

**NORTH PACIFIC MARINE SCIENCE ORGANIZATION
(PICES)**

ANNUAL REPORT

THIRD MEETING

NEMURO, HOKKAIDO, JAPAN

OCTOBER 15 - 24, 1994

January 1995
Secretariat / Publisher
North Pacific Marine Science Organization (PICES)
c/o Institute of Ocean Sciences
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AGENDA

THIRD ANNUAL MEETING

October 15 - 24, 1994



Opening Session

1. Address of welcome by Mr. Naotoshi Sugiuchi, Deputy-Director General for Arms Control and Science Affairs, Ministry of Foreign Affairs, Japan.
2. Remarks by the Chairman.
3. Remarks by representatives of contracting parties.
4. Announcements.
5. Keynote lecture by Prof. Y. Nagata: *Subarctic North Pacific Ocean in Global Climate System*.

Governing Council

1. Preliminary report on administration.
2. Relations with other international organizations and observers from such organizations.
3. Membership and observers from other countries.
4. Election of Chairman.
5. Report of Finance and Administration Committee.
6. Audited accounts for financial year 1993.
7. Estimated accounts for financial year 1994.
8. Budget for financial year 1995.
9. Forecast budget for financial year 1996.
10. Trust Fund.
11. Report and recommendations of Science Board.
12. Future meetings of the organization and subsidiary bodies, including time and place for the Fourth and Fifth Annual Meeting.
13. Any other business.

REPORT OF OPENING SESSION

The meeting of October 18 was called to order by the Chairman, Dr. Warren S. Wooster, who welcomed all delegates, observers and researchers to the Third Annual Meeting. Dr. Wooster introduced Mr. Naotoshi Sugiuchi, Deputy Director General for Arms Control and Scientific Affairs, Ministry of Foreign Affairs, Japan.

I would like to thank Dr. Wooster for the kind introduction. It is a great honor to have the opportunity to welcome all participants, especially those who have traveled great distances and spared valuable time from their very busy schedules to attend this meeting.

Recently an earthquake of extraordinary scale struck this region. In fact it was one of the largest ever experienced and it was feared the damages caused by the earthquake might compel the postponement of this meeting. That fortunately did not happen. I would like to expressed my deep sympathy to the city of Nemuro, the host city, for any serious damages that has been suffered by the citizens and to property, and at the same time I sincerely appreciate all the efforts the city of Nemuro made to meet the meeting schedule in spite of the difficulties following the earthquake.

Nemuro, located at the eastern end of Japan, is one of the key centers of Japanese fisheries, and the people have deep-roots with the sea. Exactly one year ago, Nemuro held the Nemuro Workshop on Western Subarctic Circulation in conjunction with several PICES Working Group meetings. Today it is a great pleasure for Japan to hold the PICES Third Annual Meeting here with the participation of all those present.

One duty of the Ministry of Foreign Affairs of Japan is to promote both bilateral and multilateral cooperation in science and technology. Scientific issues have become important to the diplomatic agenda, and occupy the largest part of discussions on international relations. The field of basic research, such as space and high energy physics draw the world's attention and the costs related to funding, facilities and time are enormous. At the same time, there have also occurred global environmental deterioration, energy shortages, an AIDS epidemic, and other global issues, which must be urgently tackled as they threaten the foundation of human existence. Research costs are increasing in terms of needed facilities, the breadth of research required and the problems country now face which tend to cross national borders. No country alone can totally cope with current issues either scientifically or economically. Global scale problems require international cooperation on research, exchanges of researchers, information and data.

The sea was formed before the existence of human beings and it has been deeply related to human life and large amounts of time, effort, and money have been spent on marine science, and this will continue to happen. In this sense, marine science, like the Global Ocean Observing System Program, is one of the oldest programs in mega science. It is almost a prerequisite in conducting marine science to cooperate bilaterally and multilaterally. The oceans cover 70 per cent of the surface of the globe, and it is the last frontier on earth. In order to research them effectively, it is essential to have coherent worldwide cooperation.

The North Pacific Region has a great impact on the global environment and climate change. Marine science is a complex science which continues to greatly contribute to the understanding of global climate change. In this context, promoting multilateral cooperation on marine science is a model case of collectively tackling marine problems that humans face today.

The first PICES meeting was in Victoria in 1992, and since then PICES has steadily expanded its activities. It has established the Secretariat, held many workshops and working group meetings. Above all, the Russian Federation has decided to accede to the PICES Convention and delegates from the Russian Federation are taking part in this meeting as observers. Participation of the Russian Federation, which have a great amount of experience and information related to the North Pacific area, will contribute considerably to future PICES activities. With the addition of Russian scientists participating at the annual meeting, PICES will now be able to widen its scope of activities.

I hope that all participants will develop friendly relationships with each other. The purpose of the PICES meeting is not only to discuss and to exchange information and knowledge, but to also network with scientists. I believe this networking will make our research activities efficient and act as a catalysis to jointly explore the greatest frontier on the planet. I hope that the meeting will prove to be fruitful and show a spirit of cooperation.

The Chairman of Council, Dr. Wooster, spoke on behalf of PICES.

First may I comment on the passing of Academician Victor Ivanovich Il'yichev, Director of the Pacific Oceanological Institute of the Far-Eastern Branch of the Russian Academy of Sciences and Chairman of the Far-Eastern Regional

PICES Committee. Academician Il'yichev attended our last meeting, in Seattle, and his support was important to the development of Russian participation in PICES scientific committees and working groups. May I ask you to rise for a moment of silence in his memory.

In this connection, as many of you are aware, Russia has initiated the process of being a member of PICES. This will come into effect by the end of the present year. We are also in discussions with officials of the Republic of Korea, and it is hoped that Korea will soon accede to the organization.

Because many here have not previously attended a PICES meeting, it might be helpful for me to say a bit about how the organization functions. Some of you will have participated in the workshop on the PICES-GLOBEC Program on Climate Change and Carrying Capacity. The idea of this workshop came from two PICES working groups that met last year; it was approved at the Second Annual PICES Meeting, first by the Science Board and then by the Governing Council. The Science Board consists of the chairmen of the four Scientific Committees (Biological Oceanography, Fishery Science, Marine Environmental Quality, and Physical Oceanography and Climate) and an elected chairman. The Board is the scientific component of the governance of the organization. The Governing Council, consisting of two Delegates from each member country, makes the final decisions on actions to be taken by PICES.

So in general, scientific ideas arise in the working groups and scientific committees, pass to the Science Board for review and consolidation into a coherent scientific program, and then go to the governmental representatives for approval. The opportunity for most of you to contribute to this process at the present meeting is through the workshops -- at the end of this

week, there is a second workshop, the PICES-STA Workshop on Monitoring the Subarctic Pacific -- and in the meetings of the Scientific Committees. These committees are meeting on Wednesday and Thursday afternoons. The meetings are open to all participants, and it is hoped you will all attend the committee of your choice. That is your best chance to start influencing the future course of PICES action.

Since the Second Annual Meeting in Seattle last year, several working groups have met, planning was initiated for the workshops of the present meeting, and the Secretariat and I have been busy trying to make everything work. As in all such endeavors, there is much more going on behind the scenes than meets the eye. I would like to extend my thanks to all who have contributed to this work over the year.

Finally, I would like to comment on the speech of Director General Ishikawa a few days ago at a reception offered by the Japan Fishery Agency for participants in the PICES-GLOBEC Workshop. That workshop was sponsored by the Agency whose help has been most appreciated. Mr. Ishikawa noted the responsibility of PICES to study marine issues from the scientific viewpoint and, in particular to promote scientific study and research related to the use of marine living resources. He sees a large role for PICES in developing the scientific basis for decisions on resource use and looks forward to the time that science will provide the recognized criteria for such judgments. I hope that as PICES grows and develops its effectiveness and its scientific constituency we will be in a position to meet this challenge.

Dr. Wooster called upon the head of the Canadian delegation, Dr. William Doubleday, to make a statement on behalf of his government.

I would like to thank Dr. Wooster and express that it is both an honour and a pleasure for me to represent Canada at the Third Annual Meeting of the North Pacific Marine Science Organization, in Nemuro. One month ago, the International Council for the Exploration of the Sea, ICES, met in St. Johns, Newfoundland, Canada. When I breathe the fresh salt air of Nemuro on my way to PICES sessions, I am reminded of St. Johns. Both cities have a similar climate and both cities have strong links to the sea.

I would like to recognize the work of several agencies of the Japanese Federal Government, the Government of Hokkaido Prefecture and the City of Nemuro in preparing for this meeting. I wish particularly to commend the Local Arrangements Committee, whose hard work allowed this meeting to occur without delay in spite of earthquake damage to the main hall where PICES was to meet.

During the past few days I have observed discussions of the PICES-GLOBEC Workshop. I was impressed by the number of participants from a wide range of scientific disciplines from countries all around the North Pacific. The joint planning of this major ecological research program brings together physical oceanographers, biologists, climatologists and others to contribute their unique knowledge and experience to a common goal. PICES-GLOBEC is providing a framework to organize and coordinate marine research around the rim of the North Pacific and across the North Pacific. Planning and implementing PICES-GLOBEC represents a major new phase for PICES as we move towards coordinating a joint research program.

A few days ago, in Vladivostok, the North Pacific Anadromous Fish Commission adopted a resolution about PICES-GLOBEC. The resolution recognized again the two key issues identified last year by the

Commission - factors affecting productivity trends of the North Pacific ecosystem together with their effect on salmonid carrying capacity, and factors affecting trends in production of North Pacific salmonids; but went further. This year's resolution offered to share the Commission's records and documents related to salmonids with PICES-GLOBEC and declared the Commission's desire to play a leading role in the planning and implementation of parts of PICES-GLOBEC which relate to salmonids. The Commission has proposed joint discussions between its scientists and PICES scientists to develop the PICES-GLOBEC plan.

Canada welcomes the North Pacific Anadromous Fish Commission resolution and looks forward to a growing partnership between the NPAFC and PICES in the coming years.

I have been informed that this year's attendance at PICES is higher than last year's. Growing participation and a strong and dynamic scientific program are clear signs that PICES is moving forward into a new period of international scientific cooperation. On behalf of all Canadian participants I look forward to a stimulating and successful annual meeting. Thank you, ladies and gentlemen.

Dr. Wooster called upon the acting head of the People's Republic of China delegation, Prof. Yu-Kun Xu to make a statement on behalf of his government.

I would like to thank Dr. Wooster for the opportunity to speak on behalf of the People's Republic of China. I would also like to thank the local Japanese Government and the Japanese delegation for their support in making it possible to hold the Third Annual Meeting in beautiful Hokkaido.

Several strong earthquakes have recently occurred off the Hokkaido area causing

great loss to property of the people of the area. I would like to express sympathy to all on behalf of the Chinese delegation.

In addition, the Chinese delegation would like to extend a warm welcome to our neighbor, the Russian Federation to join PICES, thus becoming the fifth member of the PICES family.

Three years have passed since PICES came into being and during this period Dr. Wooster has done a lot of work such as the coordination of committee work, publication of PICES activities as well as the promotion of PICES influence. The Secretariat headed by Dr. McKone has also done a lot of work on behalf of setting up PICES. The Chinese delegation would like to express our thanks for their excellent work and will, as we have in the past, continue to support PICES.

After the formation of PICES, the focus is now on ocean scientific research in the PICES region. At present, the issue of population size, resources and the environment has drawn the world's attention. Especially after UNCED, various nations and international agencies are actively working on carrying out the principles and guidelines of UNCED. The sustainable use of oceans and their resources described in chapter 17 of agenda 21 becomes the main subject of ocean science. It is worth mentioning, that this November, the UN Convention on the Law of the Sea will come into force. A new era of cooperation will develop on oceanographic research and ocean development. PICES should take advantage of the coming into force of the Law of the Sea Convention to promote the advancement of ocean sciences in the North Pacific region.

The North Pacific characterizes important ocean properties, it has been one of the major research areas of oceanographers

and is one of the most rapidly developing economic areas of the world. PICES should play an important role for the advancement of ocean science and the development of the economy of the region.

The Chinese delegation, together with other countries, would offer support for PICES activities in the future to allow PICES to play a bigger role in international ocean science research.

Dr. Wooster called upon the U.S.A. delegate, Dr. William Aron, to make a statement on behalf of his government.

Ladies and gentlemen, distinguished citizens of Nemuro, it is a great honor for the United States to participate in this PICES meeting. It is easy to be last in the order of the opening speeches and to simply agree with the important points made by my colleagues both in terms of saying thank you to the organizers and hosts for these sessions and emphasizing the growing importance and contributions of PICES. I must, however, repeat the tributes to the people of Nemuro for their extraordinary contributions to these sessions in the face of a major natural environmental assault.

I would like to make a few remarks about the current status and role of PICES. The recent political perturbations associated with the role of PICES in relation to other international organizations to a large degree reflects a growing awareness of PICES as a formidable intellectual enterprise. A truce, perhaps even genuine peace has been restored, largely because reason has prevailed and there is a

recognition that PICES can play an important role in providing the scientific underpinning for decisions regarding the wise use of natural resources.

In recognizing the role that science may play, both in terms of prediction and sustainable use of resources it is essential to remember that our prime responsibility is to tell our leadership not what they want to know, but what they must know to make effective decisions.

I remain a wild eyed optimist about the future of PICES. The presence of many old and distinguished friends in the audience combined with so many young and very bright scientists makes it clear that this young organization, while rooted with tradition, also contains the vigor and enthusiasm that assures a bright and lengthy future. While many people have made vital contributions to our current state, I would particularly like to acknowledge Warren Wooster for his role in establishing a solid foundation for PICES in what has proven to be a rather unstable environment.

Dr. Wooster thanked the Delegates for their remarks and introduced Prof. Yutaka Nagata of Mie University to give the keynote lecture. Prof. Nagata addressed the subject of the *Subarctic North Pacific Ocean in Global Climate System*, describing the ocean circulation and the transfer of heat and nutrients in the North Pacific and Kuril Island region off Northern Japan.

REPORT OF GOVERNING COUNCIL MEETINGS

The Governing Council met on October 18, 20 and 24, under the Chairmanship of Dr. Wooster. The Executive Secretary, Dr. W. Doug McKone, served as rapporteur.

All Contracting Parties were represented at the three sessions (Endnote 1). The Chairman of the Science Board, Dr. Dan Ware was in attendance during part or all of each session.

At the first session, the Chairman welcomed the delegates and noted that there were some new permanent delegates, notably Dr. T. Sasaki who replaced Dr. H. Hatanaka and Dr. W.G. Doubleday who replaced Dr. L.S. Parsons. Dr. D.J. Noakes and Mr. H.D. Guo replaced Dr. J.C. Davis and Mr. C.M. Liu respectively for this Annual Meeting. The Chairman reviewed the agenda and proposed the order in which to take up the various items. This report summarizes the treatment of each agenda item during the course of the three sessions.

Agenda Item 1. Preliminary Report on Administration

The Executive Secretary summarized the activities of the Secretariat during the previous year (Endnote 2). During the reporting it was decided that Science Board should review the utility of the ship schedule document prepared by the Secretariat, consider how it could be made more useful, and provide recommendations to Council.

Agenda Item 2. Relations with Other International Organizations and Observers from such Organizations

Dr. Wooster expressed his pleasure that Prof. V.K. Zilanov, Chairman of the North Pacific Anadromous Fish Commission, was present at the meeting and asked consent

that he be invited to attend sessions of Council. This was agreed.

Prof. Zilanov indicated that the NPAFC strongly supports cooperation with PICES through the development of programs that meet the goals of both organizations. Prof. Zilanov reported that the NPAFC is prepared to work jointly on two critical issues and proposed that PICES scientists join in a *Research Planning and Coordinating Meeting* the week of March 6-10, 1995 (Endnote 3). Dr. Wooster thanked Prof. Zilanov for his report and indicated that this was a good opportunity for both organizations to further develop a spirit of cooperation.

Council reviewed the text of the Memorandum of Understanding (MOU) with the Intergovernmental Oceanographic Commission (IOC) and approved its implementation (Decision 94/A/1). Similarly, Council discussed with Prof. Zilanov the possibility of developing an MOU with the NPAFC. Prof. Zilanov agreed that the development of an MOU would form a good basis for cooperation between the two organizations. Council approved the proposal and the Executive Secretary was instructed to undertake the development of the MOU over the next few months jointly with the NPAFC Secretariat and circulate it to delegates for approval (Decision 94/A/2).

Council briefly discussed the formation of a new international organization with responsibilities for management of fisheries in the central Bering sea (Donut Hole). It was agreed that PICES should establish relations with it once the organization becomes operational.

The Executive Secretary provided a list of Organizations that are currently invited to

participate in the Annual Meeting. In the past, the list was circulated for approval before each meeting. This process was unnecessarily complicated and he recommended that the Governing Council approve a standing list that members of Council could change as required at subsequent Annual Meetings. The Governing Council approved the adoption of a standing list of observers (Decision 94/A/3 and Endnote 4).

Agenda Item 3. Membership and Observers from Other Countries

Dr. Wooster reported that the Russian Federation and the Republic of Korea had sent observer delegations to this Annual Meeting and suggested that they be allowed to attend Council Meetings as observers. Council agreed with the proposal and Dr. Wooster welcomed Dr. Kotenev and Dr. Shaboneev of the Russian Federation and Mr. Doo and Dr. Huh from the Republic of Korea.

Dr. Kotenev reported that the Russian Federation had filed its intent to join about 90 days previously and he thought that the government would soon (perhaps during this meeting) file its instrument of ratification.

Mr. Doo reported that Korea was attempting to obtain funding for support of its application to join. The funding support will be decided in the next month or two and the Republic of Korea would then likely be in a position to file a letter of intent. Mr. Doo further emphasized that the Republic of Korea was determined to join PICES as soon as funding was available.

Dr. Wooster thanked both delegations for their reports and he expressed, on behalf of Council, how important it was for PICES that both countries become members.

Agenda Item 4. Election of Chairman

Prof. Xu replaced Dr. Wooster as Chairman to call for nominations for Chairman of Council. In accordance with the Rules of Procedure, delegates were provided ballots for nomination of candidates for Chairman. A single candidate, Dr. Wooster was nominated and elected unanimously. The delegates congratulated Dr. Wooster on his re-election for a second term.

Agenda Item 5. Report of Finance and Administration Committee

In the absence of its Chairman, Dr. John C. Davis, the Finance and Administration Committee met under the Acting Chairmanship of Mr. William L. Sullivan, Jr., who presented the report to the Governing Council (see F & A report for text). The report was accepted by Council.

Agenda Item 6. Audited Accounts for Financial Year 1993

With the recommendation of the Finance and Administration Committee, the Governing Council accepted the audited accounts and agreed to continue with Flader and Greene as auditors for another year (Decision 94/A/4).

Agenda Item 7. Estimated Accounts for Financial Year 1994

The estimated accounts from October 1 to December 31 were reviewed by the Finance and Administration Committee that recognized a surplus over expenditures would occur in 1994. This surplus along with earnings would be added to the Working Capital Fund (WCF).

Agenda Item 8. Budget for Financial Year 1995

The detailed components of the budget were discussed by the Finance and

Administration Committee, appropriations were reduced in most categories and funds for a new workshop were provided to give a 1995 budget total of \$440,000 CND, the same as last year (Decision 94/A/5).

Salary increases for staff based on merit were accepted by the Finance and Administration Committee and a new full time continuing secretarial position was recommended. The Governing Council approved the merit increases and the new secretary position.

The Governing Council approved the 1995 budget as revised by the Finance and Administration Committee. It was also agreed that \$240,000 surplus from the WCF would be shared equally by the Contracting Parties. Members would inform the Executive Secretary no later than December 15, 1994 how they wish to disburse their share. The WCF for 1995 is expected to be approximately \$28,000 CND (Decision 94/A/5).

