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Nemuro Meeting ends successfully

The Third Annual Meeting of PICES took place in the city of Nemuro, Hokkaido, Japan 15-24, 1994. Mr. Naotoshi Sugiuchi Deputy Director General for Arms Control and Scientific Affairs, Ministry of Foreign Affairs, Japan, gave the address of welcome to all participants. Professor Yutaka Nagata of Mie University gave the keynote lecture on the subject of "Subarctic North Pacific Ocean in Global Climate System" (See Feature Article on page 9).

The people of Nemuro must be commended for the efforts they undertook to make the PICES meeting a success during a time of great difficulty. Approximately one week prior to the meeting the area suffered an earthquake of 8.2 magnitude. The center of the earthquake was about 100 miles from the city of Nemuro. The building where the meeting was to take place was damaged so that the meeting had to be moved to the local library (and two associated buildings) where books and shelves had to be removed before the meeting was to take place. We can only thank those who worked so hard to accomplish this task during a time when important repairs (water works, sewage, roads etc.) to the city had to also be undertaken on behalf of those that lived there. The participants will not forget the spirit of good will shown by the local people. Participants were continually reminded of the frailty of man when nature acts from the almost daily after-shocks they experienced during the meeting.

In addition to meetings of the Standing Committees of PICES, two Workshops, namely, PICES-GLOBEC "Climate Change and Carrying Capacity Program (CCCC)" and PICES-STA "Monitoring Subarctic Pacific Ocean Variability" and scientific sessions on

important topics took place. 220 people registered and attended the meetings from Canada(16), China (10), Japan (124), Italy(1), Mexico(2), Norway(1), Republic of Korea(7), Russian Federation(23) and the USA(36). A total of 96 scientific papers were presented at the scientific sessions and Workshops during the meeting.



Scientific session topics included structure, trophic linkages and ecosystem dynamics of the subarctic, physical processes and modelling of the subarctic North Pacific and its marginal seas, structure and ecosystem dynamics of the subarctic transitional zone North Pacific, recruitment variability of clupeoid fishes and mackerel and interdisciplinary methodology to better assess and predict the impact of pollutants on structure and function of marine ecosystems.

The business of PICES is undertaken by four standing Scientific Committees that report to Science Board which in turn reports to the Governing Council. The four standing Committees are - Physical Oceanography and Climate (POC), Fishery Science (FIS), Biological Oceanography (BIO) and Marine Environmental Quality (MEQ). The standing Committees and Science Board receive reports from six Working Groups and also this year from the two Workshops (above). The Working Groups met in

Seattle, La Jolla and Tokyo. Advice from the Working Groups and Workshops were reviewed by the standing Committees and forwarded for consideration at the other levels.

The Governing Council approved the recommendations from the PICES-GLOBEC Workshop to establish a Scientific Steering Committee to proceed with the further implementation of the program of the Science Plan (Science Plan Available from Secretariat). The North Pacific Anadromous Fish Commission (NPAFC) has been invited to work with PICES to jointly implement the plan to the benefit of both Organizations (For more details see page 3).

The Governing Council approved the recommendations from the PICES-STA Workshop to establish an interdisciplinary Working Group to 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 Working Group should coordinate its activities with the CCCC and GOOS (For more details see page 4).

The recommendations of Science Board regarding the scientific sessions for the Fourth Annual Meeting adopted by Council address key issues in the North Pacific. Topics include;

1. Marine Carrying Capacity, Fact or Fiction.
2. Circulation in the Subarctic North Pacific, and its Marginal Seas, and its Impact on Climate.
3. Factors Affecting the Balance Between Alternative Foodweb Structures in Coastal and Oceanic Ecosystems.
4. Density-Dependent Effects on Fluctuations in the Abundance of Marine Organisms.
5. Sources, Transport and Impact of Chemical Contaminants.

In addition there will be a one-day symposium on "Oceanography and Fisheries of the Bering Sea".

PICES IV in Qingdao, China

The Governing Council agreed to accept the invitation of the People's Republic of China to host the Fourth Annual Meeting in Qingdao 16-22 October, 1995 (See First Announcement for details). Subsequently, Canada has confirmed they will host the Fifth Annual meeting on the southern part of Vancouver Island and tentative dates are 16-22 October 1996. The Sixth Annual Meeting is tentatively set to

be held on the western side of the Pacific Ocean at about the same time of the year.

Scientific Decisions Approved by Council

Resolutions developed by Science Board based largely on considerations of the Scientific Committee and Working Group recommendations were approved as decisions of the Governing Council as follows:

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 Annual Report). 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 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 Annual Report).

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 Annual Report 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 CCCC 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 Annual Report 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 Annual Report 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.

PICES-GLOBEC Workshop

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.

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 the organization of a workshop to develop 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.

The following section summarizes the Science Plan proposed by the Steering Committee and endorsed by the Governing Council.

Nemuro CCCC 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?¹ 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?¹ (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 and 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
 2. Development of numerical models
 3. Ecosystem process studies
 4. Development of Observation Systems
- (See 1994 Annual Report for more details)



¹ 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.

Monitoring Workshop

A workshop was held to provide advice to the PICES Science Board on a strategy for monitoring in the subarctic North Pacific. This workshop was sponsored by PICES and the Japan Science and Technology Agency. 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.

