. Feely, U.S.A., and Dr. Nojiri, Japan), the first day of the meeting was devoted to a series of technical presentations (see the agenda Annex 1).

The North Pacific is an important sink for atmospheric carbon dioxide in the oceans and, consequently, plays a significant role in controlling long-term climate changes on the Earth. Some biogeochemical processes relating to the oceanic CO_2 system are peculiar to the North Pacific. This occurs because (1) the North Pacific is the final destination of circulation of the deep water that contains a high level of preformed nutrients; and (2) the North Pacific Intermediate Water stores dissolved CO_2 for more than a few tens of years. There is a considerable contrast in the ecosystems producing organic carbon and $CaCO_3$ particles, one of the factors determining the CO_2 sink strength in the ocean, between the eastern and western North Pacific. The contrast is likely due to the difference in the nutrient composition in water supplied from the subsurface to the surface euphotic layer (i.e. resulting from the physical forcing which affects mixed layer depth) and in the atmospheric input of iron and