

REPORT OF THE IMPLEMENTATION PANEL ON THE CCCC PROGRAM

The Implementation Panel on the Climate Change and Carrying Capacity Program (CCCC/IP) met on Tuesday, October 12. The meeting was opened by the Co-Chairman, Dr. David W. Welch, who welcomed the participants (see *CCCC Endnote 1*). The agenda was reviewed and adopted.

The CCCC/IP received reports from the Task Teams on their progress in 1999 and planned activities for 2000 (these reports appear as *CCCC Endnotes 2-5*). The Panel discussed those issues with financial implications for 2000 and recommends:

Publications

Reports of the 1999 MONITOR and REX workshops and the 2000 MODEL workshop be published in a single volume of the PICES Scientific Report Series.

2000 workshops

The following meetings are to be convened prior to the PICES Ninth Annual Meeting:

- a 2-day BASS Workshop on "Development of a conceptual model of the Subarctic Pacific Basin Ecosystem(s)", with one half-day held in conjunction with MODEL and REX Task Teams;
- a 2-day MODEL Workshop on "Strategies for coupling higher and lower trophic level models";
- a 2-day MONITOR Workshop on "Progress in monitoring the North Pacific";
- a 2-day REX Workshop on "Trends in herring populations and trophodynamics", with one day held in

collaboration with BASS and MODEL Task Teams;

- A 2-day IFEP Planning Workshop on "Designing the iron fertilization experiment in the Subarctic Pacific" (co-sponsored by PICES and CRIEPI).

2000 sessions and symposia

The following sessions are to be convened at the PICES Ninth Annual Meeting:

- a 1-day CCCC Topic Session on "Recent findings and comparisons of GLOBEC and GLOBEC-like programs in the North Pacific";
- a 1-day joint BASS/REX symposium to examine the linkages between production in the subarctic gyres and resulting impacts on coastal and transition ecosystems (the subject of this joint symposium was subsequently chosen for the Science Board Symposium);
- a 1-day joint BIO/CCCC Topic Session on "Recent progress in zooplankton ecology study in PICES regions (CCCC agreed to co-sponsor this session in discussion following PICES VIII).

Travel support

PICES provide financial support for:

- 2 persons to attend the MODEL Workshop on "Lower trophic level modeling" in January 2000, in Nemuro, Japan;
- 1 person (ECOPATH model expert) to attend the BASS Workshop in October 2000, in Hakodate, Japan;
- 3 outside experts to attend the 2000 IFEP Planning Workshop;

- 2 persons to attend the MODEL Workshop in October 2000, in Hakodate, Japan;
- 1 person (expert on mooring observations or design of observational arrays) to attend the MONITOR Workshop in October 2000, in Hakodate, Japan;
- 2 persons to attend the REX Workshop in October 2000, in Hakodate, Japan.

New groups

- The revised terms of reference for MONITOR Task Team be adopted (see GC Appendix B (i));
- An Advisory Panel on the Continuous Plankton Recorder survey in the North Pacific be established, with a lifespan of 2 years, renewable with prospect of future funding for the CPR program (see GC Appendix B (iii)).

Approval of new members

- Dr. Tokimasa Kobayashi (Japan) to replace Dr. Tokio Wada (Japan) as Co-Chairman of REX;
- Dr Bernard A. Megrey to replace Dr. Daniel M. Ware as Co-Chairman of MODEL.

Several other issues were identified during the CCCC/IP meeting and were endorsed and brought forward to the Science Board:

Both BASS and REX independently proposed that time be set aside prior to PICES IX in Hakodate for joint sessions (during their workshops), which would also include participation by members of the MODEL Task Team. MODEL is also interested in coordinating its activities with BASS and REX. The Panel supports the

recommendations to identify the benefits of separate versus combined meetings and seek ways to improve connections and communication between Task Teams.

The CCCC/IP supports the proposal of REX to endorse the Fisheries Acoustics workshop that is being planned by the Acoustic Society of Japan in conjunction with PICES IX.

The proposal for a 1-day workshop on "Factors affecting production of juvenile salmon: comparative studies on juvenile salmon ecology between the East and West North Pacific Ocean" was described and accepted. The workshop will be organized by NPAFC and PICES and hosted by NPAFC on October 29, 2000, in Tokyo, Japan.