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.

PICES is Expanding its Horizons.

The Russian Federation submitted a letter to the Department of Foreign Affairs and Trade of Canada the Depository for the PICES Convention, on 31 May, 1994, indicating its desire to join PICES. In the absence of objection by any Member States, the Russian Federation became a full member of PICES on 16 December, 1994. As many of you already know, Russia was party to the formal discussions to form PICES starting in 1987. Due to internal problems it did not join PICES in 1992, when the other founding States did. We would like to offer a sincere welcome to the Russian Federation on behalf of all Members and particularly on behalf of the Chairman Dr. Warren S. Wooster and the Secretariat. We all look forward to having our Russian research colleges participation as full members in the activities of PICES.

The Republic of Korea submitted a letter to the Depositor, on 27 November, 1994, indicating its wish to join PICES. Similar to the Russian Federation, in the absence of written objection it could become a member by the end of April. We look forward to the Republic of Korea becoming a full member in 1995. In the mean time it has been invited to appoint observers to the Governing Council, Scientific Committees and Working Groups.



PICES News E-mail Distribution

We are distributing, via e-mail, news and information on marine sciences in the North Pacific. Approximately 600 scientists from 18 countries all over the world are currently on the e-mail list.

If you want to be added to the list, please make a request by sending a message to:
Motoyasu Miyata (e-mail: moto@ios.bc.ca)

Snapshots from the Third Annual Meeting, Nemuro, Oct. 15 - 24, 1994



Governing Council representatives. From left: Prof. H.T. Huh, Dr. M. Miyata, Mr. M. Nakahara, Mr. J.S. Doo, Dr. W.G. Doubleday, Mr. H.D. Guo, Dr. D.J. Noakes, Dr. W.D. McKone, Prof. Y.K. Xu, Mr. W.L. Sullivan, Jr., Dr. W. Aron, Dr. W.S. Wooster, Dr. B.N. Kotenev, Dr. V. Alexander, Dr. I. Shaboneev, Dr. T. Sasaki and Mr. N. Sugiuchi.



PICES-GLOBEC Workshop in progress. Dr. Warren Wooster, Prof. Brian Rothschild and Dr. Brent Hargreaves in front row.



Dr. Brent Hargreaves giving a speech at the PICES-GLOBEC Reception hosted by the Japan Fisheries Agency.



Drs. John Hunter, Andrew Bakun, Al Tyler and Tom Royer at the PICES-GLOBEC Reception.



Drs. Elena Dulepova, Olga Temnykh and Victor Filatov at the PICES-GLOBEC Reception.



Participants giving their fullest attention at the Opening Session.



Prof. Yutaka Nagata gives a keynote lecture at the Opening Session.



A big turnout at the PICES Third Annual Meeting Reception hosted by the Government of Japan.



The Chinese delegation at the PICES Reception.



Another well-attended reception hosted by the Hokkaido Prefecture.



A hearty handshake between Mr. Kaiji Ooya, Mayor of Nemuro, and Dr. Wooster at the Farewell Party hosted by the Nemuro Supporting Committee.

Snapshots from the Third Annual Meeting, Nemuro, Oct. 15 - 24, 1994



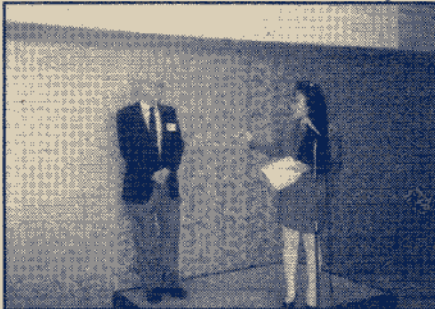
Dr. Motoyasu Miyata chats with Japanese delegates Mr. Naotoshi Sugiuchi and Dr. Takashi Sasaki at the Chairman's Party.



Prof. R. Wang, Prof. J.Y. Zhou, Dr. H.T. Huh, Dr. W. Aron and Prof. Q.S. Tang at the Chairman's Party.



The happy hosts: Dr. and Mrs. Warren S. Wooster.



Dr. Wooster making life insufferable for his interpreter (again).



Volunteers from local women associations making delicious lunches for the participants.



One corner of the Lunch Hall where the poster session is held.



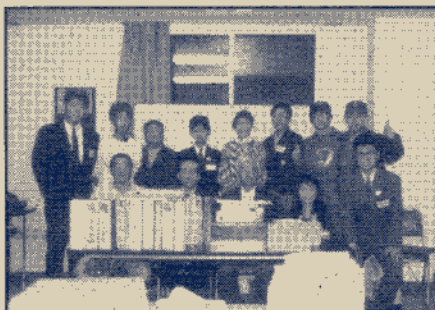
Drs. Richard Brodeur, William Aron and William Pearey inspect fish samples on a morning local fish market tour.



Spouses enjoy a session of Japanese flower arrangement, part of many wonderful activities organized by the Local Organizing Committee.



Christina from the Secretariat with Dr. Makoto Kashiwai, the Local Contact Person for the entire meeting and his special assistant Mrs. Ikuko Matsubara.



Members of the Local Organizing Committee, Mr. T. Endo, Mr. S. Sada, Heads of the Public Relations and Administration Committees (front left 1 & 2), that made everything happen.