Dr. Aron pointed out that the \$240,000 surplus in the Working Capital Fund was generated by contributions to PICES and it should be used in support of PICES objectives. He urged Contracting Parties to consider allocating some or all of the surplus to the PICES Trust Fund which was set up to further the activities of PICES.

Agenda Item 9. Forecast Budget for Financial Year 1996

The forecast budget for 1996 was revised by the Finance and Administration Committee to reflect the changes in the 1995 budget. The Governing Council agreed with the adjustments as the budget was only for planning purposes (Decision 94/A/5). Council noted that the membership was likely to increase in 1995 and further revisions would likely be required.

Agenda Item 10. Trust Fund

The expenditures from the account and guidelines for administrating the account were reviewed in the Finance and Administration Committee. The provisional guidelines were amended to emphasize that junior scientists should be considered when accepting applications. Council approved the revised guidelines as permanent and requested that the Secretariat develop options for funding the Trust Fund and report on these at the next Annual Meeting (Decision 94/A/4).

Agenda Item 11. Report and Recommendations of Science Board

The Chairman of Science Board, Dr. Ware summarized the report of the Board's meeting on October 22 and 23 and presented its recommendations. Five working groups met during the year and their work, summarized in the report, has been reviewed by the relevant Scientific Committees and Science Board. Two workshops convened during this Annual Meeting reported their recommendations to Science Board; these are summarized in the report. Decisions on the following matters were approved by Council (full text of the Decisions are in Appendix 1A):

1. **94/S/1:** The Secretariat will examine ways of improving the use of electronic networks and bulletin boards, and will examine the possibility of obtaining a real-time recording and display system in 1995. Member States are encouraged to improve availability of electronic mail for information exchange through PICES.
2. **94/S/2:** Review papers from the PICES-STA Workshop on *Monitoring Subarctic Pacific Ocean Variability* will be published in *PICES Scientific Report*

series and this series could also be used to publish extended abstracts from topic sessions. Publication of proceedings of symposia will be made on a case by case basis and the use of commercial publishers for these symposia, books and monographs may be appropriate in some cases.

3. **94/S/3:** The Workshop on the *Okhotsk Sea and Adjacent Areas* will be held in Vladivostok (June 19-24, 1995).
4. **94/S/4:** WG 4 on *Data Exchange* will be replaced with a *Technical Committee on Data Exchange* (TCODE). TCODE, together with the Secretariat, will start work on implementing the recommendations from WG 4.
5. **94/S/5:** A joint PICES-NPAFC task group on fisheries data will be established and will report to TCODE.
6. **94/S/6:** The Secretariat will arrange with TINRO to translate into English detailed inventories of scientific surveys undertaken since 1984.
7. **94/S/7:** A Steering Committee will be established to develop implementation of the PICES-GLOBEC International Program on *Climate Change and Carrying Capacity* (CCCC). The NPAFC invitation to participate in the *Research Planning and Coordination Meeting* March 6-10, 1995 in Seattle will be accepted. Subsequently, a NPAFC-PICES Scientific Liaison Group will be established to develop the implementation plan for the anadromous species component of the CCCC program.
8. **94/S/8:** An interdisciplinary working group *Subarctic Pacific Monitoring* (WG9) will be established to plan monitoring activities in the PICES area.
9. **94/S/9:** Member States are encouraged to support the development of new monitoring technology identified in the PICES-STA report, particularly in relation to autonomous biological instrumentation.
10. **94/S/10:** WG 2 on *Development of Common Assessment Methodology* will be disbanded and replaced by a new group on *Practical Assessment Methodology* (WG 8).
11. **94/S/11:** WG 6 on *Subarctic Gyre* will disband; WG 3 on *Coastal Pelagic Fish* and WG 7 on *Modeling of the Subarctic Pacific Circulation* will continue for an additional year.
12. **94/S/12:** WG 5 on the *Bering Sea* will organize a one day symposium for PICES IV, will meet in early 1996 to review future priorities, and will then disband. The WG 5 Editorial Committee will continue preparation of a review volume on the Bering Sea.
13. **94/S/13:** The Executive Secretary in consultation with the Chairman will develop procedures for selecting scientists for support from the Trust Fund, once funding sources have been found.
14. **94/S/14:** Requests for endorsements of meetings/symposia are to be reviewed by Science Committee Chairmen and the Chairman of Science Board who will notify the Secretariat of the action to be taken.

The Science Board also approved a scientific program for the Fourth Annual Meeting (See Science Board Report) and addressed questions directed to it by Council:

1. The Board noted that the ship schedule document prepared by the Secretariat

was not very useful and proposed that the Chairman of Council and the Secretariat prepare a scheme indicating what information is required on what time schedule and how it might be most effectively disseminated. The scheme should be circulated to interested parties with a view to having a specific proposal for consideration at PICES IV.

Council approved the Science Board proposal to develop a ship schedule scheme for consideration at PICES IV.

2. The Board proposed a mechanism for collaboration between the NPAFC and PICES.

See Decisions 94/S/5 and 94/S/7.

Agenda Item 12. Future Meetings of the Organization and Subsidiary Bodies, Including Time and Place for the Fourth and Fifth Annual Meeting

Council accepted with pleasure the invitation of the People's Republic of China to host PICES IV in the week of October 16, 1995 (Decision 94/A/6). The scientific program for the meeting has been proposed by Science Board. Council approved the Finance and Administration Committees plan for scheduling future meetings in advance over the next three years (Decision 94/A/6 and the F&A report).

Agenda Item 13. Any Other Business

Council approved the Finance and Administration Committee recommendation that the Secretariat be allowed to undertake small contracts at the discretion of the Executive Secretary in consultation with the Chairman of Council, if necessary, with all funds received being deposited to the Trust Fund Account (Decision 94/A/4).

The Governing Council approved the Finance and Administration Committee

recommendation that no fees be initiated on publications at this time but the Executive Secretary should review policies and cost recovery of publications by other Organizations and report these findings next year (Decision 94/A/4).

Appendix 1

A. Decisions

94/A/1: Council reviewed the text of the Memorandum of Understanding (MOU) with the Intergovernmental Oceanographic Commission (IOC) and approved its implementation.

94/A/2: Council requested the Executive Secretary to institute discussions with the Executive Director of the North Pacific Anadromous Fish Commission (NPAFC) to jointly develop an MOU over the next few months and circulate it to delegates for approval.

94/A/3: Council approved the adoption of a *standing list of observers* to Annual Meetings which could be amended by members at subsequent meetings (see Endnote 4).

94/A/4: Council accepted the report of the Finance and Administration Committee and agreed to the following actions:

1. *Small Contracts.* The Secretariat is authorized to undertake small contracts at the discretion of the Executive Secretary, in consultation with the Chairman of the Council as necessary, and to deposit the funds received in the Trust Fund account.
2. *Publications.* Publications should continue to be distributed without charge, but the Executive Secretary should look into cost recovery practices of other international organizations and report back to PICES IV.

3. *Auditor.* Flader and Greene will be retained as auditors for another year.
4. *Trust Fund.* Guidelines for operating the Trust Fund were approved (Endnote 5). The Executive Secretary should develop options for obtaining additional moneys for the fund and report on the matter to the Committee at PICES IV.

94/A/5: Council accepted the financial statements for the audited accounts of 1993 and the estimated accounts of 1994 and agreed to the following actions:

1. *1995 Budget.* The budget of \$440,000 was approved.
2. *Forecast 1996 Budget.* The forecast budget for 1996 was reviewed and will be further considered during PICES IV.
3. *Working Capital Fund.* The Fund will be reduced to approximately \$28,000. The advance payment of Japan will be treated as a separate item. The residue of \$240,000 will be shared equally by the Parties who will inform the Executive Secretary about their disposition by December 15, 1994.

94/A/6: Council accepted the invitation of the People's Republic of China to hold PICES IV in China the week of October 16, 1995. The practice of advance planning over three years was adopted and a schedule was established for 1995-1997 meetings and for receipt of estimates of financial requirements. In the absence of invitations for future meetings, they will be hosted at the Secretariat.

94/S/1: The Secretariat will examine the potential uses of electronic networks and bulletin boards for making the conduct of PICES business more effective. Member States are encouraged to make electronic mail communication available to those engaged in information exchange through PICES. The Secretariat will examine the possibility of obtaining a real-time PC-based recording and display system in 1995.

94/S/2: The review papers presented at the PICES-STA Workshop on *Monitoring Subarctic Pacific Ocean Variability* will be published in the PICES *Scientific Report* series. Co-editors will be Prof. Y. Sugimori (Japan) and Dr. M.G.H. Briscoe (U.S.A.). Use of the series for publishing collections of extended abstracts from Scientific Committee topic sessions will be considered. Decisions on publishing proceedings of PICES symposia will be made on a case-by-case basis. The use of commercial publishers for such proceedings and for books and monographs resulting from PICES activities may be appropriate in some cases.

94/S/3: The Workshop on the *Okhotsk Sea and Adjacent Areas*, being organized by POC and other committees, will be held in Vladivostok on 19-24 June, 1995. The objective of the workshop is to review present knowledge of the oceanography and fisheries of that region, the availability and exchange of relevant data, and the development of cooperative investigations.

94/S/4: WG 4 on *Data Exchange* will be replaced with a standing *Technical Committee on Data Exchange* (TCODE) with new terms of reference (see Appendix 1 B. 1). The purpose of TCODE is to guide the data management activities of PICES. Its membership will consist of two scientists from each member country, one experienced with physical/chemical/meteorological data and one with biological/fisheries data. The Chairman will be selected from among TCODE members. The proposed joint PICES-NPAFC task group on fisheries data will report to TCODE (see Decision 94/S/5). TCODE will work on WG 4 recommendations: 4.2.1, 4.2.2, 4.2.3, and 4.2.4 and together with the Secretariat will undertake to implement recommendation 4.3.2 (see Appendix 1 C.).

94/S/5: A joint PICES-NPAFC task group on fisheries data will be established. The first function of this group will be to examine the

possibility of having the existing INPFC annual, summary catch statistics converted to electronic data files, so these data can be more easily accessed by scientists working on PICES programs (like PICES-GLOBEC), and by the global science community. The task group will report to the Technical Committee on Data Exchange.

94/S/6: The Secretariat will arrange to have TINRO's (Vladivostok) detailed inventories of scientific surveys undertaken since 1984 translated from Russian into English. The Secretariat together with TCODE, will proceed with implementation of 93/S/5.

94/S/7: PICES-GLOBEC *Climate Change and Carrying Capacity Program* (CCCC)

1. A Scientific Steering Committee (SSC) for the CCCC Program will be established (see Appendix 1 B. 2 for terms of reference).
2. Membership of the SSC will be determined by the PICES Chairman in consultation with the Science Board and with the agreement of relevant national authorities.
3. The SSC will proceed with further development and implementation of the program, with particular emphasis on elements of Phase 1, planning and data assimilation, of the Science Plan (see PICES-GLOBEC Science Plan).
4. The SSC will encourage compilation of historic data in consultation with TCODE and initiation of retrospective analyses and development of circulation and regional food web models.
5. The invitation of NPAFC to participate in their *Research Planning and Coordinating Meeting*, tentatively scheduled for the week of March 6-10 in

Seattle is accepted. Subsequently, NPAFC-PICES Scientific Liaison Group will be established jointly with the CSRS of the NPAFC to develop the implementation plan for the part of the CCCC Program dealing with anadromous species, including exchange of relevant data as suggested by NPAFC. This group will be chaired by a person designated by the NPAFC. The liaison group will report to the PICES-GLOBEC Steering Committee.

94/S/8: An interdisciplinary working group *Subarctic Pacific Monitoring* (WG 9) will be established (see Appendix 1 B. 4 for terms of reference). The membership of the WG will consist of two people from each member country, with credentials in the scientific and technical areas concerned with the monitoring activities. The Chairman will be named by the PICES Science Board.

94/S/9: Member States are encouraged to support the development of the new technology required for monitoring identified in the report of the PICES-STA Workshop on *Monitoring in the Subarctic North Pacific*. Particular attention should be paid to the development of autonomous biological instrumentation, without which monitoring of ecosystem response to climate forcing will be particularly difficult.

94/S/10: A new MEQ working group (WG 8) *Practical Assessment Methodology* will be established (see Appendix 1 B.(3) for terms of reference). WG 2 *Development of Common Assessment Methodology* will disband.

94/S/11: WGs on specific regions (*Coastal Pelagic Fish*, and *Bering Sea*) will review current monitoring of the ecosystems in those regions and will advise on cost-effective ways whereby it might be strengthened. WG 3 (*Coastal Pelagic Fish: FIS*) will spend one more year completing the work it began on: (a) compiling an inventory of scientists

studying pelagic fish, and (b) comparing life table differences. WG 4 (*Data Exchange: SB*) will be replaced by a new technical committee (see Decision 94/S/4). WG 5 (*Bering Sea: SB*) will continue until mid-1996 (see Decision 94/S/12). WG 6 (*Subarctic Gyre: SB*) has completed its terms of reference, and will disband. WG 7 (*Modelling of the Subarctic North Pacific Circulation: POC*) will complete its terms of reference over the next year.

94/S/12: WG 5 on the *Bering Sea* will organize a one-day symposium on the Bering Sea to be held in conjunction with the PICES IV general meeting. Following the symposium the WG will convene in early 1996 in order to review the symposium and to formulate a set of topics that would be the genesis for a new, focused WG. The current WG will then disband. The WG will continue preparation of the review volume on the Bering Sea under the direction of the WG's editorial committee, headed by Dr. T. Loughlin (U.S.A.) and Prof. K. Ohtani (Japan). Members of the Editorial Committee will meet as two subgroups, in Asia and in North America, early in 1995. Subsequent coordination will be conducted by correspondence. PICES will take responsibility to arrange publication of the book when completed, preferably through a commercial publisher.

94/S/13: Taking into account the Science Board recommendation to support the travel of outside scientists who can contribute significantly to PICES activities, and that of young scientists, the Executive Secretary, in consultation with the Chairman and the Chairman of the Science Board, will develop procedures for selecting scientists for support from the Trust Fund, once funding sources have been found.

94/S/14: Letters received seeking endorsement of meetings/symposia outside PICES will be forwarded to the appropriate Science Committee Chairman. His views will

be forwarded to the Chairman of Science Board for action.

B. Terms of Reference

1. *Technical Committee on Data Exchange (TCODE)*
 - a. Identify the data management requirements of PICES.
 - b. Develop strategic plans to meet these requirements.
 - c. Recommend establishment of *ad hoc* task groups to deal with specific functions of TCODE.
 - d. Review the progress of task groups and provide Annual Reports to Science Board on the work of TCODE.
 - e. Advise the PICES Secretariat on its data exchange activities.
2. *CCCC Scientific Steering Committee*
 - a. Initiate development of a draft Implementation Plan. The Committee will meet during the first half of 1995 to prepare a strategy for circulation to Delegates and other interested parties.
 - b. Determine how the work of PICES Scientific Committees and WGs can most effectively support the CCCC Program.
 - c. Identify existing or foreseen national and international research programs with which the CCCC Program could be coordinated and determine how this can most effectively be achieved.
3. *Practical Assessment Methodology (WG8)*
 - a. In 1995 the WG will draft a workplan and outline for a 2-3 week practical workshop

on the East China Sea, as recommended in the WG 2 Report of October, 1994

- b. Organize and host the practical workshop, described above, by October 1996 (or 1997 if there are unforeseen practical difficulties). The workshop will be designed to assess methodologies and explore the feasibility of assessing observable biological effects, at differing levels, along a selected pollutant gradient in the East China Sea.

4. *Subarctic Pacific Monitoring* (WG 9)

- a. The WG will be responsible for planning the monitoring activities in the PICES area, including proposing priorities and schedules, and including physical, biological, and chemical measurements.
- b. The WG should cooperate with the GOOS *Ocean Observing Panel for Climate*, the GOOS *Living Marine Resources Science Planning Group*, the Scientific Steering Committee of the PICES-GLOBEC *Climate Change and Carrying Capacity Program*, and other such bodies as may be needed.
- c. The WG will work with the PICES *Technical Committee on Data Exchange* to ensure timely and open exchange of monitoring data between participants and to external data users, as a mechanism to control the quality and relevance of the data.
- d. The WG will report regularly to the PICES Science Board.

C. **Selected Recommendations from WG 4 Report**

- 4.2.1 Recognizing that PICES is a new organization, and noting that many of the data exchange issues may have already been addressed by other

science organizations, and wanting to make the development of PICES data exchange mechanisms the most cost-effective and efficient, **WG 4 recommends that PICES visit or contact international science organizations to review their data inventories, data exchange functions, etc., and report on the findings.**

- 4.2.2 Recognizing that many organizations have already produced inventories of their data holdings in the PICES region, **WG 4 recommends that a master inventory (inventory of inventories) in the PICES region be developed as a long-term goal of PICES.** Initially, the master inventory might be as simple as a bibliography of available inventories. This might not necessarily involve active searches for existing inventories but rather PICES should establish a mechanism whereby member nations can submit lists of existing inventories to PICES. Data collections from future PICES projects should be listed in these inventory lists.

- 4.2.3 **WG 4 recommends that PICES continue the development of the Healey et al. (1985) inventory** for the eastern Pacific and expand the inventory to the central and western Pacific if these inventories do not currently exist.

- 4.2.4 WG 4 noted that more descriptive and more comprehensive metadata (information about data) inventories will be required for new PICES science projects in the North Pacific, particularly for science surveys. The inventory will provide the necessary detail about what, how, when, and where data were collected. **WG 4 recommends that PICES develop a detailed inventory that can**

accommodate recent (perhaps beginning with 1991) and future scientific surveys in the PICES region. In developing this inventory, it will be important for member nations to submit information annually about surveys to PICES using existing standard formats where possible. For some institutions, this will not be a new reporting requirement as they already submit survey reports to international organizations. One example that PICES could consider

for use is the ROSCOP format used by the IOC/IODE.

- 4.3.2 **WG 4 recommends that PICES facilitate the exchange of unique data sets (e.g., Ocean Station 'PAPA' time series 1956-1981) by entering into cooperative ventures with other organizations (e.g., World Data Centre A, MEDS, etc.) to produce CD-ROMs for general distribution.**

Endnote 1

Participants

Canada

Dr. William G. Doubleday (delegate)
Dr. Donald J. Noakes (alternate delegate)

China

Prof. Yu-Kun Xu (delegate)
Mr. Han-Di Guo (alternate delegate)
Mr. Shu-Ping Chen (advisor)
Ms. Yue Chen (advisor)
Mr. Ru-Guang Dai (advisor)

Japan

Dr. Takashi Sasaki (delegate)
Mr. Naotoshi Sugiuchi (alternate delegate)
Mr. Masashi Mitzukami (advisor)
Mr. Masataka Nakahara (advisor)

U.S.A.

Dr. Vera Alexander (delegate)
Dr. William Aron (delegate)
Mr. William L. Sullivan, Jr. (advisor)

Observers

Mr. Jungsoo Doo (Korea)
Dr. Hyung-Tack Huh (Korea)
Dr. Boris N. Kotenev (Russia)
Dr. Igor E. Shaboneev (Russia)

Prof. Vyacheslav Zilanov (North Pacific Anadromus Fish Commission)

Others

Dr. Warren S. Wooster (Chairman, PICES)
Dr. W. Douglas McKone (Executive Secretary) (Rapporteur)
Dr. Daniel M. Ware (Chairman, Science Board)

Endnote 2

Report on Administration for 1994

Council, Committees and Working Groups

1. Membership

a. As agreed by Council in 1993 a letter was sent encouraging the Russian Federation and the Republic of Korea to seek membership in PICES. On July 5, 1994 the Russian Ministry of Foreign Affairs notified the depository (Department of Foreign Affairs and International Trade) of the PICES Convention, in Ottawa, of its desire to accede to the Convention. Canada informed Member States on July 19, 1994. If Member States raise no objections, Russia could deposit its instrument of accession in October, to be effective 60 days later.

b. On August 31, 1994 the Ministry of Foreign Affairs for the Republic of Korea indicated that it is trying to secure the necessary funds to support their membership in PICES. This decision will likely be made sometime in November.

2. Payment of National Contributions

All financial contributions were received by March 1994.

3. National Delegations

The Japanese delegates, Consul General Yashuhide Hayashi and Dr. Hiroshi Hatanaka, have been replaced by Consul General Yasuo Nozaka and

Dr. Takashi Sasaki respectively on the Governing Council. The senior Canadian delegate Dr. Scott Parsons has been replaced by Dr. William Doubleday; Dr. Donald Noakes will substitute for Dr. John Davis at this meeting.

4. Committees and Working Groups

- a. Russian observers have been identified by the Russian National Oceanographic Committee for all Science Committees and Working Groups.
- b. Japan has named Dr. Kiyoshi Wakabayashi to replace Dr. Takashi Sasaki, who is now a member of Council, on the Fishery Science Committee.
- c. Canada has replaced Dr. John McInerney by Dr. Lee Harding and Japan has appointed Prof. Makoto Shimizu and Dr. Tokuhiisa Yoshida to the Marine Environmental Quality Committee.
- d. Japan has replaced Dr. Yukimasa Ishida with Dr. Kazuya Nagasawa on WG 6.
- e. WG 7 was successfully formed and the co-chairmen will provide a report of its activities this year.
- f. 93/S/5 - The Secretariat is updating the report *Inventory of Time Series of Physical, Chemical, Biological and Fisheries Data from the Eastern North Pacific* by Healey et al (1985). A letter of inquiry was sent to 32 marine science institutions in North America asking for the information on the time series data that they might have collected recently to include in the new version. The Secretariat has received 15 replies to date. The Secretariat plans to finish updating the inventory and have it

available in machine-readable form by mid-1995.

5. Observers

The Observer list was circulated for review again this year and invitations were sent according to the agreed list. The following positive responses were received:

Russian observers

Dr. Boris N. Kotenev	VNIRO
Dr. Igor E. Shaboneev	Ministry of Science &

Technology

Republic of Korea observers

Mr. Jungsoo Doo	Ministry of Foreign Affairs
Dr Hyung Tack Huh	KORDI
Dr. Su Am Kim	KORDI
Dr. Jae Hak Lee	KORDI
Dr. Chul In Baik	KORDI
Dr. Soon Song Kim	KORDI

Inter-Governmental Organizations

Dr. Vyacheslav Zilanov	NPAFC
Dr. Michael L. Dahlberg	NPAFC
Dr. Andrew Bakun	FAO

Non-Governmental Organizations

Dr. Takao Hoshiai	IASC
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6. Travel and Representation at Other Organization Meetings

- a. Dr. L.S. Parsons represented PICES at the Annual Meeting of ICES (September 22-30).
- b. Dr. D. Ware represented PICES at the United States (January 8-13) and International (July 16-23) GLOBEC meetings.

- c. Dr. M. Miyata represented PICES at the Annual Meeting of NPAFC (October 10-13).
- d. Dr. W.D. McKone and Dr. D. Ware visited the People's Republic of China (April 25-May 9) to meet with scientists to discuss PICES and their research activities and discuss the possible venues for holding a future meeting of PICES.
- e. Dr. W.D. McKone and Dr. M. Miyata visited Japan (May 9-14) to discuss logistics and other issues related to the Third Annual Meeting.
- f. Dr. W.S. Wooster attended WGs 4 (June 20-22) and 5 (July 14-15) meetings and Dr. M. Miyata attended WGs 4 (June 20-22) and 7 (June 22-24).
- g. Dr. W.D. McKone attended the Pension Society (May 16-20) meeting on behalf of PICES.

Communication

1. Publications

- a. The Annual Report was published and circulated in early February to all PICES members, international organizations and libraries.
- b. Newsletters were circulated in early February and together with the Annual Report in early August.
- c. The First Announcement for the Third Annual Meeting was distributed in early February.
- d. The Final Announcement for the Third Annual Meeting was distributed in early June.
- e. A poster for the Third Annual Meeting was distributed in early February.

Posters for the PICES-GLOBEC and PICES-STA Monitoring Workshops were printed in Japan, and sent out by the Secretariat in early July.

- f. The Vladivostok Workshop First Announcement was printed and sent out in late August.
 - g. WG 4 report was distributed to the Chairman, Science Board Chairman, Scientific Committee members and WG 4 members in mid-August. WGs 3, 5 and 7 reports were circulated to Scientific Committee Chairman, Science Board Chairman, Scientific Committee members and the respective WG members in late August.
 - h. Three Science Plan drafts for the PICES-GLOBEC Workshop were sent to all PICES active participants plus a special list. Comments on the plan were forwarded to the Steering Committee members.
 - i. The PICES Directory was distributed in early March and updated and sent out again in early August.
 - j. The PICES Handbook was revised and circulated in early April.
 - k. A volume of abstracts for the Third Annual Meeting was prepared for circulation at the Annual Meeting.
 - l. PICES Scientific Report No. 1 containing the 1993 reports of WGs 3 and 6 was circulated to Delegates, Chairman, Science Board Chairman, Scientific Committee members and members of WGs 3 and 6 in mid-September.
- ### 2. Communication
- a. In April 1994, the Secretariat distributed a questionnaire to PICES members

(who are listed in the PICES Directory) and the users of Internet (who are on the PICES e-mail list) to determine if the PICES bulletin board on Omnet and sending news via Internet was useful or could be modified to improved their use.

The results indicate that most of the users are satisfied with the information being provided but a number of improvements were suggested. Almost all of the users are interested in receiving relevant information, but some of them find the e-mail messages too long. A large majority support the use of Internet as the basis of our service with a few wishing to maintain Omnet.

The Secretariat is seeking support to set up our own bulletin board which would only be accessible via Internet. Once such a bulletin board is established, the Omnet service would be discontinued. Those not on Internet will be served by mail.

- b. The Secretariat developed a communication policy based on cost factors of fax, mail, and e-mail (appendix). The fax use by the Secretariat increased over the year, for example, from mid-July to mid-September 1000 fax messages were sent and received. An analysis of the average time it takes for mail to reach the Secretariat from member countries (all sources combined) has also been examined in relation to costs.
- c. Appointment of the contact persons for ship schedule by all four member countries was completed in March 1994. Subsequently, the Secretariat sent a letter to each of the four persons asking their opinions on how the ship schedule should be designed and distributed. U.S.A. and Japan replied. Subsequently, the Secretariat sent a letter asking for ship schedule

information from each country. US schedule information from one fleet was received, by e-mail, from various institutions over a period of time. The Secretariat received the Japanese ship schedules in July. Canada supplied the necessary information in September. So far no information has been received from China. The Secretariat compiled the schedules of the three countries in loose bound form to circulate to those who would like to receive it by mail.

In PICES PRESS Vol. 2. No. 2, an article about the ship schedule was written informing PICES scientists of the availability of the ship schedules. To date the Secretariat has not received a request for the ship schedules.

Secretariat Matters

1. Administration/Financial
 - a. No action was taken by the Secretariat with regard to 93/S/7 concerning the development of a *Visiting Scientist Program* during this past year.
 - b. As discussed under Agenda Item 2 of the 1993 Governing Council Report, a Memorandum of Understanding (MOU) was drafted between PICES and the IOC. The draft was circulated to delegates for review and comment on March 10, 1994. The draft was revised based on the comments and forwarded to the IOC for their approval. Recently, the Secretariat contacted the IOC regarding the status of the MOU and we expect to receive it from them in the near future.
 - c. The PICES Privileges and Immunities Order was passed on December 15, 1993. PICES can now recover the 7% Goods and Services Tax (GST) on expenditures and need not pay income tax for foreign nationals working in the

Secretariat from that date on. The Finance Department is processing a Remission Order which would back date the original order to January 8, 1993 when the Headquarters Agreement was signed by PICES and the Government of Canada. The Secretariat is putting together a claim for reimbursement of the GST starting from 8th January 1993. Additionally, the Revenue Department has accepted our claim under the Order and has returned income tax paid on behalf of Dr. Miyata during 1993 to the PICES account.

- d. On January 26, 1994, the United States Government extended to PICES the same privileges, exemptions, and immunities conferred by the International Organizations Immunities Act.
- e. At our request, the British Columbia Government recently passed an order granting PICES the privilege to not pay the Provincial Sales Tax (PST) of 7% from 8th January, 1993. The Secretariat is currently undertaking the process to recover past expenditures and we have notified suppliers that PST will not be paid in the future.
- f. In accordance with Agenda Item 13 of the Governing Council regarding future meetings of the Organization and subsidiary bodies, the Secretariat was asked to compile a relative cost schedule (including airfare, per diem allowance and hotel accommodation) of six selected locations. A separate report has been prepared by the Secretariat for circulation at this meeting.
- g. As reported by the F&A Committee (Agenda Item 12, 1993), APEC has now submitted a proposal to the Secretariat to undertake a USD \$5,000 contract to collect information on marine

organizations working in the Pacific, their principal officers, and their objectives and current and planned activities in relation to the UNCED Agenda 21 follow-up (Ocean Chapter). The objective of the proposal is to establish a network amongst APEC and other organizations, developing collaborative programs and planning objectives and avoiding costly duplication of effort between organizations.

The Secretariat has accepted the proposed contract which will be completed by April 1, 1995.

- h. Flader and Greene was retained as auditor for another year. The report for 1993 was circulated March 14, 1994.
 - i. The fax machine was replaced with a new model that reduces the cost of sending messages and greatly reduces the time required to send multiple messages.
- 2. Space, Facilities and Equipment
 - a. Space for PICES has been greatly increased with the addition of a large room adjacent to current office space. This room can be used for storage as well as for other uses (library, mailouts, and secondments that need space).
 - b. An additional desk top computer will be purchased this year as it is contemplated that additional help will be required for most of next year.

3. Staffing

A part-time employee was taken on in early July to do secretarial work this year. There is sufficient work to keep her busy well into the new fiscal year. It is expected that a full-time position might be needed in 1996. Workload

increases have been experienced at every level this year, and this is expected to continue, particularly with the possibility of the addition of two new member states next year.

Appendix

Communication Policy for Facsimile, Postal and Courier Services

- a. Where possible the Secretariat should send all information by Internet as there is no cost of the service to PICES.
- b. All mail that does not require a response is sent by first-class mail. This includes mailouts of letters, the Newsletter, the Annual Report and the PICES Scientific Reports etc.
- c. All correspondence with Member States, Committees, and WGs that requires a response is sent by Internet or fax (provided the document does not have too many pages). Each shall include a request for confirmation of receipt.

- d. All draft Working Group Reports that need to be circulated to members of the Committees and WGs prior to the Annual Meeting will be sent by first-class mail.
- e. Larger documents that need a response from Member States are sent by express mail. Similarly, in an extreme case (because of cost), this also holds true for large documents that require a response by Committee Chairmen and Working Group Chairmen but if they must discuss this document with their members, the members will not be sent the document by express mail. In the latter case it is up to the Committee and Working Group Chairmen to schedule their work in a way that will allow for exchange of large documents through the mail system.

Endnote 3

Excerpt from the NPAFC Committee on Scientific Research and Statistics 1994 Annual Report

The Committee on Scientific Research and Statistics reaffirms the need for NPAFC and PICES to jointly examine two critical issues identified last year by the Commission:

- (i) *The factors affecting current trends in the productivity of the North Pacific Ocean and their impacts on salmonid carrying capacity.*
- (ii) *The factors affecting changes in biological characteristics of Pacific salmon. These characteristics include growth, size at maturity, age at maturity, oceanic distribution, survival and abundance.*

The CSRS Committee is pleased to note that the proposed PICES-GLOBEC Climate Change and Carrying Capacity (CCCC) program would include studies on anadromous resources. NPAFC liaison member at the PICES-GLOBEC Workshop in Nemuro should convey the following points regarding cooperation on the CCCC program:

- (i) *The NPAFC has a large body of documents and data of historical research on the oceanography and the living marine resources in the North Pacific Ocean that it would share with*

PICES-GLOBEC for implementation of the CCCC program.

- (ii) The NPAFC wishes to take the lead role in the development and implementation of that part of the CCCC program dealing with anadromous species.*
- (iii) The Committee expects that the liaison member and other CSRS members who will be attending the Nemuro PICES-GLOBEC Workshop would contribute their scientific advice at the workshop and other discussions about the PICES-GLOBEC Science Plan with the view of*

promoting the interests of NPAFC to have the two critical issues identified by the Commission to be incorporated fully into the PICES-GLOBEC work plan.

- (iv) The Committee RECOMMENDS that a “Research Planning and Coordinating Meeting”, tentatively scheduled for the week of March 6-10, 1995, be held in Seattle, and RECOMMENDS inviting the participation of PICES scientists to the meeting.*

Endnote 4

Standing Observer List

Inter-Governmental Organizations

- Intergovernmental Oceanographic Commission (IOC)
- International Council for the Exploration of the Sea (ICES)
- International Maritime Organization (IMO)
- International Pacific Halibut Commission (IPHC)
- Maritime Resources Conservation Working Group, Asia Pacific Economic Cooperation organization (APEC)
- North Atlantic Salmon Conservation Organization (NASCO)
- Northwest Atlantic Fisheries Organization (NAFO)
- North Pacific Anadromous Fish Commission (NPAFC)
- Pacific Salmon Commission (PSC)
- South Pacific Regional Environmental Program (SPREP)
- United Nations Environment Programme (UNEP)

- Food and Agriculture Organization of the United Nations (FAO)
- World Meteorological Organization (WMO)

Non-Governmental Organizations

- International Council of Scientific Unions (ICSU)
- Engineering Committee on Oceanic Resources (ECOR)
- International Arctic Science Committee (IASC)
- International Geosphere-Biosphere Programme (IGBP)
- Scientific Committee on Oceanic Research (SCOR)
- Scientific Committee on Problems of the Environment (SCOPE)
- South Asian Regional Committee for the System for Analysis, Research and Training (START)

Endnote 5

PICES TRUST FUND Guidelines

1. The Executive Secretary shall accept voluntary contributions for credit to the Fund. When there is any question about restrictions placed on contributions, the Executive Secretary shall consult with the Council before acting.
2. Activities of the Organization for which Fund support may be appropriate include functions associated with the Annual or other Council Meetings; meetings of Scientific Committees, Working Groups, or other scientific bodies established by the Council;
3. Any scientist (including junior scientists) may apply to the Executive Secretary for support from the Fund to participate in an Organization activity. Scientists may also be nominated for support by the Chairman of the Council or by the scientific symposia, workshops, planning meetings, or other scientific events of the Organization; research projects recommended by the Council; visits to foreign laboratories for collaboration or training related to scientific projects sponsored by the Organization.

Chairman or members of the Science Board.

4. Applicants for support shall specify (a) the activity to be participated in; (b) the applicant's special expertise; (c) expected benefits for the Organization from the participation; and (d) the amount required. Applicants shall report on the availability of other support for their participation. The Executive Secretary may specify the form of the application and other information to be included.
5. Applications must reach the Executive Secretary at least sixty days before the proposed activity, unless otherwise agreed. Additional information may be requested against a reasonable deadline.
6. The Executive Secretary, taking into account the availability of funds, other commitments, and the perceived benefit to the Organization, may authorize full or partial payment of the request. Payment shall be in accord with Financial Regulation 11 (iii) as if the travel were performed by a staff member in accord with Staff Rule 36.
7. The Executive Secretary shall inform the Point of Contact of a Contracting Party when application is received for a scientist of that Party.
8. The Executive Secretary shall report at each Annual Meeting on the condition of the Fund, including the contributions and applications received and their disposition.

REPORT OF SCIENCE BOARD

The Board met on October 22 (08:30-17:30) and October 23 (17:30-18:30). (See Endnote 1 for participants.)

The Chairman, Dr. D.M. Ware called the meeting to order and the task before the Board was discussed. The Board was to review the findings and recommendations of the Science Committees and Working Groups; review the PICES/GLOBEC science plan and recommendations; review recommendations from the PICES-STA Monitoring Workshop; make arrangements for future science activities; and plan the Fourth Annual Meeting.

Science Committee Reports

Reports from the four Science Committees were presented by their chairmen and are summarized below (see reports for full text):

Biological Oceanography Committee (BIO) -Prof. Michael M. Mullin

The Biological Oceanography Committee met on October 19 and 20 to discuss the PICES-GLOBEC draft report and other business. The Committee endorsed the PICES-GLOBEC report. At the Fourth Annual Meeting the Committee proposed to sponsor a theme session on *Factors Affecting the Balance between Alternative Foodweb Structures in Coastal and Oceanic Ecosystems*. The co-convenors will be Drs. R. Wang (China) and M. Omori (Japan).

With respect to other business, the Committee asked Prof. Mullin to continue as chairman for another year, and reiterated that it would welcome a third committee member from Japan. The Committee discussed and

made recommendations regarding a *Visiting Scientist Program*, dissemination of information on ship schedules in the PICES area, and PICES symposium publications. Input to the PICES-STA Monitoring Workshop from the Committee was also discussed, particularly the merits of establishing a *Continuous Plankton Recorder Program* and a sorting and identification centre (in Russia), and the development of biological instruments for untended moorings.

Fishery Science Committee (FIS) - Prof. Qi-Sheng Tang

The Fishery Science Committee met on October 19 and 20. It discussed PICES Scientific Report No. 1, and WG reports 2, 3, 4, 5, 6 and 7. The PICES-GLOBEC draft Science Plan was also discussed and accepted. With respect to the Bering Sea report (WG 5), the Committee agreed with the proposed approach for publication of a review volume on the Bering Sea, and endorsed the proposed Editorial Board. For the Fourth Annual Meeting, FIS supported the one-day symposium on the Bering Sea proposed by WG 5 and selected for the FIS theme session the topic *Density-Dependent Effects on Fluctuations in Abundance of Marine Organisms*. The convenors for the theme session will be Drs. V. Wespestad (U.S.A.) and Y. Sakurai (Japan). The Committee also recommended that the Science Board sponsor a session on marine carrying capacity.

FIS discussed PICES publications and recommended that papers given at PICES symposia be printed as extended abstracts in the PICES Scientific Report series. The Committee also reiterated its recommendation for establishing a visiting scientist program.

Marine Environmental Quality Committee (MEQ) - Prof. Jia-Yi Zhou

The Committee reviewed and discussed the WG report and recommended that the Science Board accept (a) the selection of the western North Pacific as the MEQ's major focus over the long term, and (b) the sponsorship of a scientific session at PICES IV to *Review and Summarize Appropriate Existing Scientific Information on this Region, and Especially the East China Sea*. Convenors Prof. J.Y. Zhou and a co-convenor to be determined.

The Committee also recommended the following changes in the terms of reference of WG 2:

1. Draft a work plan and an outline for a practical workshop on the East China Sea and,
2. Organize and host a practical workshop to assess methodologies and explore the feasibility of assessing observable biological effects, at differing levels, along a selected stressor gradient in the East China Sea.

Physical Oceanography and Climate Committee (POC) - Prof. Yutaka Nagata

The Committee reviewed and discussed the WG 7 report and based on the discussions the report will be revised and circulated in early 1995. The POC Committee accepted the progress report of the WG and recommended that the WG continue over the next year to finish its work. It was also recommended the final report of the WG should be published by PICES.