Dr. Paul K. Park (right most) with members of the Korean delegation.



Weighed down by business or food ... Drs. Doug Hay, Jake Rice and Mr. Skip McKinnell take a break at a reception.

Subarctic North Pacific Ocean in Global Climate System

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The ocean plays an important role in global climate system as it:

- 1) moderates climate change through its large heat capacity,
- 2) transports huge amount of heat in the meridional direction, and
- 3) absorbs CO₂ and other gases responsible for the greenhouse effect.

However, if water in the surface layer does not sink into deeper layers by downwelling, subsidence, convection or mixing:

- 1) temperature change will be limited within a very thin surface layer, and the effective heat capacity of oceans would be much smaller,
- 2) the meridional heat transport of the oceans will be considerably reduced as deep water circulation plays an important role in the present system, and
- 3) the surface water would be easily saturated with green house gases, and the ability of absorption would be much reduced.

In addition, if the upwelling of deeper layer waters caused by global abyssal circulation is weakened, the supply of nutrients in the surface layer would be decreased. This would result in decreasing the rate of downward transport of CO₂ through biological pumping, and would reduce the absorption ability of the ocean.

The effect of the surface water subsidence on climate change can be seen in the results of numerical experiments: for example, Staufe et al. (1989) investigated climate change when the atmospheric CO₂ concentration increases at a rate of 1 % per year. The calculated latitude-time distribution of the surface air-temperature anomaly is shown in Fig. 1. The temperature increase is moderate in the latitudes of around 60-70 S, less than 0.5C degrees over 65 years. This is very reasonable because a strong convective motion in the southern oceans is well reproduced in their model. If the signal of the climatic

change penetrated into the deep layers, the rate of the climatic change would be small as the time scale of the abyssal circulation of the ocean is of the order of thousand years.

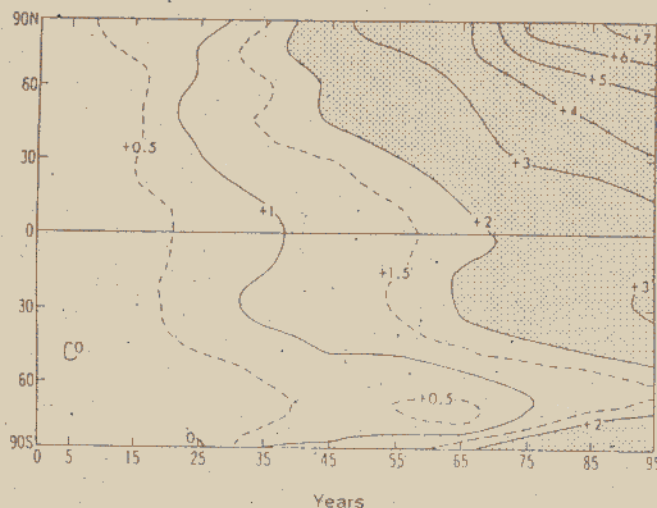


Fig. 1: Latitude-time distribution of the increase of the surface air-temperature in C. The zonally averaged decadal mean is given. (Staufe et al. 1989)

However, the rate of the temperature increase in the southern hemisphere estimated by Staufe et al. might be underestimated, as intermediate water circulation having the shorter time scale is not well simulated in their model. If the surface water subsides mainly into intermediate layers, the time scale of the change would be several tens of years. A schematic box model of the world ocean is shown in Fig. 2. It should be noted that typical time scales differ significantly among the layers, and that the time scale of the intermediate circulation is decadal.

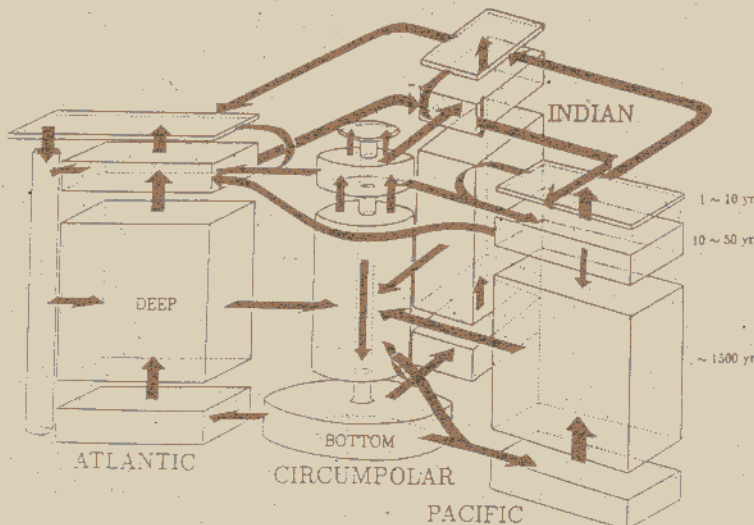


Fig. 2: A schematic box model of the world ocean (Suginohara, personal communication).