The Committee discussed the issue of making the ship schedules available and suggested that the Science Board have the ship schedules placed in the OCEANIC database. The Committee also recommended that the topic for PICES IV

be *Circulation in Subarctic North Pacific North Pacific and its Marginal Seas and its Impact on Climate*. Convenors Dr. M.Y. Zhou and Dr. J.F. Garrett.

The Committee reaffirmed support for the Workshop on the *Okhotsk Sea and Adjacent Areas* to be held in Vladivostok. The Committee recommends that PICES provide financial support for this Workshop.

The Board endorses the intersessional activities planned by the Scientific Committees, some of which are reflected in subsequent specific resolutions.

Working Group Reports

PICES currently has six WGs, tasked to meet specific objectives. The Board reviewed the WG reports and recommendations. WG summaries follow:

WG 2. Development of common assessment methodology (MEQ)

The 1994 meeting of WG 2 was held on October 13-14, 1994 at the offices of the Japan Environmental Agency in Tokyo. Four members were present (Dr. R.F. Addison (Canada), Co-Chairman, Prof. T. Hirano (Japan), Dr. T. Umezu (Japan) and Dr. M. Watanabe (Japan)). Dr. E. Shumilin (Russia) attended as an observer, and Mr. Y. Deai and Mr. T. Yoshida (Japan Environment Agency) attended some of the sessions.

WG 2 discussed three main questions: (i) the appropriateness of its terms of reference, (ii) a comparison of methods-based, performance-based and assessment-based methodologies in the evaluation of pollution, and (iii) plans for a practical co-operative workshop to compare methods of assessing pollution. Members agreed that there was no need to revise the WG's terms of reference as these had been agreed to at last year's meeting. A review of the topic of method-

based, performance-based and assessment-based comparisons was prepared for the MEQ Committee.

The third question, the planning of a practical workshop, generated considerable discussion. Some members felt that a small number of WG members (representing only two countries) was not authorized to make decisions for the entire WG. Some members also felt that it was premature to plan a practical workshop without a comprehensive review of existing data describing contamination in the region. Finally, some members felt that PICES should approach pollution questions in the area by integrating existing program elements rather than developing new initiatives. Members agreed to discuss these issues further at the MEQ business meetings, and in the course of these, it was agreed that the main cause of changes to environmental quality in the western North Pacific was likely to be from control or diversion of freshwater input through projects like the "Three Gorges" development on the Yangtze River.

WG 3. Coastal pelagic fish (FIS)

WG 3 met in La Jolla, U.S.A. on August 3-4, 1994, under the co-chairmanship of Dr. John Hunter (U.S.A.) and Dr. Tokio Wada (Japan). The objective of the working group is to develop a program for a comparative study of the population dynamics and productivity of key pelagic fish along the coastal margin of the North Pacific. The WG is initially focusing on the dynamics of Pacific herring, sardine, and anchovy, and proposes to use comparative methods to determine how changes in oceanic conditions affect the dynamics of these stocks, and the coastal ecosystems in which they live. WG members reached a consensus that trophodynamic modelling is an appropriate approach for comparing the productivity of pelagic ecosystems and for assessing how the pelagic fish production system may respond to climate change. WG members brought life

table values for a number of North Pacific sardine, anchovy and herring stocks to the meeting. There was a consensus that the life table approach will provide valuable insights into the effects of broad environmental change as well as specific short-term effects. Most of the discussion at the meeting focused on the development of the coastal ecosystem component of the PICES-GLOBEC Science Plan. The group concluded that: 1) retrospective studies would be very useful in improving understanding the effects of climate change on coastal pelagic fishes (somatic growth was recommended as a key variable); 2) comparative field process studies should be designed to determine the linkages between physical forcing and population dynamics of coastal pelagic fishes; 3) a wide range of models are needed for the proposed comparative fish stock and ecosystem studies, including fish growth energetics models, trophodynamic models, species interaction models, and physical circulation models. To complete an earlier term of reference, the WG is preparing an inventory of scientists working on coastal pelagic fishes in the North Pacific.

Inter-Committee (Science Board) Working Group Reports

WG 4. Data Exchange

The WG met in Seattle (U.S.A.) on June 20-22, 1994, under the Chairmanship of Mr. Skip McKinnell (Canada), The co-chairman Dr. De-Quan Yang (China) was absent. Two observers from Russia presented reports on the considerable amount of data available in Russian scientific institutes. Since the last meeting, some progress was made in the development of data inventories. The Secretariat, with the assistance of the WG, is updating an inventory of physical, chemical, biological, and fisheries data for the NE Pacific. Two catalogues of oceanographic data were made available by China, and a

series of CD-ROM data products available from the U.S. NOAA was reported to the WG. The WG proposed an expanded role for PICES in facilitating the exchange of unique data sets on electronic media. The WG also proposed an organizational restructuring to give it the ability to create subordinate bodies to undertake clearly defined tasks requiring common knowledge. The WG recommends that PICES representatives become more proactive in the collection of information about data, and data inventories leading to the development of a master inventory. To obtain more detailed information about recent (and future) scientific activities, the WG recommended that PICES member countries routinely submit detailed information about research cruises and the data collected during these cruises. To make these data and inventories available to the scientific community, the WG is recommending that preference be given to providing this information via the internet. The WG also recommended a number of data projects that could be undertaken in the following year. The first is a cooperative project with the NPAFC to have all of the summary catch statistics from the former INPFC made machine readable. The second involves collation of all available historical time series from Ocean Station P into a single collection for distribution on CD-ROM. The third involves the translation of selected Russian data inventories into English so that they can be included in the PICES master inventory.

WG 5. Bering Sea

The WG met in Seattle, U.S.A. on July 14-15, 1994, under the chairmanship of Prof. Al Tyler (U.S.A.). The tasks set out for the WG this year were to: 1) develop research strategies for the principal scientific questions developed during the first meeting; 2) organize a symposium on the Bering Sea for presentation at the Fourth Annual Meeting; and 3) initiate preparation of a book reviewing present knowledge of the climatology, oceanography, and biology of the Bering Sea.

The group spent some time discussing the research questions that it considered important for understanding environmental and ecosystem function in the Bering Sea. They considered, identification of ecosystem emergent properties; origin, and impact, of decadal-scale changes in the atmosphere and ocean on living marine organisms; interaction between deep basin and shelf waters; influence of ice on Bering Sea productivity; and biology of predator-prey interactions. The WG also discussed the format and content of the major review volume it plans to produce on the Bering Sea.

The book will cover all aspects of the physical, chemical and biological components of the Bering Sea ecosystem, and is expected to take about three years to complete. The WG began organizing the Bering Sea Symposium that will be held at the Fourth Annual Meeting. Papers will be requested to address the principal scientific questions. Approximately 6-8 papers of 45 min. duration are planned. Other submissions will be incorporated in an extensive poster session, with a brief oral introduction. Symposium topics are expected to be submitted early in 1995, so that paper selections can be made by May 1. The group recommended that following the Symposium, it should convene a workshop in early 1996 to review the symposium and to formulate a set of topics that could form the basis for a new, focused working group.

WG 6. Subarctic Gyre

This WG is co-chaired by Dr. Brent Hargreaves (Canada) and Prof. Takashige Sugimoto (Japan). The WG was asked to prepare a review of the ocean circulation and climate variability in the subarctic North Pacific, including information on primary and secondary production, and what is known about the carrying capacity for salmon and other nektonic species. The review completed by the group was published in PICES Scientific Report No. 1. The principal activity of the WG this year has been to

participate with WG 3 in the development of a PICES-GLOBEC *International Program on Climate Change and Carrying Capacity*, and organization of the PICES-GLOBEC Workshop (see next section).

WG 7. Modelling of the subarctic North Pacific circulation (POC)

This WG was formed after the Second Annual Meeting, and is co-chaired by Dr. Paul LeBlond (Canada) and Dr. Masahiro Endoh (Japan). The objectives of the WG are to: 1) review the status of present physical modelling efforts on the subarctic North Pacific circulation; 2) identify the observations and information needed to improve circulation models; 3) identify the knowledge of physical processes and ocean dynamics needed to improve the circulation models; and 4) identify how incompleteness of the present models influences other modelling efforts on global climate, ecosystems, material transport, etc. The first meeting of the WG was held in Vancouver (Canada) on June 22-24, 1994, and the second meeting in Nemuro on October 18, 1994. The group reviewed the status of existing models of surface circulation, intermediate layers and deep and bottom flows. They also discussed the data requirement to improve the models, the important physical processes and the marginal seas, and the consequences of the current deficiencies in knowledge. The WG gave its activity report to the POC-WG7 Joint Meeting held in Nemuro on October 19, 1994. The Joint Meeting accepted their interim report and appreciated their efforts. The Joint Meeting asked the WG to continue their efforts for another year in order to complete their report and to summarize their results in the form of recommendations to the POC in time for PICES IV in October, 1995.

PICES-GLOBEC Workshop Report

The PICES-GLOBEC Workshop was held on October 15 and 17, in conjunction with the

Third Annual Meeting. The objectives of the workshop were to develop a strategy for determining how the productivity of phytoplankton, zooplankton and high-trophic level carnivores, like Pacific salmon changes in response to climatic variations in the subarctic Pacific; and to develop a plan for a cooperative study of how changes in oceanic conditions change species dominance and productivity of key plankton and fish populations in the coastal ecosystems around the Pacific Rim. The report and recommendations that emerged from the workshop are found in the PICES-GLOBEC Workshop Report and Science Plan (see report in a following section).

PICES-STA Workshop Report

The PICES-STA (Science and Technology Agency of Japan) Workshop was held on October 22 and 23, 1994, in conjunction with the Third Annual Meeting. The objectives of the workshop were to review current programs devoted to monitoring ecosystems, their atmospheric, oceanic and anthropogenic forcing, and their biological productivity; and to advise on a strategy for developing a PICES monitoring program, taking into account existing and planned international programs such as GOOS. The preliminary report and recommendations from the workshop are found in the PICES-STA Monitoring Workshop Report (see report in a following section).

PICES Publications

The first volume of the new PICES Scientific Report series was published this year. It contains last year's reports from WGs 3 and 6. The second volume, containing WG 1's report, is in press.

Fourth Annual Meeting

The Fourth Annual Meeting (PICES IV) will be held in the People's Republic of China in 1995. The program will include sessions of

invited and contributed papers organized by the indicated committees on the following topics:

1. (Science Board) *Marine carrying capacity: fact or fiction?* Co-convenors: Alec D. MacCall (U.S.A.) and Makoto Kashiwai (Japan).
2. (POC) *Circulation in the subarctic North Pacific, and its marginal seas, and its impact on climate.* Co-convenors: Ming-Yu Zhou (China) and John F. Garrett (Canada).
3. (BIO) *Factors affecting the balance between alternative foodweb structures in coastal and oceanic ecosystems.* Co-convenors: Rong Wang (China) and Makoto Omori (Japan).
4. (FIS) *Density-dependent effects on fluctuations in the abundance of marine organisms.* Co-convenors: Vidar G. Wespestad (U.S.A.) and Yasunori Sakurai (Japan).
5. (MEQ) *Sources, transport and impact of chemical contaminants.* Co-convenors: Jia-Yi Zhou (China), Richard F. Addison (Canada) and John E. Stein (U.S.A.).

A one-day symposium on *Oceanography and fisheries of the Bering Sea* will be held in conjunction with PICES IV. Co-convenors: James E. Overland (U.S.A.) and James C. Rice (Canada).

Science Board Recommendations

Consideration of Scientific Committee, Working Group and Workshop reports led to a set of Resolutions for presentation to

Council for approval (see Appendix 1.A to Council Minutes, Decisions of Council).

Future work of Scientific Committees and Working Groups

The board discussed the recommendations of the Scientific Committees and Working Groups and endorses the following actions for the period leading up to the Fourth Annual Meeting:

Scientific Committees:

Biological Oceanography: See Decisions 94/S/7 (Terms of Reference in Appendix 1B.(2)), 94/S/8 and 94/S/11.

Fishery Science: Begin planning a one-day FIS topic session on *The significance of truncated age-structures in fish populations*, which will be held at PICES V (October 1996). The co-convenors will be Richard J. Beamish (Canada) and Anne B. Hollowed (U.S.A.). See Decisions 94/S/7 (Terms of Reference in Appendix 1B.(2)), 94/S/8 and 94/S/11.

Marine Environmental Quality: See Decisions 94/S/10 (Terms of Reference in Appendix 1B.(3)).

Physical Oceanography and Climate: See Decisions 94/S/3, 94/S/7 (Terms of Reference in Appendix 1B.(2)), 94/S/8 and 94/S/11.

Technical Committees:

Data Exchange (TCODE): See Decisions 94/S/4, 94/S/5, 94/S/6 and 94/S/7 (Terms of Reference in Appendix 1B.(2)), and Terms of Reference in Appendix 1B.(1).

Working Groups:

- WG 2. Development of common assessment methodologies: See Decisions 94/S/ 10 and 94/S/11.
- WG 3. Coastal pelagic fish: See Decisions 94/S/7 (Terms of Reference in Appendix 1B.(2)) and 94/S/11.
- WG 4. Data exchange: See Decisions 94/S/4, 94/S/5, 94/S/6, 94/S/7 (Terms of Reference in Appendix 1B.(2)) and 94/S/11.
- WG 5. Bering Sea: See Decisions 94/S/11 and 94/S/12.
- WG 6. Subarctic Gyre: See Decisions 94/S/7 (Terms of Reference in Appendix 1B.(2)) and 94/S/11.
- WG 7. Modelling subarctic North Pacific Circulation: See Decision 94/S/11.
- WG 8. Practical Assessment Methodology. See Decision 94/S/10 and Terms of Reference in Appendix 1B.(3).
- WG 9. Subarctic Pacific Monitoring. See Decision 94/S/8, 94/S/9 and Terms of Reference in Appendix 1B.(4).

Other matters referred by Governing Council

1. Is the PICES member states' ship schedule useful? How could it be made more effective (e-mail bulletin board etc.)? What information should be included in the schedule?

Science Board agreed that the ship schedule document prepared by the

Secretariat was not very useful and recommended that the PICES Chairman and Secretariat prepare a scheme indicating what information is required on what time schedule and how it might be most effectively disseminated. This scheme should be circulated to interested parties with a view to having a specific proposal for consideration at PICES IV.

2. Recommend a mechanism for collaboration of the NPAFC and PICES on the salmon component of the PICES-GLOBEC CCCC Program. (The NPAFC plans to have a meeting in March 1995, and would like to involve PICES scientists.)

Science Board recommends accepting the invitation of NPAFC to participate in their "Research Planning and Coordinating Meeting", tentatively scheduled for the week of March 6-10 in Seattle and, subsequently, establish a NPAFC-PICES Scientific Liaison Group jointly with the CSRS of the NPAFC to develop the implementation plan for the part of the CCCC Program dealing with anadromous species, including exchange of relevant data as suggested by NPAFC. This group should be chaired by a person designated by the NPAFC. The liaison group will report to the PICES-GLOBEC Steering Committee.

Scientific Program

The Scientific Program at PICES III consisted of two workshops, and a two and a half day session of scientific papers and posters. The PICES-GLOBEC Workshop was held on October 15, 16 and 17. Each of the Scientific Committees held topic sessions, and sessions of other contributed papers on October 18 to 21. An overview of these papers was presented at a Closing Scientific Session (on October 21) by Drs. D.

Musgrave, M. Mullin, A. Hollowed and M. Shimizu. The PICES-STA Workshop was held on October 22 and 23.

An interdisciplinary session was organized by the Science Board. The following papers were presented.

Structure, trophic linkages, and ecosystem dynamics of the subarctic Pacific. Co-convenors: Dr. Kazuya Nagasawa (Japan) and Dr. William G. Pearcy (U.S.A.)

Bruce W. Frost

Processes regulating plankton production and its interannual variability in the open subarctic Pacific Ocean

Steven R. Hare

Interdecadal climate-driven variability in salmon production: A discussion of mechanisms

Paul H. LeBlond, Michael C. Healey, Carl J. Walters, Keith A. Thomson & James Scandol
Modelling the biophysical controls of Pacific salmon migration and production

William G. Pearcy & Joseph P. Fisher

Assemblages of epipelagic fishes from the subarctic Pacific Ocean

Kenji Shimazaki, Haruo Ogi & Yasunori Sakurai

Distribution and food habitat of pelagic fishes in the subarctic North Pacific

Akira Taniguchi

Plankton community in the subarctic Pacific unsorted pasture of the sea

David W. Welch, Yukimasa Ishida, Victor Bugaev, Skip McKinnell & Katherine Myers

Growth variation and population dynamics of salmonids in the North Pacific

Endnote 1

Dr. Daniel M. Ware

(Chairman, Science Board)

Prof. Michael M. Mullin

(Chairman, Biological Oceanography Committee)

Prof. Qi-Sheng Tang

(Chairman, Fishery Science Committee)

Prof. Jia-Yi Zhou

(Chairman, Marine Environmental Quality Committee)

Participants

Prof. Yutaka Nagata

(Chairman, Physical Oceanography and Climate Committee)

Dr. Warren S. Wooster

(Chairman, PICES)

Dr. W. Douglas McKone

(Executive Secretary) (Rapporteur)

Ms. Christina Chiu

(Administrative Assistant)

REPORT OF BIOLOGICAL OCEANOGRAPHY COMMITTEE

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After introductions, Chairman Mullin thanked the convenors of the Committee's symposium, Drs. R. Brodeur and A. Taniguchi, for their efforts.

The PICES-GLOBEC draft report was discussed. Concerns expressed were:

1. Whether adequate long-term, routine monitoring of lower trophic levels could be conducted without leadership from the equivalent of a "Sir Alistair Hardy Foundation".
2. Whether phrases in the report such as "whole ecosystem" and "all trophic levels" were appropriate without explicit commitment to measure nutrients and phytoplankton. After discussion, the Committee unanimously endorsed the draft report, requesting Mullin to convey the above-mentioned concerns to the Science Board.

After discussion, the Committee chose not to recommend establishment of a new WG. However, it was reported that the U.S.A. may request PICES to establish a WG on top predators (particularly marine mammals and birds). Such a WG would probably report to our Committee.

Possible session topics for the Fourth Annual Meeting were discussed. The Committee proposes to sponsor a topic session entitled *Factors affecting the balance between alternative foodweb structures in coastal and oceanic ecosystems*. Co-convenors will be Drs. R. Wang (China) and M. Omori (Japan). The goal of the symposium is to transcend the traditional "diatoms-crustaceans-fish" food chain to consider, e.g., the microbial loop, gelatinous zooplankton, heterotrophic dinoflagellates, and how natural or

anthropogenic forces can cause changes in the structure of food webs.

The present chairing of the Committee, and the Committee's relative reactive mode of operation to date were discussed. No changes were agreed upon; Mullin will continue as chairman for another year. It was also noted that the Committee would welcome a third Japanese member.

A *Visiting Scientist Program* funded by PICES was discussed; as last year, the majority of the Committee felt that assuring funds for travel of invited speakers and symposium convenors to annual meetings and workshops should receive higher priority. If a *Visiting Scientist Program* is funded, it should be directly related to specific research needs identified by some Science Committee.

In discussion of disseminating schedules of research ships, R. Wang noted that e-mail was not yet widespread in China. T. Sugimoto summarized the schedules of major Japanese distant-water cruises. It was noted that PICES might be helpful by scanning a WOCE e-mail bulletin board (Oceanic, U. Delaware) and disseminating a printed version.

The majority felt that PICES should not issue its own publications of symposia. It would be preferable to subsidize the publication of special or supplementary issues of existing, recognized journals containing PICES papers. This might cost \$20K per issue. Alternatively, the Secretariat could merely assign PICES contribution numbers to papers published in refereed journals chosen by the authors, and collect reprints into a PICES library.

T. Sugimoto requested, and received, comments to be relayed to the PICES-STA

Workshop. A *Continuous Plankton Recorder Program* and sorting/identification center (e.g., Vladivostok) and biological instruments suitable for untended moorings were specifically discussed.

Scientific Program

The following scientific papers were presented from the BIO Committee sponsored part of the program.

Structure and ecosystem dynamics of the subarctic transition zone North Pacific - is the east like the west? Co-convenors: Prof. Akira Taniguchi (Japan) & Dr. Richard D. Brodeur (U.S.A.). Dr. Yoshinari Endo (Japan) and Prof. Patricia A. Wheeler (U.S.A.) co-chaired the contributed papers session.

Alina I. Agatova, N.M. Lapina & N.I. Torgunova

Organic matter: biochemical composition and rates of transformation at the Kuril Archipelago

N.V. Arzhanova, V.L. Zubarevitch & V.V. Sapozhnikov

Estimation of primary production in the ecosystem of western Bering Sea

Kuo-Ping Chiang & Akira Taniguchi

Distribution of diatom assemblages in a warm core ring in the western North Pacific frontal zone off Hokkaido

Patrick J. Gould & Peggy Ostrom

Marine bird communities in the temperate North Pacific

Steven Ignell

Small and large scale distribution of zooplankton within the subarctic frontal zone

Akito Kawamura & Satoshi Goto

Microscale vertical distribution of *Neocalanus plumchrus* s. l. and *N. cristatus* in the Northwestern North Pacific

Moriyuki Kotori

Seasonal variations in the abundance and composition of chaetognaths in the

epipelagic layer off eastern Hokkaido, April 1992 to February 1993

Skip McKinnell & Akihiko Yatsu

Distribution and zoogeography of epipelagic nekton of the North Pacific transition zone

Vladimir V. Navrotsky & Tamara A. Zadonskaya

Interrelations of eddies, fine structure and zooplankton in the subarctic front zone

Jeff Polovina

Impact of 1977-88 climate event on mixed layer depth and links to ecosystem productivity in the central and north Pacific Ocean

Gunnar I. Roden

Subarctic-subtropical transition zone in the western, central and eastern Pacific: physical and biological implications

Hiroaki Saito, Hiromi Kasai & Satoru Taguchi

Seasonal change in zooplankton biomass in the western subarctic off Hokkaido, Japan

Jiro Seki & Ikutaro Shimizu

Food environment for some small sized fishes in the Pacific coastal waters of Hokkaido in spring

Naonobu Shiga, Koji Numata & Kazuyoshi Fujiya

Some aspects of zooplankton community in the subarctic Pacific Ocean in summer

Ahihiro Shiimoto, Yuimasa Ishida, Kazuya Nagasawa & Kazuaki Tadokoro

Variation in phytoplankton productivity in water around the subarctic boundary

V.P. Shuntov & Elena P. Dulepova

New data about communities of plankton and nekton of the far eastern seas in connection with climate - oceanological reorganization

Takashige Sugimoto, Kazuaki Tadokoro & Noriyuki Koizumi

East-west comparison of year-to-year and decadal scale variations in plankton biomass and its physical environment in the North Pacific

Ichiro Yasuda
Hydrographic structures of the subarctic transition zone in the north-western Pacific
Katsumi Yokouchi, Akira Tomosada, Yutaka Matsuo & Hiroya Sugisaki

Nutrient-chlorophyll interrelationships in the Oyashio/Kuroshio inter-frontal zone during phytoplankton bloom
Tokio Wada & Makoto Kashiwai
Environmental changes in the western subarctic region and population fluctuations of pelagic fishes

Endnote 1

Participants and Observers

Canada

Dr. Kenneth L. Denman (Oct. 19 only)
Dr. David L. Mackas
Prof. Tim R. Parsons

China

Prof. Rong Wang

Japan

Dr. Yoshinari Endo (Oct. 19 only)
Dr. Tsutomu Ikeda
Prof. Takashige Sugimoto

U.S.A.

Prof. Michael M. Mullin (Chairman)
Prof. Patricia A. Wheeler

Observers

Prof. Vera Alexander (U.S.A., Oct. 19 only)
Dr. Richard D. Brodeur (U.S.A., Oct. 19 only)
Dr. Victor V. Filatov (Russia, Oct. 20 only)
Dr. Patrick J. Gould (U.S.A.)
Prof. Akira Taniguchi (Japan, Oct. 20 only)

REPORT OF FISHERY SCIENCE COMMITTEE

The Fishery Science Committee met at 14:30 on October 19, 1994, and 13:30 on October 20, 1994. Following introductions, the Chairman presented a draft agenda which was discussed and adopted. The Committee agreed that a draft version of the Committee Report would be distributed to Committee members for review before the close of the meeting.

The Committee accepted PICES Scientific Report No.1, 1993, as tabled. There was some discussion about the policy of PICES with regard to publication of WG reports. The Committee understood that the PICES Committee which sponsors a WG is the body which recommends publication of WG reports in the Scientific Report series. The recommendation would be based on the scientific content of a particular WG report, and not all WG reports would be published.

The Committee considered reports from WGs 2, 3, 4, 5, 6 and 7. Discussion centered on reports from WGs 5 (Bering Sea WG) and PICES-GLOBEC Workshop Steering Committee, which contained recommendations of direct relevance to FIS.

Discussion of the PICES-GLOBEC Workshop Steering Committee report led to acceptance of the report as tabled. The WG agreed that the document was a very comprehensive general science plan which opens many avenues for good and important scientific initiatives to be undertaken. FIS noted that the Implementation Plan for PICES-GLOBEC, yet to be developed, will be crucial in actually laying out what work will be done under PICES-GLOBEC. The meeting between PICES-GLOBEC and NPAFC representatives, tentatively scheduled for March 1995, will also be important in clarifying the exact work which will be done

on key scientific questions 5 and 6 in the PICES-GLOBEC Science Plan.

With regard to the Implementation Plan for PICES-GLOBEC, the WG approved the four recommendations proposed by the Chairman of the PICES-GLOBEC Workshop Steering Committee:

1. Develop a draft Implementation Plan addressing the key scientific questions, and meet in the first half of 1995 to discuss the plan.
2. The Implementation Plan would identify the common interests of the national research programs that could form a core PICES-GLOBEC Program, and the resources that each country might contribute to the program.
3. Identify cooperative research programs that could be developed using existing resources, and ones requiring new funds.
4. Identify how the PICES-GLOBEC Program will be coordinated with other PICES WGs and activities (e.g., WG 7 and PICES-STA Workshop), and other international organizations and programs in the North Pacific, in particular NPAFC and GLOBEC.INTERNATIONAL.

To ensure full participation by all members of the group developing the Implementation Plan, FIS also recommends:

The PICES-GLOBEC Implementation Plan group take new steps to facilitate participation by those speaking English as a second language; possible approaches include real-time recording and display of minutes and discussion using pc-based large screen video display, or use of boards for all discussion,

with frequent printing and duplicating of summaries.

FIS also noted that the approach to developing an implementation plan described in the four recommendations from the PICES-GLOBEC Steering Committee is likely to result in an Implementation Plan which largely consists of coordinating programs of interest to member states. This may be the most feasible way to implement the PICES-GLOBEC program. However, some FIS members expressed the hope that the PICES-GLOBEC Implementation Plan would also clearly identify what the most fundamental questions and scientific needs were for the coastal and open North Pacific marine ecosystems, to help to focus PICES-GLOBEC activities. FIS requests that the group charged with developing the PICES-GLOBEC Implementation Plan take note of that point.

With regard to the report from the Bering Sea WG, on the basis of scientific merit FIS agreed with the proposed approach to publication of a review volume on the Bering Sea, and endorsed the proposed editorial board. FIS does note that the proposal does not address the matter of the cost of publishing the proposed book, and calls the attention of Science Board and the PICES administrators to that important consideration. FIS deferred discussion of the WG 5 recommendation for a symposium on the Bering Sea, until its discussion of all proposals for symposia and theme sessions at future meetings.

FIS received proposals for a total of four symposia and theme sessions. After discussion the Committee agreed to recommend:

A symposium on the Bering Sea, as described by the report from WG 5, be held for one day, immediately preceding the 1995 PICES Annual Meeting. Drs. J. Overland

(USA) and J. Rice (Canada) would be co-convenors.

A FIS theme session on *Density dependent effects on fluctuations in abundance of marine organisms* would be held as part of the 1995 Annual Meeting. The session would focus on key scientific questions of the PICES-GLOBEC Science Plan. Drs. V. Wespestad (U.S.A.) and Y. Sakurai (Japan) would be co-convenors.

A session on *Marine carrying capacity, including analytical/theoretical frameworks*, with papers and, if possible to arrange, a hands-on workshop component, should be held at the 1995 Annual Meeting. It is recommended that the Science Board sponsor this session. Co-convenors will be Drs. A.D. MacCall (U.S.A.) and M. Kashiwai (Japan).

A one-day topic session on *The significance of truncated age-structures in fish populations* should be held at the 1996 Annual Meeting. Drs. R.J. Beamish (Canada) and A.B. Hollowed (U.S.A.) would be co-convenors.

FIS also discussed the future of three WGs of which FIS is sponsor or co-sponsor. It concluded that the PICES-GLOBEC Workshop Steering Committee should evolve into the group which develops the PICES-GLOBEC Implementation Plan. The Bering Sea WG should be continued until after the proposed symposium in 1995 is held. The Coastal Pelagics WG should work by correspondence for one more year.

FIS agreed that it was desirable to have a publication record of PICES symposia. After discussing alternative modes for publication, FIS recommends symposia be recorded as 1,000-2,000 word abstracts with 2-3 figures, and included in the PICES Scientific Report series. This is a minimum requirement, and symposium convenors may arrange for more formal publication of symposium proceedings. Such volumes of proceedings generally

would not be part of the PICES Scientific Report series.

FIS again recommends establishment of a visiting scientist program, as described in the 1993 PICES Annual Report.

Scientific Program

The following scientific papers were presented from the FIS Committee sponsored part of the program.

Recruitment variability of clupeoid fishes and mackerels. Co-convenors: Dr. Tokio Wada (Japan) and Dr. Anne B. Hollowed (U.S.A.).

Alina I. Agatova & A.V. Verkhunov

The evidence of biological origin of the subarctic waters dissolved oxygen minimum in the northwestern North Pacific

Andrew Bakun

“Sub-El Niño frequency” climatic variability and simultaneous “regime-scale” clupeoid fish population shifts in distant parts of the world ocean

Tim Baumgartner, Vicente Ferreira & Andy Soutar

A 1700 year perspective on recruitment variability of sardines and anchovies in the California current

V. Dulepov & M. Ermolitskaya

Mathematical modelling of processes in mariculture with regard for natural reproduction and catch

Douglas E. Hay & P.B. McCarter

Anatomy of a strong year class: Analyses of the 1977 year class of pacific herring in British Columbia

Yoshiaki Hiyama, Hiroshi Nishida & Tsuneo Goto

Year-class strength and growth of sardine in the Sea of Japan and adjacent waters

Larry D. Jacobson & Alec D. MacCall

Stock-recruitment models for pacific sardine

Suam Kim & Sukgeun Jung

The effect of seasonal anomaly of sea water temperature and salinity on the fluctuation in the bimonthly yields of yellow crocker, *Pseudoscianea Manchurica* in Korean waters

Jiro Kittaka

Current research problems with the king crab in Nemuro waters

Tokiwasa Kobayashi

Long-term fluctuation of herring populations distributed around northern Japan and discussion on the relationship to marine environment

Boris N. Kotenev

The influence of regional climatic changes on marine fishery in the far east seas

Kazunori Kuroda

On the main cause of the collapse of the Japanese sardine

Daniel Lluch-Belda

On the sources of recruitment variability in small pelagics

Alec D. MacCall & Kenichi Tatsukawa

Recruitment patterns of sardines, anchovies and mackerel off California, and comparison with Japanese stocks

Keiichi Mito, Akira Nishimura & Takashi Yanagimoto

Estimation of consumption of walleye pollock by flatfish in the eastern Bering Sea during 1970-1985

Hiroya Miyake

Body size and distribution of 0-age walleye pollock along the Pacific coastal area of south-eastern Hokkaido in Autumn, 1987-1993

Jeffrey M. Napp, D.L.W. Siefert, L.S. Incze, L. Britt, P.J. Sabeno & S. Syrjala

Trophic linkages and interannual variability in the Alaska coastal current: larval pollock (*Theragra Chalcogramma*) and the zooplankton that affect their survival

Brenda L. Norcross, Franz-Josef Mütter & Brenda A. Holladay

Habitat models for juvenile pleuronectids around Kodiak Island, Alaska, U.S.A.

Toshiya Suzuki, Kazuya Nagasawa & Masahide Kaeriyama

Feeding strategy of juvenile chum salmon (*Oncorhynchus keta*) in the Japan Sea off northern Honshu, Japan
Kazuaki Tadokoro, Yukimasa Ishida, Nancy D. Davis & Shoji Ueyanagi
Shift in chum salmon (*Oncorhynchus keta*) food habits due to changes in pink salmon (*O.gorbusha*) abundance in central North Pacific Ocean and Bering Sea
Qi-Sheng Tang
Recruitment variability of pelagic stocks in the Yellow Sea especially herring in relation to environment

Olga S. Temnykh
Spatial pink salmon differentiation during anadromous migration in connection with climatic-oceanological reorganizations in the far eastern seas
Yoshiro Watanabe
Mortality in egg and early larval stages of sardine *Sardinops melanostictus* in the Northwestern Pacific
Vidar G. Wespestad & Nikolai I. Naumenko
Evidence of species replacement in the Bering Sea pelagic fish community
Orio Yamamura
Food web structure of demersal fish assemblages: Trophic pathways and anthropogenic influence

Endnote 1

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Japan

Dr. Keiichi Mito
Prof. Kiyotaka Ohtani
Dr. Tokio Wada
Dr. Kiyoshi Wakabayashi

U.S.A.

Dr. John R. Hunter
Dr. Jimmie J. Traynor (for Gary D. Stauffer)
Dr. Vidar Wespestad

Observers

Dr. Suam Kim (Korea)
Dr. Gennady V. Khen (Russia)

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

The MEQ Scientific Committee met in Nemuro, Hokkaido, Japan, in two sessions, held jointly with members of WG 2. Sessions were held on Wednesday, October 19 and Thursday, October 20, 1994. There were two new MEQ members from Japan (Prof. M. Shimizu and Dr. T. Yoshida) and one from Canada (Dr. L. Harding). In addition, MEQ welcomed our Russian colleagues as first-time participants, with Drs. A. Tkalin and E. Shumilin attending as observers.

Prof. J.Y. Zhou extended a welcome, and asked all present to briefly introduce themselves and their backgrounds and interests. The Chairman then set forth an outline of the agenda, and the meeting was called to order.

Dr. M. Watson presented a brief synopsis of the history and evolving scope of the MEQ Scientific Committee. This included summaries of the two previous scientific meetings held in Victoria, B.C., Canada (1992), and Seattle, Washington, U.S.A. (1993). Discussions included an overview of the key issues facing MEQ, especially the continuing need to reach a consensus on the major environmental effects issue upon which the MEQ should focus. Namely, the need to select a given research site of common interest to all PICES nations, and which will suitably address the issue of pollutant transfer and impact; from the obvious pollutant sources of coastal areas and marginal seas to the open North Pacific Ocean itself.

Dr. R. Addison led a detailed discussion outlining the past and present activities of WG-2.

1993 WG 2 Report

Prior to the Seattle 1993 MEQ meeting, WG 2 had been tasked with identifying the major and unifying problems with marine environmental quality in participating countries, and identifying knowledge gaps. All four participating countries submitted comprehensive scientific overview papers to WG 2, which clearly indicated that their primary concerns were with pollution as a coastal problem, rather than one involving the open ocean. WG 2 recommended that MEQ organize a symposium on approaches being used to assess marine pollution (at Nemuro in 1994), and also organize a practical workshop at some future date, which would allow scientists to come together and work on a common problem at a site (most likely in the Asian North Pacific region) or concern to all PICES nations.

1994 WG 2 Report

WG 2 met in Tokyo on October 13-14, 1994, at the offices of the Japan Environmental Agency. Its tasks were to (a) review the WG 2 terms of reference to ensure that they were still relevant, (b) review and discuss a comparison of methods-based, performance-based and assessment-based methodologies in the evaluation of pollution, and (c) outline plans for the proposed technical workshop. Because the WG 2 Tokyo meetings did not include members from all PICES nations, there was reluctance among attending WG 2 members to make decisions affecting the future workshop and symposium for PICES IV. The 1994 WG 2 Report was presented and discussed as a "draft", rather than as a final document.

Terms of reference and future focus for WG 2

After extensive discussions, MEQ and WG 2 members agreed that the future scientific membership of WG 2 should remain essentially the same. However, the focus and terms of reference for WG 2 should be narrowed toward a specific area in the western North Pacific region which can satisfy various interests shared by all PICES nations. Criteria for such a specific focal area would include: a) the presence of a major and quantifiable long-term environmental stressor(s), b) linkages between stressor-induced phenomena in coastal regions with those in adjacent marginal seas and ultimately, the open North Pacific Ocean itself, and c) the presence of suitable baseline data relative to source, transport, and characterization of pollutants and their associated biological effects.

Possible assessment methodologies and analytical tools:

Dr. Addison then gave an overview of three types of Quality Assurance approaches for measurements made in assessing pollutant-stressed ecosystems. It is, of course, essential that all approaches be of high accuracy and thus comparable. These three approaches were:

1. Methods-based, in which the same methods (e.g., GC/MS, HPLC Fluorescence, etc.) are rigorously used by all laboratories to improve comparability of the results generated in assessing perturbed ecosystems.
2. Performance-based, in which the individual participating laboratories use common standard reference materials to assess the accuracy of the method used to generate the data (e.g., measurements of chemicals in sediment), and as such the use of the same method by each laboratory is not mandatory. These two

approaches are the major QA/QC paradigms that are commonly used by analytical laboratories worldwide, and often both common methods and standard reference materials are used to increase data quality and thus intercomparability between laboratories.

3. Assessment-based comparisons, in which the interpretations of the different data types from the various investigators are compared. For example, one laboratory might measure mixed function oxidase activities in livers from benthic fish inhabiting a pollution gradient. Another laboratory might measure co-planar PCBs and related chemicals in the fish tissue and/or in surrounding sediment, while other investigators might examine liver slices of the fish in question for histopathology, or perform tissue assays for excess production of detoxifying proteins like ethoxyresorufin-oxy-deethylase (EROD). Concurrently, other investigators might measure "scope for growth" (SFG) in benthic invertebrates (e.g., mussels), while others examine species diversity, or historical data on extirpation of species. In this approach, a variety of different analytical techniques and perspectives are used to assess a stressed ecosystem, the criterion used to evaluate the accuracy of the approach is whether the approach is effective at identifying a gradient for the stressor perturbing the system. This approach is gaining greater attention where the monitoring used primarily biological rather than chemical endpoints.

Such approaches would bring to bear many of the current arsenal of tools being utilized in "analytic biology", in which different disciplines attempt to assess how chemical contaminants bring about biological change. Such tools allow us to look in greater detail at the whole chain of events between the presence of a stressor and its biological impact.

Various practical examples, where such assessment-based comparison techniques were used, was discussed by Dr. Addison (industrial contamination of Norwegian fjords) and Dr. Harding (relationships between pollutants and the background of natural change driven events which affect assimilative capacity). Dr. Stein briefly discussed how valuable PICES can be to the study of transboundary effects of marine pollution.

MEQ symposium at the PICES Fourth Annual Meeting, Qingdao

Selection of a common site for future study:

The comparative weaknesses and advantages of preferentially focusing on various potential "candidate areas" in the North Pacific were discussed in detail. Potential areas included: Seto Inland Sea, Puget Sound/Georgia Strait region, Tokyo Bay, Sea of Okhotsk, Bering Sea, Dalian Bay, and the East China and Yellow Sea regions. The possibility of selecting more than one site, e.g., one on either side of the North Pacific - was also discussed.