The most important time scale of future climate change is decadal if our efforts are to determine and mitigate expected climate change. For example, one of my friends, an engineer in Japanese Ministry of Construction told me that, if sea level rises 50 cm in 100 years or more, we can deal with it and the Japanese coasts can be protected, as the life of coastal dike repair cycle is about 100 years. It is not so hard to increase height of dikes 50 cm at the time of repair work. If it occurs within next 30 years, we have no ability to protect the coasts. Thus, accurate modeling of the intermediate circulations in the ocean is essential for the forecasting of the climate change. Our knowledge of the intermediate circulation is very limited in the present stage. The investigation of the subarctic ocean is urgent as intermediate waters are generated and subside there.

The North Pacific is the only ocean where a well-defined subarctic gyre exists: In the North Atlantic Ocean, considerable amount of the Subtropical Surface Water flows into the Polar Sea. In the southern Oceans, the Circumpolar Current flows in their subarctic areas. The dynamics of the formation of the intermediate water is simpler in the North Pacific Ocean, but the formation mechanism of the North Pacific Intermediate Water (NPIW) is not well understood. This is one of the most important items discussed by PICES.

No outcrop of the typical density surface of NPIW, 26.8 sigma-theta, is found in the North Pacific Ocean, except in the northwestern margin of the Okhotsk Sea where active sea ice formation occurs throughout winter. (The high density water is also generated in small areas of the coastal regions near Japan where the high salinity waters originated from the Tsushima Current Water in the Japan Sea, Tsugaru Current Water and Soya Current Water, are stagnant in winter). This is the reason why POC first set up the working group on the Okhotsk Sea and Oyashio Region (WG-1). WG-1 (chaired by L. D. Talley) reviewed the present knowledge on the oceanic conditions of this area, and the results will be published as one of PICES Scientific Report series. Though WG-1 was terminated in October 1993, the related discussions are continuing through the PICES Workshop on the Okhotsk Sea and its Adjacent Areas held in Vladivostok, June 19-24, 1995.

Some curious facts concerning the formation mechanism of NPIW are:

1) A saline and dense water with almost freezing temperature is found near the bottom of the shelf region of the northwestern Okhotsk Sea. This water loses its high salinity characteristics when it flows out into the central part of the Okhotsk Sea (presumably, mixed with cold fresh surface water nearby), but it keeps high density comparable to NPIW. No quantitative discussion has been undertaken.

2) The high density water flows out through the southern gaps of Kuril Islands, and receives considerable modification in the Oyashio region. However, the modification mechanism is too complicated, and we have no precise model to describe it.

3) The water is carried along the Hokkaido coasts toward the northwestern corner of the Mixed Water Zone where NPIW appears to be generated.

However, in order to get the water property of NPIW, the water need to be supplied with salt. There are three possible mechanisms:

i) horizontal mixing with the high salinity NPIW which has been carried in this region by the Kuroshio,

ii) horizontal mixing with the high salinity water which is produced from Tsugaru Current Water cooled near Japan coast, and

iii) uplift of, or diapycnal mixing with, the deeper salty water.

Though the data on water mass and current distributions in these regions are increasing, through observations and data analysis it is difficult;

1) to estimate the volume transport in the NPIW layer, and to calculate the amount of the supply of dense water to be required to maintain NPIW,

2) to check the heat and salinity balances in local key area such as in the northwestern part of the Okhotsk Sea, as well as in whole subarctic area, and

3) to fill gaps of the existing data, especially to estimate oceanic conditions in winter season.

In order to gain a better understanding of the problems, we need to model to simulate oceanic conditions of the Subarctic North Pacific and its marginal seas. Recently, NPIW is well described in some ocean models which adopt a coordinate system that follows isopycnal surfaces (e.g., G. Yamanaka et al. 1994). The detailed formation mechanism, however, is not included, and the water masses in the Okhotsk Sea are usually given by climatological conditions deduced from observations. Some of the answers are being determined through these numerical model experiments. We need much more elaborated modelling

studies. Modelling of the subarctic oceans is much more difficult in comparison with that of the Subtropical oceans, because:

1) Available data are limited in these areas, especially in winter season.

2) Data of fresh water flux across the sea surface are not available. (In the high latitude ocean, salinity is much more important than temperature to determine sea water density. It should be noted that the position of the southern boundary of the Subarctic Gyre or the northern boundary of the Subtropical Gyre shifts considerably by given conditions of surface salinity distribution or on fresh water exchange through sea surface),

3) In order to produce the sharp halocline and the mesothermal layer in the Western Subarctic Gyre, we need very fine vertical resolution in the surface layer. (The winter convection there appears not to penetrate into the halocline. However, deeper winter convections are assumed in usual numerical models),

4) The Subarctic Gyre penetrates well into the shallow marginal seas, the Bering Sea and Okhotsk Sea. The water mass modification is very strong there, but is hard to simulate in models, and

5) The stability in the ocean is relatively low, and the mixing of the water occurs extensively. The mixing activity appears to differ from place to place. Especially, when the current passes through the straits of the Aleutian Islands and Kuril Islands or flows over banks and ridges, we find many evidences of strong mixing. It is hard to take into account these mixing processes in present models.

We believe that improvements of modelling studies in the Subarctic North Pacific are urgently needed. Thus, POC/PICES established Working Group on Modelling of the Subarctic North Pacific Ocean (WG-7) in October 1993. For the same reason, the POC session in the Third PICES Annual Meeting in Nemuro was focused on the modelling efforts and was held under the title, Physical Properties and Modelling of the Subarctic North Pacific and its Marginal Seas. WG-7 is chaired by P. LeBlond and M. Endoh, and will finish its task and complete its report by the Fourth PICES Annual Assembly in Qingdao 1995.

References

- Staufer R. J., S. Manabe and K. Bryan, *Nature*, vol. 342, 1989.
Yamanaka G., Y. Kitamura and M. Endoh, presented in PICES 3rd Annual Meeting, 1994.

Biomass Flips in the Pacific

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International Symposium on "the large marine ecosystems (LMEs) of the Pacific Ocean" was held on October 8-11 in Qingdao, China.

Major shifts in abundance of marine fish populations are occurring in large marine ecosystems of the Pacific. The biomass of small fast growing and economically important sardines and anchovies are undergoing massive biomass changes according to marine scientist meeting at Qingdao Ocean University. Ninety marine scientists from 17 countries and three international organizations gathered in Qingdao to assess the changing conditions of large marine ecosystems around Pacific Ocean rim. Early indications of a multi-year cooling regime was reported to the symposium by Dr. Daniel Lluich Belda of the Mexican Center for Biological Research. From an examination of historical global climate change records Dr. Belda presented evidence of a cooling regime in Pacific waters. In response to this environmental change, sardine populations have been in decline while anchovy population are undergoing increases of several million metric ton abundance in the Oyashio and Kuroshio marine ecosystems of the northwest Pacific off the coast of Japan, and in the Humboldt Current ecosystem off the coast of Peru and Chile in the southeast Pacific.

Three major changes of the biological features of the fisheries in the China marine areas were observed:

- 1) The resources of some traditional high value species increased,
- 2) The number of large sized adult fish decreased and the unmaturing young fish increased in the catch,
- 3) A faster growth and mature smaller body size fish were observed in some species.

All of the features resulted from overexploitation as well as from environmental conditions (change) that occurred during the last three decades. Scientists at the Symposium also provided the opportunity to review evidence on the increasing problems of degraded

marine ecosystems from pollution and consider the implementation of core monitoring and assessment programs aimed at mitigation of ecosystem stress.

The Symposium was convened by Dr. Qi-Sheng Tang, Director General of the Yellow Sea Fisheries Research Institute in Qingdao with the support of the Chinese Government, and several other international organizations. The Symposium was held to advance the objectives of the UN Conference on environment and development held in Rio de Janeiro, Brazil in 1992, where coastal nations of the world recommended that greater effort be directed to:

- 1) controlling and reducing the degradation of marine ecosystems,
- 2) improving the potential of marine ecosystems to meet human nutritional needs, and
- 3) ensuring sustainable economical development of marine resources.

The Symposium provided recommendation for improving the link between the results of scientific investigations and improved management of marine resources within the large marine ecosystems of the Pacific Ocean.

The Climate State of the North East Pacific in the Second Half of 1994

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Through 1994 the N.E. Pacific has continued its slow recovery from the impact of two El Niño events in as many years. As 1994 began the sea surface temperature anomalies showed the characteristic El Niño pattern, for the N.E. Pacific, of positive anomalies at the American coastline and negative anomalies in the central Pacific. As 1994 progressed we saw a steady erosion of this pattern. The maps (Fig. 1-4) shown here are the anomaly patterns for June, August, October and December of 1994. These show a steady decline in sea-surface temperatures along the coasts of the Americas and the steady building of a central Pacific warm pool. As the year closed sea surface temperatures were below normal along the coasts of Oregon, Washington, British

Columbia and Alaska. That is evident in the anomaly map for December 1994, and is backed up by observations at the B.C. lighthouses.