The Yangtze Estuary and East China Sea:

Dr. P.K. Park recounted in detail the high degree of PICES commonality exhibited by the East China Sea. A tremendous hydroelectric dam - the "Three Gorges Project" - is to be built several hundred kilometers inland on the Yangtze River, and it will be the largest construction project in Asia since the Great Wall. This dam will be the most important single environmental impact on the East China Sea and its northern circulation pathways, including the Sea of Japan. Construction will take from five to ten years, and filling the huge impoundment will take approximately twenty years. Dr. J.S. Gray stressed that the lessons we have learned from the Aswan Dam clearly indicate that the two most critical changes that will occur from the Three Gorges Project will be altered sediment and nutrient fluxes.

Potential transboundary effects on the marine ecosystem will continue for centuries.

Prof. Hirano presented an overview of the physical oceanography and current flow in the East China and Yellow Sea region. Very rich fishing grounds are located at the area where the Yangtze empties into the East China Sea. He has modelled the estimated riverine discharge from the Chinese mainland into the adjoining seas at about 100,000 tons per second; with about 40,000 to 50,000 tons per second coming from the Yangtze. During the summer months, the Kuroshio Current transports a significant portion of the massive Yangtze freshwater contribution to the northeast, where it travels upward off eastern Japan. Likewise in summer, other major portions flow northward toward the Yellow Sea, Bohai Sea, and ultimately into the Sea of Japan. In winter, the Kuroshio takes much of the Yangtze influences toward the south - toward the southern Ryukyus and Taiwan.

Prof. Hirano estimates the residence time for water in the east China - Yellow Sea area at 100-200 days. Although the subsequent residence time for the Sea of Japan is quite long - on the order of 100 to 200 years - this water ultimately mixes with the North Pacific and the Sea of Okhotsk as it reaches northern Hokkaido and the Kuril Islands. The East China Sea pathway thus provides a good example for assessing linkages between impacts in coastal areas and their transfer to marginal seas, and ultimately the North Pacific.

Focus of 1995 symposium and subsequent workshop

The most important theme upon which MEQ / WG 2 will focus for the long term will be assembling information on how changes in the Yangtze freshwater flow will affect such factors as: upwelling, sediment flux, behavior of nutrients and contaminants, benthic conditions, and biological perturbations in the East China Sea and its various major

pathways to the North Pacific. The 1995 PICES IV MEQ symposium should therefore be an overview of what is known about the Yangtze area, including physical and chemical oceanography, sedimentology, chemical pollutants, and biological perturbations. In addition to invited papers, an extensive literature review of the Yangtze-East China Sea will be required.

Dr. Gray enlarged upon the Three Gorges theme further by stressing the benefit of studying such a colossal impact both before and after its actual inception. This will give MEQ a baseline from which to compare perturbations from the area, as the ongoing effects of the dam are eventually and perhaps irrevocably manifested. The East China Sea is also of great interest and value to all PICES nations, and such a site would serve to bring relevant scientists together for a common and mutually supportable goal. Through the cooperative efforts of both China and Japan, the Yangtze and East China Sea systems are fairly well characterized in terms of physical and chemical parameters of waters and sediment at this time. However, data on biota for the general area are lacking. This should be an important component of MEQ's long term focus on the actual impact of the chemical and physical stressors from the changing Yangtze system.

Dr. Shumilin put forth the suggestion that we conduct the future workshop from a research vessel, rather than from a land-based site. Such an approach would facilitate access to, and sampling of a suitable pollution gradient. In addition, every effort should be made to coordinate our efforts with the builders and timetable of the Three Gorges Project. Dr. Shumilin reinforced Dr. Gray's prior comments that the Three Gorges Project will likely parallel the type of environmental influences brought about in the Mediterranean Sea as a consequence of building the Aswan Dam (which unlike our planned effort in the Yangtze, unfortunately had no pre-construction baseline data

collected relative to marine environmental quality).

MEQ recommended that the proposed future workshop on such a system include predictive models, as well as incorporating remote sensing and geographic information system (GIS) capabilities to follow pollutant trends and fluxes entering the marine ecosystem as a consequence of the massive Yangtze dam site. Along these lines, Dr. Watanabe indicated that several major Asian countries are currently amplifying their GIS capabilities, and Japan is planning a major land use conference in the near future, to be coupled with remote sensing themes. A remote sensing satellite is slated to soon be established near Okinawa.

Recommendations to the PICES Science Board

MEQ recommendations were twofold:

1. The MEQ Scientific Committee fully supported the WG 2 "draft" report, and its subsequent review and refocusing by MEQ and WG 2 joint discussions during the business meetings. MEQ recommended that the Science Board consider and implement the suggestions presented previously in this report, relative to a) selection of the western North Pacific as MEQ's major future focus over the long term, and b) sponsorship of a scientific session at PICES IV in Qingdao, to review and summarize appropriate existing scientific information on this region, and especially the East China Sea as MEQ's major focal point.
2. MEQ thoroughly considered the desirability of changing the terms of reference of WG 2. After considerable discussion, MEQ recommended that membership in WG 2 continue in its present form until the conclusion of the practical workshop (now being planned, and slated to occur in Asia within the next

two to three years). However, the focus and terms of reference of WG 2 should be redefined to reflect our PICES III decisions to focus much more specifically on the western North Pacific over the long term. The new terms of reference should therefore be redefined as follow:

- a. draft a work plan and an outline for a practical workshop on the East China Sea, as recommended in the WG 2 "draft" report of October 1994, and
- b. organize and host a practical workshop, as described above, by October 1997. The workshop will be designed to assess methodologies and explore the feasibility of assessing observable biological effects, at differing levels, along a selected stressor gradient in the East China Sea.

Scientific Program

The following is a list of scientific papers from the MEQ Committee sponsored part of the program.

Interdisciplinary methodology to better assess and predict the impact of pollutants on structure and function of marine ecosystems.
 Convenor: Prof. Makoto Shimizu (Japan).

Richard F. Addison

The role of biochemical indicators in assessing the impact of marine pollution

T.A. Belan & Alexander V. Tkalin

Responses of coastal marine ecosystems to anthropogenic stressors

John S. Gray

The role of biological effects monitoring in marine environmental protection

Lee Harding, Robert C. Wilson & Steve Wetmore

A marine ecosystem monitoring network for Canada

Toshihiro Horiguchi & Hiroaki Shiraishi

Imposex in Japanese gastropods and its development by tributyltin and triphenyltin from antifouling paints

Makoto Shimizu

Approaches to marine ecosystem monitoring: A case study at Tokyo Bay

John E. Stein, Lyndal Johnson, Annette Olson, James E. West, Chris Prescott & Usha Varanasi

Cumulative effects of anthropogenic stressors: Research in a near-coastal ecosystem of the U.S.A.

Hisashi Yamada

New monitoring method of marine pollution with toxic chemicals accumulated in squid liver (squid watch)

Tokuhiisa Yoshida

Temporal and spatial distribution of pollutants in the Tokyo Bay and its adjacent seas area

Ichiro Yuasa & Yoshitaka Fujioka

Limitation of COD as an indicator for the better assessment of the population impact on structure of the marine ecosystem

Ming-Jiang Zhou, Tian Yan, Jun Li & Zhang-yan Li

Impacts of organo-tin pollution on maricultured clam, *Venerupis philippinarum*

Endnote 1

Participants and Observers

Canada

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Dr. Makoto Shimizu
Dr. Masataka Watanabe
Dr. Tokuhiisa Yoshida

U.S.A.

Dr. John E. Stein (WG 2)
Dr. C. Michael Watson (Rapporteur)

Observers

Capt. Yoshimi Deai (Japan)
Dr. Masanori Fujimoto (Japan)
Prof. John S. Gray (Norway)
Dr. Paul K. Park (U.S.A.)
Dr. Evgeny N. Shumilin (Russia)
Dr. Alexander V. Tkalin (Russia)
Dr. Mitsuhiro Yamamoto (Japan)

REPORT OF PHYSICAL OCEANOGRAPHY AND CLIMATE COMMITTEE

Dr. Nagata presented an agenda, which was adopted after one addition.

Dr. Sugimori presented the agenda and purpose of the upcoming PICES-STA Workshop on Monitoring the Subarctic Pacific Ocean to be held October 22-23, 1994, in conjunction with PICES III. Everyone was encouraged to attend.

A report by WG 7 on Modeling was presented by Dr. LeBlond. WG 7 was formed at the PICES Second Annual Meeting in October, 1993. Members to the WG were appointed in early 1994. Drs. LeBlond and Endoh served as co-chairmen. Communications among the committee members were initiated through email and fax. A three day meeting was held in Vancouver in June, 1994. In September a draft report was circulated to all members of the WG and the POC Committee.

At the Third Annual Meeting, a meeting of the WG was convened and the revised draft was discussed by members of the WG and others. Based on discussions at that meeting, the draft report will be revised and circulated to all working group and POC Committee members. A final draft is expected to be forwarded in early 1995.

The POC Committee accepts the progress report by the WG.

By consensus, the POC Committee recommended that the activities of the WG continue over the next year until the final report is finished.

By consensus, the POC Committee recommended that the final report be published by PICES.

Dr. Navrotsky presented his written proposal for an International Working Committee on Methods of Complex Monitoring of the North Pacific. The discussion that followed encouraged Dr. Navrotsky to present his proposal at the PICES-STA Monitoring Workshop.

The Committee considered the issue of making the ship schedules available. Dr. Royer suggested that OCEANIC, a database that includes many international ship schedules, could accommodate the PICES members ship schedules. The POC Committee advises the Science Board to place the ship schedule in OCEANIC.

The PICES Fourth Annual Meeting, to be held in China, was discussed and Dr. Zhou suggested that the topic for the POC be *Circulation in Subarctic North Pacific and its Marginal Seas and its Impact on Climate*. This topic was accepted by the POC Committee. Convenors: Drs. M.Y. Zhou (China) and J.F. Garrett (Canada).

Dr. Lobanov gave a presentation on the logistic preparations for the PICES Workshop on the *Okhotsk Sea and Adjacent Areas*, to be held in Vladivostok June 19-24, 1995. The announcements have been sent out. The Workshop will consist of 3 to 4 days of two parallel sessions, one on physical oceanography and the other biology and fisheries. There will be a one day boat excursion to the Islands.

The local organization committee will consist of officials from the local and provincial governments and officials from other scientific institutes in Vladivostok.

The POC Committee recommends that PICES provide financial support for this workshop.

POC also recommends that PICES requests, in a letter, partial financial support from the Russian Foundation for Fundamental Investigations for the Okhotsk Workshop.

Dr. Lobanov presented a proposal for financial support for the publication of two books from a Russian series *Seas of the USSR: Hydrometeorology and Hydrochemistry*. Some of the books in the series have been published, but two of the books on the Okhotsk and Bering Seas remain unpublished due to lack of funds. The two books are *Hydrometeorological Conditions of the Okhotsk Sea* and *Hydrometeorological Conditions of the Bering Sea*. These books could eventually be translated and published in English but first they must be published in Russian due to Russian regulations. Five hundred copies could be printed within one year if the publisher received funds for their publication.

The POC Committee recommends that PICES provide financial support to the Gidrometeoizdat Publishing Company for the publication of the above two volumes and that PICES provide financial support, in the future, for the publication of the same two volumes in English.

Dr. Talley reported on the progress of the report by the WG 1 on the Okhotsk and Oyashio Region. It is now under its final revisions and should be finalized soon. The POC Committee recommends that PICES widely distributes the report.

POC Committee discussed publication of working group reports, symposium papers, etc. POC Committee felt it was not necessary to publish symposium proceedings since the abstracts are already

available. However, working group reports should be published. Disclaimers by PICES in working group reports are acceptable.

The POC Committee recommends that PICES provide visiting scientist travel funds.

Scientific Program

The following scientific papers were presented from the POC Committee sponsored part of the program.

Physical processes and modelling of the subarctic North Pacific and its marginal seas. Co-convenors: Prof. Yutaka Nagata (Japan) and Prof. David L. Musgrave (U.S.A.)

Roland A. de Szoeke

Buoyancy forcing of the pycnocline in a wind-driven ocean circulation model

Kenneth L. Denman

Simulations of the subarctic pacific planktonic foodweb with a simple one-dimensional coupled physical-biological model

John F. Garrett, Howard Freeland & Frank Whitney

Repeat hydrography along line P and long term sampling at station P

Sergey V. Gladyshev

Role of the warm-core Kuroshio eddies in the formation of the North Pacific intermediate water (NPIW)

Haruo Ishii & Takatoshi Takizawa

Ocean structure around the Aleutian Islands

Yasuhiro Kawasaki & Tokihiro Kono

On the change in water mass structure and characteristics around the Kuril Islands and the Kuril Basin from August to November 1993

Michio J. Kishi

Ecosystem model for Northern Pacific
Tokihiro Kono & Yasuhiro Kawaskai

- Seasonal and inter-annual variation of the Oyashio current velocity observed by moored current-meters
Andrei S. Krovnin
Progression of the sea surface temperature anomalies in the North Pacific
- Victor I. Kuzin
North Pacific circulation modelling with telescopingization
- Jae Hak Lee
An effect of freshwater input at the sea surface
- Vyacheslav Lobanov
Statistical study of the Kuril eddies and their role in regional hydrography
- Hiroji Onishi, Michihiro Shonai, Hideo Miyake & Mitsuyo Onishi
Interannual variations of physical properties in the western North Pacific
- Stephen C. Riser & N. Shikama
The flow-field in the intermediate layer of the Northwest Pacific as revealed from acoustically-tracked floats
- Konstanti Rogachev, Alexander Bychkov, P. Tishchenko, C.S. Wong, E. Carmack & Paul H. LeBlond
On the influence of tidal mixing on summer carbon dioxide apartial pressure in the Oyashio area
- Yoshihiko Sekine
A numerical experiment on the anomalous southward intrusions of the Oyashio and subarctic circulation in the North Pacific
- Lynne D. Talley
Rates of North Pacific intermediate water formation
- Kazuyuki Uehara & Hideo Miyake
Current measurements of the first branch of the Oyashio in the southeast off Cape Erimo, Hokkaido
- A.S. Vasiliev & Fedor F. Khrapchenkov
Theoretical analyses of seasonal variability of main physical fields in the Okhotsk Sea
- Goro Yamanaka, Yoshiteru Kitamura & Masahiro Endoh
Simulation of the North Pacific intermediate water formation
- Takashi Yoshida
Variations of Oyashio cold water distribution
- Yao-Chu Yuan & Wei-Bing Guan
Three dimensional numerical studies of the circulation in the northeast of the East China Sea and the area south of Japan
- Xiao-Jun Yuan & Lynne D. Talley
Characteristics and frontogenesis of the subarctic front in the North Pacific
- Jae-Yul Yun & Lynne D. Talley
What process sets the density of the North Pacific intermediate water at $26.7-26.8^{\sigma}_{\theta}$
- Ming-Yu Zhou
Long-range transport of aerosol and aerosol black carbon from China to Western Pacific

Endnote 1

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China

Prof. Ming-Yu Zhou

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Prof. Yasuhiro Sugimori

U.S.A.

Prof. David L. Musgrave (Rapporteur)
Prof. Stephen C. Riser

Observers

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Dr. Yasuhiro Kawasaki (Japan)
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Dr. Jae Hak Lee (Korea)
Dr. Vyacheslav B. Lobanov (Russia)
Dr. Vadim V. Navrotsky (Russia)
Prof. Thomas C. Royer (U.S.A.)
Dr. Oleg Ryabov (Russia)
Dr. Yoshihiko Sekine (Japan)
Dr. Takaotshi Takizawa (Japan)
Dr. Lynne D. Talley (U.S.A.) (WG 7)
Dr. Ichiro Yasuda (Japan) (WG 7)
Prof. Yao-Chu Yuan (China) (WG 7)
Dr. Jae-Yul Yun (Korea)

REPORT OF PICES-GLOBEC WORKSHOP (SUMMARY)

A PICES-GLOBEC Workshop was held during October 15-17, 1994, in Nemuro, Japan, just prior to the PICES Third Annual Meeting. This Workshop was sponsored by PICES and the Japan Fisheries Agency, and was hosted by the Japan Fisheries Agency. More than 100 participants attended this Workshop. Activities included a welcoming address by Mr. Takahiro Ishikawa, Deputy Director of the Japan Fisheries Agency, and keynote lectures by Dr. Brian J. Rothschild (Chairman, GLOBEC International) and Dr. Warren S. Wooster (Chairman, PICES). Dr. Daniel M. Ware and Prof. Timothy R. Parsons gave invited lectures regarding possible approaches to determining carrying capacity of the North Pacific. The current status of the national GLOBEC programs was summarized in lectures by Dr. David L. Mackas (Canada), Prof. Qi-Sheng Tang (China), Prof. Takashige Sugimoto (Japan) and Dr. Anne B. Hollowed (U.S.A.). Poster presentations on relevant scientific topics were included both in this Workshop and in the PICES Third Annual Meeting which immediately followed. Other significant events included a magnificent Workshop Reception in the evening of October 15, which was hosted by the Japan Fisheries Agency, and cultural events hosted by the City of Nemuro.

The purpose of this PICES-GLOBEC Workshop was to develop a plan for a new international science program in the North Pacific. At the PICES Second Annual Meeting in 1993, the Governing Council approved development of a PICES-GLOBEC International Program on *Climate Change and Carrying Capacity* (CCCC) in the temperate and subarctic regions of the North Pacific Ocean. This new scientific program was envisioned to include: (a) a strategy for determining the carrying capacity for high trophic level pelagic carnivores in the subarctic Pacific, and its

changes in response to climate variations, and (b) a plan for a cooperative study of how changes in ocean conditions affect the productivity of key fish species in the subarctic Pacific, and in the coastal zones of the Pacific Rim from China to California.

This Workshop was the culmination of an intensive interactive process used to develop the CCCC Science Plan. A PICES-GLOBEC Workshop Steering Committee (Endnote 1) was formed during February-March 1994, which included members from all PICES countries, and liaison members from Russia and the North Pacific Anadromous Fish Commission (NPAFC). The Steering Committee and Dr. Wooster developed a draft Science Plan for the CCCC Program during April-May. This draft was then widely circulated in the international science community with a request for input and suggested improvements. Many excellent comments and ideas were received and the Steering Committee used this input to revise and improve the draft Science Plan. This process was repeated several times during June-September, resulting in several major revisions of the draft Science Plan prior to the Workshop. Plenary sessions at the workshop provided opportunity for additional review and content suggestions, and the basis for a final revision by the Steering Committee. (Much of the discussion before and during the workshop dealt with the need, and possible ways, to extend the concept of carrying capacity to complex multi-species interactions.) The resulting Science Plan was subsequently endorsed by the PICES Science Committees and Science Board, and was approved by the PICES Governing Council, at the Third Annual Meeting during October 18-24, 1994 in Nemuro, Japan.

Endnote 1

PICES-GLOBEC '94 Workshop Steering Committee

PERSON	COUNTRY	AFFILIATION
1. N.B. Hargreaves*	Canada	WG6 Co-Chairman
2. T. Sugimoto	Japan	WG6 Co-Chairman & Japan- GLOBEC
3. J.R. Hunter	U.S.A.	WG3 Co-Chairman
4. T. Wada	Japan	WG3 Co-Chairman
5. K.L. Denman	Canada	WG6
6. D.L. Mackas	Canada	BIO & Canada-GLOBEC
7. K. Nagasawa	Japan	NRIFS (Shimizu)
8. T.C. Royer	U.S.A.	WG6
9. Y. Sakurai	Japan	WG3
10. A. Taniguchi	Japan	WG6
11. Q.S. Tang	China	FIS & China-GLOBEC
12. R. Wang	China	BIO
13. A.B. Hollowed	U.S.A.	WG6 & U.S-GLOBEC
14. D.M. Ware	PICES	Science Board
15. M. Kashiwai	Japan	Host Agency Rep.
16. L. Margolis#	NPAFC	NPAFC Liaison
17. V.I. Radchenko	Russia	Russia Liaison

* Chairman

M. Dahlberg (U.S.A.) represented NPAFC at PICES-GLOBEC Workshop

PICES-GLOBEC SCIENCE PLAN

Introduction

The North Pacific Marine Science Organization (PICES) and the Global Ocean Ecosystem Dynamics Program (GLOBEC) agreed in 1993 to jointly organize an international science program on *Climate Change and Carrying Capacity* (CCCC) in the temperate and subarctic regions of the North Pacific Ocean. A PICES-GLOBEC Workshop was organized in 1994 to develop a Science Plan during the PICES Third Annual Meeting in Nemuro, Japan. This proposed PICES-GLOBEC Science Plan is the result of this Workshop, and prior input from PICES Working Group and Science Committee members.

Activities in the CCCC Program are anticipated on two spatial scales:

1. Basin-scale studies to determine how plankton productivity and the “carrying capacity” for high trophic level, pelagic carnivores in the North Pacific change in response to climate variations.¹
2. Regional-scale, ecosystem studies comparing how variations in ocean climate change species dominance and productivity of key plankton and fish populations in the coastal margins of the Pacific Rim, from China to California.

Background

Why is PICES interested in studying Climate Change and Carrying Capacity? The reason stems from the remarkable

changes that have occurred in the North Pacific and adjacent seas in recent decades, in both the open ocean and coastal margins. Concurrent changes in atmospheric pressure and ocean temperatures indicate that in 1976 and 1977 the North Pacific shifted from one climate state, or regime, to another that has persisted through the 1980s (Trenberth 1990; Hollowed and Wooster 1992; Kerr 1992; Graham 1992; Trenberth and Hurrell 1994). Analyses of the North Pacific sea surface temperatures (SST) and atmospheric flow (Fig. 1) have identified a pattern of regime shifts in SST, the atmospheric Pacific/North American index (PNA; Fig. 2), and the southern oscillation index, lasting several years to decades. Specifically, since 1976 there has been an intensification of the Aleutian low during the winter (November through March). The centre of the low has shifted further east and is now about 4 mb deeper, on average. There have also been associated changes in wind stress curl, the corresponding Sverdrup transport, a warming over Alaska, and a cooling in the central and western North Pacific. The strength of flows in the Alaska and California Currents may also fluctuate out-of-phase (Wickett 1967; Chelton and Davis 1982; Chelton 1984; Tabata 1991). Changes in the Aleutian low also affect the distribution of sea ice in the Bering Sea (Niebauer 1989). Global modelling studies further suggest that if global warming is occurring, its effects should be most strongly developed and initially observed in high latitudes.

Although the important linkages are currently poorly understood, there is growing evidence that biological productivity in the North Pacific responds to these decadal-scale shifts in atmospheric and oceanic conditions, by alternating between

¹ In accordance with discussions with the NPAFC/CSRS in November 1993 and October 1994 it would be appropriate for the salmon research component of this study to be conducted jointly with the North Pacific Anadromous Fish Commission (NPAFC).

periods of high and low productivity. In coastal areas, both the far eastern and California stocks of Pacific sardine peaked in abundance in the 1930s, declined significantly in the 1950s and 1960s, then began to increase synchronously in the mid-1970s (Kawasaki and Kumagai 1984; Lluch-Belda et al. 1989; Fig. 3). Large scale changes in pelagic fish production in the western Pacific (Terazaki 1989; Kawasaki 1991), and in year class synchrony in recruitment of numerous important fish stocks (Bakkala 1993; Hollowed et al. 1987; Hollowed and Wooster 1992; Beamish 1993), suggests coastal production is linked to variations in ocean climate. Paleosedimentary records indicate that these interdecadal fluctuations have been characteristic of the California Current system for the last 2000 years (Baumgartner et al. 1992).

Between the late 1960s and mid-1970s, there was a two-fold increase in the summer biomass of zooplankton (Brodeur and Ware 1992; Fig. 4), and some higher trophic-level carnivores such as pomfret and neon flying squid (Brodeur and Ware 1994) in the eastern subarctic Pacific. Odate (1994) also reported significant fluctuations in zooplankton biomass in the Oyashio, Kuroshio and the transitional regions off the coast of Japan (Fig. 5). The combined, national catches of salmon in the North Pacific (Fig. 6) also apparently declined steadily from historic highs in the late 1930s to a low in the mid-1970s. However, by the late 1970s there was a striking increase and the combined salmon catches subsequently had risen two- to three-fold, to nearly the historic high levels for this century (Pearcy 1992; Ishida 1992; Beamish and Bouillon 1993; Hare and Francis 1994).

Significant changes in ocean climate do not affect all ecosystems or species in the same way. Conversely, it is not established that a species or ecosystem will always respond in the same way to a specific type of change in

ocean climate. During any particular ocean climate regime the productivity of some species may be high, while the productivity of other species may be low. For example, major shifts in the dominant fish species have occurred among sardine, anchovy and mackerel in the Kuroshio-Oyashio Current region from the 1970s to 1980s. Productivity changes also occur in the coastal waters around the Pacific Rim, but also are not necessarily in-phase with the open ocean, or other coastal ecosystems. For example, ocean survival of Washington and Oregon coho salmon was high during the 1960s and early 1970s, then declined markedly after 1976, opposite to the pattern observed in Alaska coho (Pearcy 1992; Hare and Francis 1994). Important changes in ocean climate likely include both physical (water mass structure, nutrient fluxes, sea ice cover etc.) and biological (primary and secondary production, predator abundance and distribution, etc.) components.

In addition to the decadal-scale regime shifts, longer-term global climate change may result in substantial changes in the biological carrying capacity of the North Pacific. Several observations are consistent with this possibility. For example, coincident with the recent increase in salmon catches, the average size of adult salmon has significantly decreased in some areas of the North Pacific. The average size of adult Japanese chum has declined by about 7% in fork length and 20% in body weight from the late 1970s to the early 1980s, but has been unchanged since the early 1980s (Kaeriyama 1989; Ishida et al. 1993). The average size of Russian chum has also decreased (Ishida et al. 1993). The mean body weight of returning pink salmon in British Columbia has declined 40% since the 1950s (Ricker 1981). There is also evidence that growth and mortality of some salmon species and stocks in the high seas may vary with levels of salmon production (Krogus 1960; Peterman 1984, 1991; Ogura et al. 1991; Ishida et al.

1993). In some cases the growth rates of abundant stocks of salmon appear to be inversely related to stock size (e.g., pink salmon, Peterman 1987). Some portion of these patterns of variation may be due to the combined current abundance of salmon and other high trophic level carnivores approaching the present “carrying capacity” of the subarctic North Pacific.

By “carrying capacity” we mean how zooplankton and high trophic level carnivore species dominance and productivity respond to changes in the ocean climate. One initiative in the CCCC program will be to develop a new theoretical and mathematical framework which extends the classical, single species concept of carrying capacity into the multi-species, ecosystem domain that the CCCC Program will address. To be relevant, this extended definition must recognize that the “carrying capacity” from this point of view changes over time in response to many factors such as: abiotic conditions, spatial distribution of the population, the supply of food, and the abundance of predators. The food supply, in turn, is a function of the productivity of the prey populations, and competition for that food from both within and between predator populations. As experience has indicated, changes in the abiotic environment can affect the distributions and productivity of populations at all trophic levels.

PICES-GLOBEC Science Plan

The CCCC Program will address how climate change affects ecosystem structure, and the productivity of key biological species at all trophic levels in the open ocean and coastal North Pacific ecosystems. The physical environmental changes that have occurred in this century,

particularly during the late 1970s, may provide a natural experiment for studying such questions.

At this stage, only the general scope of the proposed CCCC Program has been discussed. There will be a strong emphasis on the coupling between atmospheric and oceanographic processes, their impact on the production of the major living marine resources, and on how they respond to climate change on time scales of seasons to centuries.

The program shall focus on determining how the dynamics of the ecosystems of the subarctic Pacific respond to climate change. The program will include the following elements:

1. Employ mechanistic process studies to improve understanding and develop early recognition and prediction capabilities for regime changes.
2. Develop and employ models to guide research activities, integrate results, and improve capabilities for forecasting ecosystem responses to climate change.
3. Develop broader insights and understanding through regional comparative studies.
4. Support and coordinate CCCC Program activities with GLOBEC.INTERNational and other existing and planned international (e.g. NPAFC, WOCE, JGOFS, GOOS, NOPACCS, WESTPAC, YSLME, LOICZ) and national (e.g. CalCOFI, BIOCOSMOS, GLOBEC SPACC, HUBEC, FOCI, LaPerouse) organizations and research programs in the PICES region.

The **key scientific questions** to be addressed include:

1. How do interannual and decadal variations in ocean conditions affect the species dominance, biomass, and productivity of the key zooplankton and fish species in the ecosystems of the PICES area?
2. Evidence exists for climate regime shifts in the eastern North Pacific, but it is not clear if similar shifts occur on the same time scales in the western North Pacific. Are regime shifts in the eastern and western sides of the North Pacific basin in-phase? Do they have the same or opposite sign? Methods are required for both short term detection and longer term prediction of climate regime shifts.
3. How are the open and coastal North Pacific ecosystems structured? Methods are required for both short-term detection and longer-term prediction of changes in ecosystem structure, stability and productivity. The biomass spectrum approach (Platt 1985; Boudreau and Dickie 1992; Fig. 7) may provide a useful starting point for this activity.
4. What impact do variations in flow and dynamics of eastern and western boundary currents have on the productivity of Pacific Rim coastal ecosystems? Do the strengths of the Alaska and California currents vary inversely? How are their dynamics related to those of the Kuroshio and Oyashio currents?
5. What factors affect current trends in the productivity of the North Pacific Ocean and their impacts on salmonid carrying capacity?² To what extent do the seasonally migrating species such as Pacific pomfret, neon flying squid and

Pacific saury compete with salmonids in the subarctic Pacific?

6. What factors affect changes in biological characteristics of Pacific salmon? These characteristics include growth, size at maturity, age at maturity, ocean distribution, survival, and abundance?² (This is also a critical question for all key species of the subarctic Pacific.)
7. How do responses to regime state differ among potential dominant species? How do abundances, migratory patterns, and stock-recruitment relationships change? Is the response of key species to regime change characteristic and consistent over several cycles? What limits primary production during each regime?
8. What are the causes and consequences of spatial shifts in pelagic ecosystems?

Key research activities proposed to address fundamental scientific questions include:

1. Retrospective analyses

Retrospective analyses of existing atmospheric, physical, biological and paleoceanographic data, to identify recent (and historical) changes in the subarctic Pacific. For example, plans are currently underway to:

- examine atmospheric and physical oceanographic time series in the eastern and western Pacific to determine if regime shifts occurred and

² In 1993 the NPAFC agreed that "... NPAFC and PICES could jointly examine the critical issue of the impact of change in the productivity of the North Pacific on Pacific salmon" (see NPAFC Report 1993, p.51). Key Scientific Questions #5 and #6 (above) were the two items that were specifically identified by the NPAFC as two critical issues that should be examined.

if these shifts were synchronous across the North Pacific;

- examine long-term plankton and fisheries records from the eastern and western Pacific for shifts in species composition and biomass changes, and determine if these changes are synchronous on both sides of the Pacific;
- analyze plankton and high trophic level carnivore biomass data from North Pacific ecosystems to determine the average slope and intercept of the biomass spectra (Fig. 7) for different ocean regimes;
- examine the statistical evidence for a link between variations in ocean conditions, plankton, and catches of key fish stocks, and investigate the relationship between fish catches and total production, or recruitment;
- reconstruct interdecadal-through-centennial scale variability in fish populations and associated environmental changes for the past one to two millennia;
- examine historical variations in salmon growth through the analysis of their scale patterns;
- conduct comparative studies of somatic growth of fish populations around the Pacific Rim (e.g., Wada and Kashiwai 1991);
- compare the dynamics of coastal fish stocks of the North Pacific;
- examine how physical forcing affects the eastern Pacific marine mammal (e.g., harbor seals and sea lions) and seabird populations via changes in the abundance and availability of their food.

Other retrospective analyses will be carried out to meet program requirements.

2. Development of numerical models

This component of the program will develop models for ecosystem dynamics research and monitoring. The CCCC Program will involve scientists from countries on both sides of the North Pacific, requiring regional and ocean-basin scale models. PICES Working Group 7 (WG7) is reviewing three-dimensional circulation models of the North Pacific including nested circulation models of the marginal seas and shelf areas. PICES-GLOBEC and NPAFC member countries will be interested in developing regional food web models to couple with the nested, regional circulation models. However, reliability of results of complex nested models needs to be investigated because of the accumulation of errors. The models will be developed in close cooperation with the Ecosystem Process Studies and will also serve an important role in focusing and integrating other CCCC Program activities.

The following specific activities are proposed:

- develop a variety of foodweb formulations representing the appropriate dynamic ecosystem properties of interest to PICES-GLOBEC;
- embed the various formulations of foodweb models in one-dimensional mixed layer models forced by surface wind, heat and moisture exchanges typical of the subarctic Pacific, on time-scales from hours to years;
- embed mixed layer dynamics and foodweb models in the three-dimensional circulation models, and run retrospective simulations of the last 30-

50 years with observed atmospheric inputs;

- develop second generation models to generate projections of physical and biological responses to possible future climate variation and large scale environmental change.

3. Ecosystem process studies

The CCCC Program will include well-resolved process studies of hypothesized linkages between target species and their environment. The process studies will be integrated closely and iteratively with the regional and basin-scale ecosystem models described in the previous section. They will also complement time series studies by allowing quicker evaluation of statistical significance, identification of important and informative intermediate variables and linkages, and verification and improvement of model structure and parameters.

The process studies will be conducted both in the open subarctic, and in selected regional, coastal ecosystems around the Pacific Rim. They will focus on how environmental conditions affect primary production; zooplankton production, distribution, and life history; food web trophodynamics (feeding, growth, reproduction and mortality rates); life history models; and the migratory behavior of key zooplankton, micronekton, squids, fishes, marine mammals and sea birds. Many of these topics are core components of the GLOBEC.INTERNATIONAL Program.

Because many of the physical and biological changes of interest to PICES-GLOBEC occur over multi-year to interdecadal time scales, an important practical objective will be to maximize the range of environmental conditions examined in the process studies. This will be done in two ways. The first (and a very important element of the overall effort to understand how changes in ocean climate affect the

production of coastal ecosystems and the population fluctuations of key species around the Pacific Rim) will be between-site comparisons among the numerous regional GLOBEC and GLOBEC-like studies ongoing or planned by Pacific Rim countries. These will include parallel and cooperative field studies comparing and contrasting the eastern and western Pacific in terms of their physical and geochemical settings, and biological characteristics of key species, including recruitment and stage specific vital rates (growth, mortality, fecundity). These measurements will be combined with parallel applications of trophodynamic and individual-based models.

Second, shorter time scale temporal variability (e.g., El Niño events) will also be studied, and the extent to which conditions and outcomes may be used as proxies or models to understand longer-term climate change will be examined. For both spatial and temporal variability, the linkage of diverse national and regional activities by cooperative process studies will provide opportunities and scientific insights which would not be gained through research conducted solely by the individual countries.

4. Development of Observation Systems

A monitoring program will be developed to collect new observational data on surface winds, upper ocean temperature and circulation, nutrient flux, phytoplankton productivity (from ocean colour sensors and *in situ* studies), zooplankton, mesopelagic micronektonic animals and higher trophic level carnivores. These data will be obtained from satellites, drifting buoys, moorings, volunteer observing ships, research vessels, and by development and implementation of required new methods and technology. Intensive multi-ship, multi-disciplinary surveys on whole ecosystem structure and dynamics, to understand biological productivity, trophic level

interactions and physical biological interactions, will be developed in the Kuroshio-Oyashio transitional region. The data will be used in the numerical modelling and by other CCCC program activities. Data collection, analyses and exchange activities in the CCCC Program will also be closely linked and coordinated with survey and monitoring activities developed in other PICES and international (e.g., NPAFC) programs. It would be desirable for the CCCC Program to be coordinated with GOOS activities in the North Pacific, and to consider the use of models and experimental and statistical design tools to aid in the design of observational protocols.

Relevance and Expected Benefits of the CCCC Program

The PICES-GLOBEC International Program on *Climate Change and Carrying Capacity* will address major scientific questions and provide important benefits for the member countries. These countries are developing national GLOBEC programs, therefore, it is desirable that the PICES-GLOBEC Science Plan be developed in a timely manner to guide coordinated planning among the participating nations. The new information obtained from the CCCC Program to determine the changes in productivity of each trophic level in oceanic and coastal ecosystems will provide a stronger scientific base for rational harvesting and management of living marine resources in the North Pacific³.

There are many important consequences of the climate regime changes that have occurred in the North Pacific during this century. For example, the current high catches of salmon in the North Pacific could

³ *PICES itself has no fisheries management responsibility or authority. However, the scientific findings of the CCCC Program will be fully available to national and international agencies that do have that responsibility.*

change significantly when the next climate regime shift occurs. By identifying changes in productivity under different ocean climate regimes, Pacific Rim nations could respond appropriately. There are some indications that the North Pacific may have undergone another regime shift in the late 1980s making this study timely and important. Numerous studies have also found significant relationships between commercial catches or other indices of year class strength and/or recruitment (e.g., juvenile abundance) of individual stocks of marine fish and large-scale oceanic factors (e.g., El Niño events, wind stress, upwelling, temperature, salinity, primary and secondary productivity).

Major changes in species dominance and productivity have also occurred in the marginal seas around the Pacific Rim. The increases and collapses of both the Asian and California stocks of Pacific sardine populations during this century provide a striking example. These large amplitude changes in fish abundance have important economic and social effects, and appear to be linked to the general pattern of climate change in the North Pacific.

Large-scale year class synchrony in recruitment of many fish stocks in the eastern North Pacific also suggests a climate connection. Development of methods for early recognition and longer-term prediction of ocean climate regime shifts will be very valuable, and could become an important basis for more successful harvesting of short-lived species.

Scientific knowledge of the interrelationships between high trophic level carnivores and carrying capacity would be extremely useful in improving single species models, and in developing new multi-species models which could include consideration of the role of marine mammals, sea birds and non-target fish species in the ecosystem.

The linkage of local, regional, and international activities by these cooperative studies will provide unique opportunities and new scientific insights which would not be gained through research conducted solely by the individual countries.

Time Table

There is an urgent need to initiate the CCCC Program to provide international coordination between the national GLOBEC programs. Some national GLOBEC programs are anticipated to begin in late 1994 or early 1995.

The proposed schedule of activities for the CCCC Program is shown below. This schedule will be modified as the national GLOBEC programs are approved and implemented, and as appropriate linkages are established with other international organizations and programs such as NPAFC, JGOFS, WOCE and GOOS.