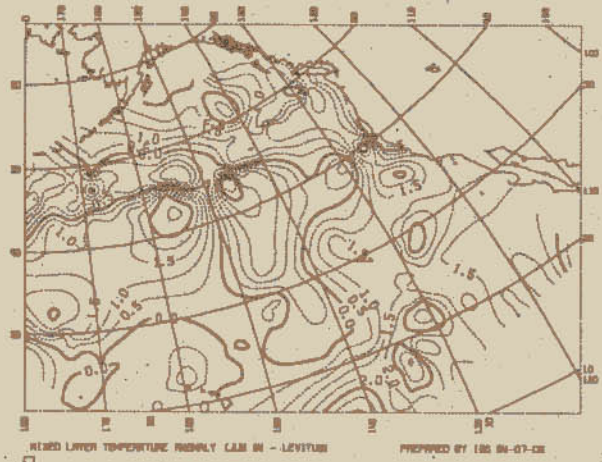


Figure 1. SST anomaly in June, 1994

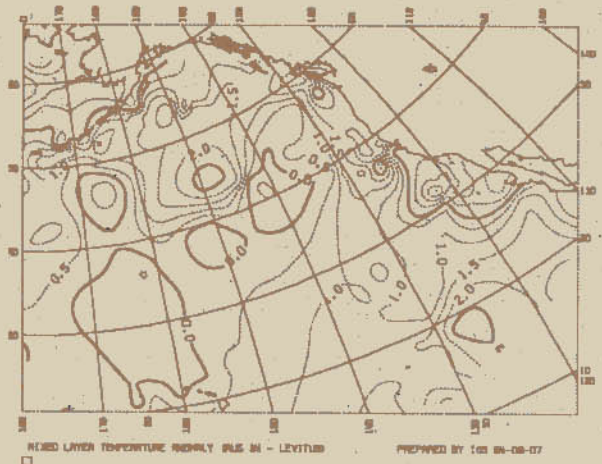


Figure 2. SST anomaly in August, 1994

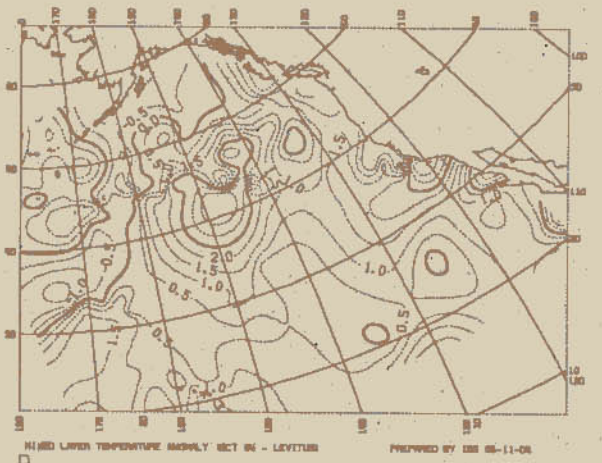


Figure 3. SST anomaly in October, 1994

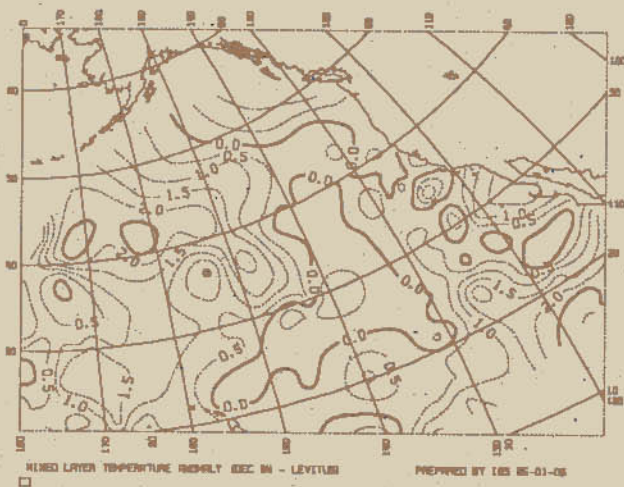


Figure 4. SST anomaly in December, 1994

However, the most commonly asked question (I guess the popular modern jargon is FAQ, for *frequently asked question*) is, will there be an El Niño in 1995? And my answer is, "I don't know." The problem seems very confused at the present time (mid January 1995). I have just downloaded the latest El Niño forecast computed using the Cane and Zebiak model. It clearly indicates that conditions in the equatorial Pacific will remain near normal for the next few seasons, and so, there will not be an El Niño. However, temperatures have risen (slightly) off the coasts of Peru and Ecuador, sea level has moved upwards (but not yet a lot), and there is enhanced convection in the central equatorial Pacific. All of which have prompted the Climate Analysis Center (Washington, D.C.) to issue an El Niño Advisory. In other words, they think the 1995 El Niño has begun. We should note that the Cane Zebiak model has an advertised success rate of about 70%, which implies a failure rate of 30%.

If anyone wishes to keep track of the developing El Niño story, the Cane Zebiak forecasts can be obtained by ftp (file transfer protocol) over the Internet. Call the anonymous ftp rainbow.ldgo.columbia.edu and change directories to pub/barnston, and then look for files with names like 4cast_oct94_initcond which is the forecast from initial conditions of October 1994. You should set the computers for binary transfer, i.e. type "type binary" and then type "get filename". The file can be viewed with any word processor. Advisories from the Climate Analysis Center can be obtained by ftp nic.fb4.noaa.gov then change to directory pub/cac/nino. Look for files like highlights.dec, indices.dec and advisory.dec which are

highlights of December data, summary of indices for December and an El Niño diagnostic advisory issued in December.



Japan Sea Oceanography

Pacific Research Institute of Fisheries & Oceanography (TINRO) is going to publish the first comprehensive "Bibliography of the Japan Sea Oceanography".

The Bibliography includes about four hundred sources (mainly Japanese, Russian and Korean): more than half of them are abstracted. There is an extensive introduction and list of authors. For the first time information about many Russian and some North-Korean sources becomes available for foreign scientists. The Bibliography includes papers on air-sea interaction, tides, waves, ice, hydrochemistry, biological oceanography as well.

The language of the Bibliography is English. Its volume will be approximately 300pp. The Bibliography should be very useful for physical and biological oceanographers and specialists on other marine sciences of Pacific Rim countries.

If you are interested by this message, inform us on quantity of the Bibliography you would like to receive, please. Its price will be approximately US \$5.

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Meetings of Interest

The following is a sample of future meetings that might be of interest. Your help in making a more comprehensive list would be greatly appreciated.

1995

Feb. 7 - 10: GCOS Data and Information Panel Washington, D.C., USA.

Feb. 7 - 10: Bering Sea Specialist Meeting, Seattle, USA.

Feb. 15: Canadian Hydrographic Symposium HYDROCOMM 95, Satellite will be used to broadcast the presentations simultaneously to Victoria, Vancouver, Calgary, Toronto, Ottawa, Montreal, Quebec, Rimouski, Fredericton, Halifax & St. John's, Canada, and Washington, DC, U.S.A. (HYDROCOMM 95, Canadian Hydrographic Service, 615 Booth Street, Ottawa, Ontario, K1A 0E6, Canada; fax: 613-996-9053).

Mar 27 - 30: IOC GOOS Committee- Strategy Subcommittee, Geneva., Switzerland.

April 2 - 7: International TOGA Scientific Conference, Melbourne, Australia

April 18 - 21: Oceanography Society Scientific Symposium, Newport, Rhode Island, USA.

April 24 - 26: IOC-WMO-ICSU Joint Scientific & Technical Committee for GOOS, Nantes, France.

March 6 - 10: North Pacific Symposium on Invertebrate Stock Assessment and Management, Nanaimo, B.C., Canada. (G.S. Jamison, Pacific Biological Station, 3190 Hammond Bay Road, Nanaimo, B.C., V9R 5K6, Canada).

March 6 - 10 NPAFC Research Planning and Coordinating Meeting, Seattle, WA, USA, (North Pacific Anadromous Fish Commission, 6640 Northwest Marine Drive, Vancouver, B.C., Canada V6T 1X2; tel: 604-228-1128; fax: 604-228-1135).

May 10 - 12: GCOS Space-Based Observation Panel Washington, D.C., USA.

May 15 - 26: UNEP Governing Council, Nairobi.

May 17 - 19: West European Conference on Marine Technology, Copenhagen, Denmark.

May 29 - Jun. 2: Coral Reef Workshop, Dumaguete City, Philippines.

May 29 - June 2: 29th Annual Congress of the Canadian Meteorological and Oceanographic Society, Okanagan University College, Kelowna, British Columbia, Canada. (William Hsieh, Dept. of Oceanography, Univ. of British Columbia, 6270 University Boulevard, Vancouver, B.C., Canada V6T 1Z4; tel: 604-822-2821; fax: 604-822-6091; e-mail: cmos@ocgy.ubc.ca; or Al Wallace, Atmospheric Environment Service, 3140 College Way, Kelowna, B.C., Canada V1V 1V9; tel: 604-491-1510; fax: 604-491-1506; e-mail: wallacea@aesvan.dots.doe.ca).

May 30 - Jun. 21: WMO Congress, Geneva, Switzerland.

June 4 - 7: Aquaculture Canada '95: The Aquaculture Association of Canada's 12th Annual Meeting and Trade Show. This years theme: "Aquaculture and the Environment: An Essential Partnership". Bastion Inn, Nanaimo, B.C., CANADA. (Aquaculture Canada '95, Unit 537 9-B, 1150 Terminal Ave. Nanaimo, B.C., Canada; fax: 604-753-6329).

June 5 - 12: Pacific Science Congress, Beijing, People's Republic of China. (XVIII Pacific Science Congress Secretariat, c/o Institute of Atmospheric Physics, Chinese Academy of Sciences, P.O. Box 2718, Beijing 100080, China; fax: 86-1-2562458).

June 6 - 9: IOC Committee for GOOS, Paris, France.

June 12 - 16: ICES International Symposium on Fisheries and Plankton Acoustics, Aberdeen Scotland. (E.J. Simmonds, Marine Laboratory, P.O. Box 101, Victoria Road, Aberdeen, Scotland AB9 8DB, United Kingdom; tel: 44-224-876544; fax: 44-224-295511).

June 13 - 27: IOC Assembly, Paris, France.

June 19 - 24: PICES Workshop on the Okhotsk Sea and Adjacent Areas, Vladivostok, Russia. (PICES Secretariat, c/o Institute of Ocean Sciences, P.O. Box

6000, Sidney, B.C., Canada V8L 4B2; tel: 604-363-6366; fax: 604-363-6827; e-mail: pices@ios.bc.ca).

June 26 - July 2: International Larval Fish Conference, Sydney, Australia. All aspects of egg, larval or juvenile fish biology. Sponsored by American Fisheries Society Early Life History Section and Australian Society of Fish Biologists. (Mike Kingsford in Australia; e-mail: mikek@extro.ucc.su.oz.au; fax: 02-692-4119; or Cynthia Jones in USA; fax 804-583-6687).

July 2 - 7: Fifth International Polychaete Conference, Qingdao, China. (B.L. Wu, Marine Ecology and Polychaete Laboratory, First Institute of Oceanography, State Oceanic Administration, 3A Hongdaozi Road, Qingdao, China; tel: 86-0532-2866810; fax: 86-0532-2879562).

July 2 - 14: 21st IUGG General Assembly, Boulder, Colorado, USA.

July 17 - 22: Coastal Zone 95, Tampa, USA.

July 24 - Aug. 4: UN 5th Fisheries Conference, New York USA.

Aug. 5 - 12: 21st General Assembly of IAPSO, Honolulu, Hawaii, U.S.A. (Robin Munench; e-mail: rmunench@frazil.nw.saic.com; or Robert E. Stevenson, P.O. Box 1161, Del Mar, California, 92014-1161, U.S.A.; tel: 1-619-481-0850; fax: 1-619-481-6938; e-mail: iapso@oceans.org)

Aug. 8: Workshop on Fossil Turbulence: Microstructure and Hydropaleontology, Honolulu, Hawaii at IAPSO General Assembly. (Carl Gibson; e-mail: cgibson@ucsd.edu).