1995-1996: Phase 1: Planning and Data Assimilation

- develop implementation plan
- feasibility/costing studies
- initiate planning of joint research with NPAFC
- begin compiling historic data
- begin retrospective analyses of existing data

- begin model identification and parameterization
- begin developing circulation models
- begin developing regional food web models
- begin planning observation system

1997: Start Phase 2: Observing, Process Studies and Modelling

- complete compilation of historic data
- continue retrospective analyses
- develop new required technology
- implement required observation system
- conduct focused, international data collection surveys
- develop 3-D circulation model
- assess model and parameter uncertainty
- conduct process-oriented field and laboratory studies
- refine regional food web models
- conduct comparative ecosystem studies

2000: Start Phase 3: Model Integration and Testing

- complete retrospective analyses
- operate observation system
- couple 3-D circulation model and regional food web models
- conduct focused, international data collection surveys
- validate ecosystem models
- develop methods to detect and predict regime shifts
- apply prognostic ecosystem models

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FINDINGS AND RECOMMENDATIONS OF THE PICES-STA WORKSHOP ON MONITORING IN THE SUBARCTIC NORTH PACIFIC

83

83

A workshop was held to provide advice to the PICES Science Board on a strategy for monitoring in the subarctic North Pacific. Invited speakers provided review papers on various topics in physical and biological oceanography. Contributing speakers provided posters illustrating several monitoring programs already in progress and new technology that might be useful for monitoring. WGs discussed specific details and reported out in plenary session. The Steering Committee assembled the input from the presentations and the discussions, and prepared the following general findings and specific recommendations. A final report of the meeting will be prepared for general distribution, by January 31, 1995.

General Findings

1. Some aspects of the climate-scale physics and biology of the subarctic North Pacific are understood, and long-term monitoring programs can be scientifically designed based on this knowledge and on existing technology. The climate module of the Global Ocean Observing System (GOOS) is a target for any recommendations concerning monitoring for the purposes of describing and understanding climate. GOOS, in addition to providing the ocean component of the Global Climate Observing System (GCOS), is a target for any recommendations concerning monitoring for the purposes of understanding climatic effects (namely, variability and change) on the living marine resources in the ocean, especially at the lower trophic levels.

2. Other aspects of the subarctic North Pacific require more research, or new technology, before monitoring programs can be undertaken. GCOS and GOOS are not targets for these recommendations, because GCOS and GOOS are not research programs or funding agencies, however it would be useful to keep GCOS and GOOS informed as to research and technology needs and programs, so that close contact can be initiated and maintained to facilitate a future transition to monitoring programs.

Specific Findings and Recommendations

1. The working papers prepared for this Workshop are, in general, review papers of high quality and broad interest. They should be published so as to provide the material in archive and accessible form.

It is recommended that PICES publish the review papers as a PICES Scientific Report, after the authors have had an opportunity (two months) to revise their papers based on the discussions at the Workshop. The report will be restricted to the seven invited authors, plus a summary statement at the beginning by the co-editors, Prof. Sugimori and Dr. Briscoe. Specific information on formats and text requirements will be provided to the authors by the co-editors.

PICES should treat the recommendations and discussions of this Workshop as only the first step regarding monitoring that is possible now and the needs for new science studies and technology development.

Therefore, it is recommended that PICES form an interdisciplinary, Monitoring Working Group with the following terms of reference:

- The WG will be responsible for planning the monitoring activities in the PICES area, including proposing scientific and technical priorities and schedules, and including physical, biological, and chemical measurements.
- The WG should cooperate with the GCOS Ocean Observing Panel for Climate, the GCOS Living Marine Resources science planning group, the Scientific Steering Committee of the PICES-GLOBEC *Climate Change and Carrying Capacity Program*, and other such bodies as may be needed.
- The WG will work with the PICES Technical Committee on Data Exchange to ensure timely and open exchange of monitoring data between participants and to external data users, as a mechanism to control the quality and relevance of the data.
- The WG will report regularly as requested by the PICES Science Board.

The WG will have a lifetime of two years, which may be extended by the Science Board if needed. Its membership will be two people from each member country, with credentials in the scientific and technical areas concerned with the monitoring activities. The Chairman will be named by the PICES Science Board.

3. New technology is essential to effective monitoring of the PICES area, but its

development requires attention for a long period, often with not visible results, and at great cost. Nevertheless, it is essential.

It is recommended that PICES encourage its member states to support the development of the new technology required for monitoring and identified in the report of this Workshop. Particular attention should be paid to the development of autonomous biological instrumentation, without which monitoring of ecosystem response to climate forcing will be particularly difficult.

Scientific Program

The following scientific papers were presented at the PICES-STA Workshop:

Kimio Hanawa

Interannual to decadal scale variations in the North Pacific

N. Brent Hargreaves

PICES-GLOBEC International Program on *Climate Change and Carrying Capacity*

Anne B. Hollowed

Potential response of Northeast Pacific fish stocks to climate change

Vladimir V. Plotnikov & Gennady I. Yurasov
Seasonal and interannual variability of ice cover in the North Pacific marginal seas

Steven C. Riser

Space and time scales of variability in the subarctic North Pacific: Implications to monitoring the system

Satoru Taguchi

Monitoring of lower trophic level variability and response to long-term forcing in the subarctic Pacific Ocean

Lynne D. Talley & Xiao-Jun Yuan

Summary of variability of physical conditions in the subarctic North Pacific

REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE

83

80

The Committee met in the afternoon of October 18, 1994 under the Chairmanship of Mr. W.L. Sullivan, Jr. (see Endnote 1 for participants).

The Chairman of PICES, Dr. W.S. Wooster, attended, and the Executive Secretary, Dr. W.D. Mckone, was the rapporteur.

Agenda Item 1. Opening by the Chairman

The Chairman called the meeting to order and welcomed the participants. It was agreed that the Committee would reconvene in the afternoon of October 19 if the opening session failed to complete all the planned business.

Agenda Item 2. Adoption of the Agenda

The agenda was adopted as proposed.

Agenda Item 3. Implementation of the Headquarters Agreement

The Headquarters Agreement was finally passed on December 15, 1993 through an Order in Council by the Government of Canada. A Remission Order is now being processed to make the effective date of the Headquarters Agreement the 8th January, 1993. The Secretariat has recovered funds paid, on behalf of Dr. Miyata, to the Government of Canada for 1993 income tax. Additionally, the Secretariat is currently reviewing the accounts from the 8th January, 1993 to identify the amount of Goods and Services Tax subsequently paid and will make application for its return when the Remission Order comes into effect.

Agenda Item 4. Scheduling Annual Meetings

The Committee discussed scheduling of the annual meeting with a view to improving budgeting by developing a three year schedule as follows:

<u>Date</u>	<u>Year</u>	<u>Country</u>
October 16-22	1995	P.R. China
October 16-22 (approx.)	1996	East side of Pacific
October 16-22 (approx.)	1997	West side of Pacific

1. For 1995, the People's Republic of China will provide estimates of their financial commitments to host the Fourth Annual Meeting to the Secretariat as early as possible. If the Secretariat does not receive these estimates by December 15, 1994, the meeting will be hosted at the Secretariat.
2. For 1996, Canada has the opportunity to host the Fifth Annual Meeting. They must provide the Secretariat with their offer by December 15, 1994. The offer must include estimates of what costs that the host country will cover so that the Secretariat can budget for other costs in the 1995 F&A meeting.
3. For 1997 an offer to host the Sixth Annual Meeting must be received by the Secretariat in time for the opening of the 1995 meeting. The offer must include

estimates of what costs that the host country will cover so that the Secretariat can budget for other costs in the 1996 F&A meeting.

4. In subsequent years the Secretariat must receive offers to host the Annual Meeting and their financial commitments on December 15 prior to the F&A meeting which would set the budget.
5. In the event there was a failure of agreement at any step the Secretariat would be responsible to host the Annual Meeting at the Secretariat.

The Committee recommends that the Governing Council adopt the three year scheduling for future meetings.

Agenda Item 5. Space, Facilities and Equipment

The Executive Secretary reported that the space at the Secretariat has been increased by the addition of a large (18 ft. by 36 ft.) room. This room is currently being used for storage and a small library. With upgrading the room could be partitioned to accommodate secondments etc.

The fax machine was replaced this year to improve the efficiency of the Secretariat by allowing batch messaging and decreasing the sending time if the receiving machine is capable. Another computer will be purchased this year for the use of temporary help. Some office furniture was also purchased after the space was increased.

Agenda Item 6. Communication

The Secretariat proposed that an electronic bulletin board be established at the Secretariat based on a survey of PICES participants. The system would also be used for distributing the newsletter, ship schedules and other requirements of the Organization.

Agenda Item 7. Contracts undertaken by the Secretariat

The Executive Secretary reported that, as discussed under the 1993 Agenda Item 12, a US\$5000 contract was negotiated with APEC to collect information on marine organizations working in the North Pacific, their principle officers, and their objectives and current planned activities in relation to the UNCED Agenda 21 follow-up (Ocean Chapter). The committee discussed whether the Secretariat should, in future, continue to undertake contracts and how the funds would be disbursed for this contract. The Executive Secretary indicated that small contracts of this type did not detract from the work of the Secretariat. He recommended that the committee allow the Secretariat to undertake contracts of this type from time to time and that the funds received be deposited to the Trust Fund account to help build this account up for future use. The Committee recommends to the Governing Council that the Secretariat be allowed to undertake small contracts of this type at the discretion of the Executive Secretary in consultation with the Chairman of Council if necessary and that the funds received be deposited to the Trust Fund account.

Agenda Item 8. Publication cost recovery

Publication costs continue to rise from \$3000 in 1992 to an estimated cost of \$19,000 in 1994. As a result of Council decision 93/S/2, the Secretariat has produced the first issue of *Scientific Reports* and another in the series is expected to be published this year. The Committee recommends to the Governing Council that no fees be initiated at this time. Further, the Executive Secretary should look into the policies and cost recovery of publications by other Organizations and report these findings next year.

Agenda Item 9. Auditors Report 1993

The Auditor's Report was reviewed by the Committee and it is recommended for adoption by the Governing Council (Endnote 2). The Executive Secretary was asked if Flader and Greene of Sidney B.C. provided a satisfactory service over the past year. Based on the recommendation of the Executive Secretary, the Committee agreed to recommend to the Governing Council that Flader and Greene be retained as auditors for another year.

Agenda Item 10. Working Capital Fund

The status of the Working Capital Fund was reviewed by the Executive Secretary and discussed by the Committee. The Committee agreed to reduce the Working Capital Fund to approximately \$28,000. The Committee decided that the \$30,240 advance payment of Japan should be included as a separate item not associated with the Working Capital Fund. The Committee recommends that Parties equally share the surplus of \$240,000. The Parties should inform the Executive Secretary of the disbursement of these funds by December 15, 1994.

Agenda Item 11. Administrative and Financial Statements for 1994 (to October 1 and estimated to December 31)

Administrative and financial statements for 1994 were reviewed by the Committee in preparation for discussion of the budget for fiscal year 1995.

Agenda Item 12. Budget for Fiscal Year 1995

The budget proposed for 1995 fiscal year was presented by the Executive Secretary and thoroughly discussed by the Committee. The budget was adjusted to reflect the experience of the Organization to

date but keeping in mind that it will continue to grow with the possibility of new Contracting Parties joining PICES in 1995. The budget includes a new permanent secretarial position, replacing temporary help, and the support for a workshop to be held independent of the Annual Meeting. The Committee recommends to the Governing Council that the 1995 budget be adopted at \$440,000 (Endnote 3).

Agenda Item 13. Forecast Budget for Fiscal Year 1996

A forecast budget for fiscal year 1996 was presented by the Executive Secretary and reviewed by the Committee. It was agreed to propose a total budget of \$500,000 for consideration by the Governing Council. Such a budget would recognize the growing role of the Organization, and the considerable uncertainties that still exist as to the actual functions and responsibilities of the Organization. Members felt that costs could increase significantly over future years as membership and expected responsibilities expand.

Agenda Item 14. Trust Fund

The Trust Fund account and the provisional guidelines for operating the account were reviewed. The Executive Secretary should develop options for funding the Trust Fund and provide these to the Committee for consideration at the next Annual Meeting. The Committee recommends that the Governing Council adopt the Provisional Guidelines as the PICES Trust Fund Guidelines (see Council Report).

Adjournment

The Committee reviewed the final draft of the report of the meeting and adjourned at 1200 hr., October 20, 1994. The Committee recommends that this report and its contents be approved by the Governing Council.

Endnote 1

Canada

Dr. Donald J. Noakes

China

Mr. Han-Di Guo
Mr. Shu-Ping Chen
Mr. Ru-Guang Dai
Ms. Yue Chen

Japan

Dr. Takashi Sasaki
Mr. Masashi Mizukami
Mr. Masataka Nakahara

Participants and Observers

U.S.A.

Dr. William Aron
Dr. John L. McGruder

Observers

Mr. Jungsoo Doo (Korea)
Dr. Boris N. Kotenev (Russia)
Dr. A.S. Krovnin (Russia)

Other

Dr. Warren S. Wooster (Chairman,
PICES)
Mr. William L. Sullivan, Jr. (Acting
Chairman)
Dr. W. Douglas McKone (Rapporteur)

Endnote 2

Auditor's Report to the Organization

Flader and Greene
Chartered Accountants
9768 Third Street,
Sidney B.C.
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We have audited the statement of assets and liabilities of the North Pacific Marine Science Organization as at December 31, 1993, and the statement of sources of funds and expenditures for the year then ended. These financial statements are the responsibility of the Executive Secretary. Our responsibility is to express an opinion on these financial statements based on our audit.

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

In our opinion, these financial statements present fairly, in all material respects, the financial position of the organization as at December 31, 1993, and the results of its operations and the changes in its cash position for the year then ended in accordance with generally accepted accounting principles described in Note 1 to the financial statements.

Sidney, B.C. Canada
February 18, 1994

Flader and Greene
Chartered Accountants

Statement of Assests and Liabilities
December 31, 1993

	<u>1993</u>	<u>1992</u>
ASSETS		
Current Assets		
Cash and term deposits	\$ 263,836	\$ 337,702
Accounts receivable	<u>15,062</u>	<u> </u>
	\$ 278,898	\$ 337,702
LIABILITIES AND FUND BALANCES		
Current Liabilities		
Accounts payable	\$ 6,662	\$ 3,053
Contributions received in advance from Contracting Parties	<u>30,240</u>	<u>118,240</u>
	\$ 36,902	\$ 121,293
Fund Balances		
Working Capital Fund	<u>\$ 241,996</u>	<u>\$ 216,409</u>
	\$ 278,898	\$ 337,702

**Statement of Income and Expenditures and Change in Funds
For the Year Ended December 31, 1993**

	General Fund	Working Capital Fund	1993 Total	9 Months 1992 Total
Fund Balances , beginning of year		\$ 216,409	\$ 216,409	
Income				
Transfers from Working Capital Fund	64,000	(64,000)		
Contributions from Contracting Parties	351,980		351,980	352,000
Interest earned	<u>13,374</u>	<u>13,374</u>	<u>359,237</u>	
Fund Balances , before expenditures	<u>415,980</u>	<u>165,783</u>	<u>581,763</u>	<u>359,237</u>
Expenditures				
Personnel services	175,537		175,537	52,687
Travel	32,647		32,647	12,917
Communication	13,161		13,161	4,175
Contractual services	7,520		7,520	2,300
Printing	11,771		11,771	3,418
Supplies	4,599		4,599	2,440
Equipment - Note 2	24,294		24,294	31,944
Meetings	14,504		14,504	31,729
Relocation	51,865		51,865	
Miscellaneous	<u>3,869</u>		<u>3,869</u>	<u>1,218</u>
	<u>339,767</u>		<u>339,767</u>	<u>142,828</u>
Net Funds Available	76,213	165,783	241,996	216,409
Transfers to Working Capital Fund	<u>(76,213)</u>	<u>76,213</u>		
Fund Balances , end of year		\$ 241,996	\$ 241,996	\$216,409

**Notes to Financial Statements
December 31, 1993**

1. Accounting Policies

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

a) Fund Accounting

The Working Capital Fund represents the accumulated excess of funds provided by the Contracting Parties over expenditures. The purposes of the General Fund and Working Capital Fund are established by Regulation 6 of the Organization's Financial Regulations.

b) Capital Assets

Capital assets acquired by the Organization are expensed in the year of acquisition (Note 2).

c) Income Tax

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

d) Foreign Exchange

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

2. Equipment

At December 31, 1993, capital assets on hand and their original purchase price are as follows:

Furniture and fixtures	\$20,507
Computer equipment	<u>35,731</u>
	\$56,731

The assets were expensed in the year of acquisition.

3. Commitments

Office space and services are provided to the Secretariat to the Organization by the Government of Canada through the Department of Fisheries and Oceans. The agreement

commenced April 1, 1992 and continues indefinitely with a review every three years. The fixed cost for office space is \$2,000 per year. Services provided are invoiced quarterly.

4. Contingent Asset

As of December 15, 1993, the Organization received approval by an Order in Council of Canada exempting it from the Goods and Services Tax (GST). A second Order in Council is required to allow the Organization to apply for a refund for GST paid retroactive to January 8, 1993. No estimate of this contingent asset is re-elected in the financial statements.

Endnote 3

Budget for Fiscal Year 1995

Source	Contributions
Contributions from four Contracting Parties	440,000
Total	440,000

Category	Allotment
Personnel Services	236,000
Travel	36,000
Communication	18,000
Contractual Services	9,000
Printing	20,000
Supplies	5,000
Equipment	20,000
Annual Meeting	60,000
Vladivostok Workshop	30,000
Relocation and Home Leave	5,000
Miscellaneous	1,000
Total	440,000

COMPOSITION OF THE ORGANIZATION

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Officers:

Chairman: Dr. W.S. Wooster
Vice-Chairman: Mr. C.M. Liu

Delegates and Points of Contact:

Canada

Dr. W.G. Doubleday (Delegate)
Dr. J.C. Davis (Delegate)

China

Mr. C.M. Liu (Delegate)
Prof. Y.K. Xu (Delegate)

Japan

Mr. N. Sugiuchi (Delegate)
Dr. T. Sasaki (Delegate)
Mr. M. Nakahara (Point of Contact)

U.S.A.

Dr. V. Alexander (Delegate)
Dr. W. Aron (Delegate)
Mr. W. Erb (Point of Contact)

Finance and Administration Committee:

Canada

Dr. J.C. Davis (Chairman)
Dr. D.J. Noakes

China

Mr. H.D. Guo
Mr. R.G. Dai
Mr. S.P. Chen
Ms. Y. Chen

Japan

Dr. T. Sasaki
Mr. M. Mizukami

U.S.A.

Mr. W.L. Sullivan, Jr.
Mr. W. Erb

Science Board:

Chairman, Science Board

Dr. D.M. Ware

Chairman, Biological Oceanography Committee

Prof. M.M. Mullin

Chairman, Fishery Science Committee

Prof. Q.S. Tang

Chairman, Marine Environmental Quality Committee

Prof. J.Y. Zhou

Chairman, Physical Oceanography and Climate Committee

Prof. Y. Nagata

Secretariat:

Executive Secretary: Dr. W.D. McKone
Asst. Executive Secretary: Dr. M. Miyata
Administrative Assistant: Ms. C. Chiu

Scientific Committees:

Biological Oceanography Committee:

Canada

K.L. Denman
D.L. Mackas
T.R. Parsons

China

Y.Q. Chen
R. Wang
B.L. Wu

Japan

T. Ikeda
T. Sugimoto

U.S.A.

L. Jones
M.M. Mullin (Chairman)
P.A. Wheeler

Observer

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(Disbanded as of October 1994)

Working Group 3: Coastal Pelagic Fish

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Q.S. Tang

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Working Group 4: Data Exchange (Disbanded as of October 1994)

Working Group 5: Bering Sea

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China

Q.S. Tang
R. Wang

Japan

K. Mito
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Working Group 7: Modelling of the Subarctic North Pacific Circulation

Canada

K.L. Denman

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V.V. Navrotsky

Working Group 8: Practical Assessment Methodology
(Members to be nominated by Contracting Parties)

Working Group 9: Subarctic Pacific Monitoring
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TCODE (Technical Committee on Data Exchange):
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