Sept. 6 - 8: Symposium on the Role of Marine Mammals in the Ecosystem, Dartmouth, Nova Scotia, Canada. (NAFO Secretariat, Tissa Amaratunga, Assistant Executive Secretary, Northwest Atlantic Fisheries Organization, P.O. Box 638, Dartmouth, Nova Scotia, B2Y 3Y9, Canada; tel: 902-469-9105; fax: 902-469-5729).

Sept. 21 - 26: ICES Statutory Meeting: Special Theme Session on Intermediate-Scale Physical Processes and their Influences on the Transport and Food Environment of Fish, Copenhagen, Denmark. (B. MacKenzie, Danish Institute for Fisheries and Marine

Research, Charlottenlund Castle, DK-2920 Charlottenlund, Denmark; e-mail: brm@fimdfh.fin.dk; tel: 45-3396-3403; fax: 45-3396-3434; or Francisco E. Werner, University of North Carolina, Chapel Hill, North Carolina 27599-3300, U.S.A.; e-mail: cisco@hydra.chem.unc.edu; tel: 919-962-0269; fax: 919-962-1254).

Oct. 9 - 12: Oceans '95, San Diego, CA, USA.

Oct. 11 - 13: International Symposium on biology, management, and economics of crabs from high latitude habitats, Lowell Wakefield Fisheries Symp., Anchorage, AK, USA. (Brenda Baxyer, Alaska Sea Grant, U. AK Fairbanks, PO Box 755040, Fairbanks, AK, 99775-5040 USA)

Oct. 16 - 20: GCOS Joint Scientific and Technical Committee, Japan.

Oct. 16 - 22 PICES 4th Annual Meeting, Qingdao, China. (PICES Secretariat, c/o Institute of Ocean Sciences, P.O. Box 6000, Sidney, B.C., Canada. V8L 4B2; tel: 604-363-6366; fax: 604-363-6827; e-mail: pices@ios.bc.ca).

Oct. 31 - Nov. 2: California Cooperative Oceanic Fisheries Investigations - Annual meeting, Lake Arrowhead, California (George Hemingway, or Mary Olivarria, both at MLRG/SIO/UCSD, La Jolla, California 92093-0227; tel: 619-534-4236; fax: 619-534-6500; e-mail: ghemingway@ucsd.edu)

Oct. 31 - Nov. 3: Bering Sea Annual Meeting, Seattle, USA.

Nov. 6 - 11: NPAFC 3rd Annual Meeting, Seattle, U.S.A. (North Pacific Anadromous Fish Commission, 6640 Northwest Marine Drive, Vancouver, B.C., Canada V6T 1X2; tel: 604-228-1128; fax: 604-228-1135).

November: Intergovernmental Meeting on the Protection of the Marine Environment from Land-Based Activities, Washington, D.C., USA.

1996

March 5 - 8: Oceanology International, Brighton, England.

June 24 - 29: International Coral Reef Symposium, Panama.

Oct. Commencing on the week of 21. NPAFC 4th Annual Meeting, Japan: (North Pacific Anadromous Fish Commission, 6640 Northwest Marine Drive, Vancouver, B.C., Canada V6T 1X2; tel: 604-228-1128; fax: 604-228-1135).

PICES Publication List

1. Annual Report (ISSN 1192-7771)
1992
1993
1994 (in print)
2. PICES Press (ISSN 1195-2512)
Vol. 1 No. 1, June 1993 (out of stock)
Vol. 2 No. 1, January 1994
Vol. 2 No. 2, July 1994
Vol. 3 No. 1, January 1995
3. PICES Scientific Report Series
No. 1: Part 1: Coastal Pelagic Fishes
Part 2: Subarctic Gyre
(ISBN 0-9698420-0-7)
No. 2: The Okhotsk Sea and the Oyashio
Region (in print)
4. The PICES Papers: Reports of Meetings Leading to the Establishment of the North Pacific Marine Science Organization (PICES), 1978 - 1992 (ISBN 0-9698420-1-5)



New Staff at Secretariat

On January 3, 1995, Ms. Christie McAlister joined the Secretariat staff filling the newly appointed secretary position. Christie studied business at a Victoria high school and then moved to Edmonton, Alberta to attend Northwest Bible College for two years, as a music major. Following her love of music some of her interests include reading, crafts and floral design. Here at the PICES Secretariat, her duties mainly consist of general secretarial work, formatting publications, keeping the ever increasing and changing PICES mailing list current and assisting Christina wherever needed. Having lived in Canada all her life she looks forward to traveling to China this coming October and meeting all of you at PICES IV.



Secretariat Staff

Back row: Dr. W. D. McKone, Dr. M. Miyata
Front row: Ms. C. Chiu, Ms. C. C. McAlister

Note From Editor

The editor would be pleased to receive any contributions that you may wish to make. Articles received will be published in the next edition of PICES PRESS

In the first edition of PICES PRESS it was indicated that quarterly editions would be produced. We now find this is too ambitious and we intend to reduce publication to semi-annual.

PICES PRESS

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