The CCCC/IP members were updated on plans for a mini-workshop on "Zooplankton ecology of the North Atlantic and North Pacific" to be held in conjunction with the meeting of the ICES Working Group on Zooplankton Ecology, April 17-19, 2000, in Honolulu, U.S.A. The Panel, as well as the BIO Committee, was very positive about involvement of PICES scientists in the workshop and consider this meeting as a starting point for active collaboration between PICES and ICES on zooplankton monitoring and comparisons of the Pacific and Atlantic Oceans.

In reviewing the PICES standing list of organizations and programs for collaboration with PICES, the Panel identified GOOS (LMR-GOOS and ARGO) and GLOBEC as its highest priorities.

CCCC Endnote 1

Participation List

Canada

Susan E. Allen
Richard J. Beamish
Robin M. Brown
Paul J. Harrison
Douglas E. Hay

Gordon A. MacFarlane
David W. Welch (Co-Chairman)

China

Qi-Sheng Tang
Ling Tong

Japan

Koji Iida
Tsutomu Ikeda
Yukimasa Ishida (representing NPAFC)
Masahide Kaeriyama
Michio J. Kishi
Yutaka Nagata
Yasunori Sakurai
Takashige Sugimoto
Tokio Wada
Akihiko Yatsu

Korea

Jin-Yeong Kim
Suam Kim (Co-Chairman)
Chang-Ik Zhang

Russia

Gennady A. Kantakov
Victor I. Kuzin
Vyacheslav B. Lobanov
Vadim V. Navrotsky
Alexander A. Nelezin
Vladimir I. Radchenko
Alexander Slizkin
Alexander V. Tkalin
Konstantin Zgurovsky
Yury Zuenko

U.S.A.

Patricia Livingston
Stewart A. Macklin
Bernard A. Megrey
Christopher N.K. Mooers
William T. Peterson
Bruce A. Taft
Warren S. Wooster
Patricia A. Wheeler

BASS Task Team Report

The BASS Task Team met in the morning of October 10, 1999 to review 1999 activities and plan activities for 2000.

1999 activities and accomplishments

Selection of papers from the 1997 Science Board Symposium (a BASS Task Team initiative) on "Ecosystem dynamics in the eastern and western gyres of the subarctic Pacific" was published in the special issue of *Progress in Oceanography* – Vol. 43 (2-4). The objective of the symposium and its subsequent publication was to compare processes in the two gyres as well as to record existing information.

The BASS Task Team planned to convene a 2-day workshop on "Development of a conceptual model for the Subarctic North Pacific Gyres" immediately prior to the PICES Eighth Annual Meeting in Vladivostok. Due to the absence of one convenor and insufficient attendance at the workshop it was cancelled and postponed to 2001.

A proposal was received (Dr. Paul Harrison) for PICES to construct an ecozone classification system for the North Pacific Ocean. A number of classification systems (including the recent one proposed by Dr. Alan Longhurst) were reviewed based on biogeographical, currents and wind patterns, chlorophyll and remote sensing methods. After considerable discussion, the Task Team recognized that physical and biological boundaries were not necessarily the same, and boundaries in the transition areas are variable. It was agreed to continue discussions on delineation of ecozones in the North Pacific at future meetings.

BASS recognizes iron limitation as an important unanswered question in the North Pacific and at the last year's meeting

identified this as an area requiring further research. An Advisory Panel (under BASS) on "An Iron Fertilization Experiment in the Subarctic Pacific Ocean" (IFEP) was established after PICES VII. The IFEP members worked by correspondence during the year to develop a preliminary work plan and met at PICES VIII to discuss it and report to BASS (see *Annex 1*). The current timetable for the IFEP members is to write proposals to representative governments for submission by April-June 2000 and hold a planning workshop in conjunction with the PICES Ninth Annual Meeting in Hakodate. Presently the iron fertilization experiment is planned for August 2002 in the eastern North Pacific (Station P) and for spring 2001 (preliminary experiment) and May-June 2003 (full-scale experiment) in the western North Pacific.

BASS members discussed the need for a thorough assessment of the potential impacts before endorsing whole ecosystem manipulations. There was also concern that PICES should be careful about endorsing claims of large-scale increases in ocean production.

2000 planned activities and recommendations

BASS proposes to convene a 2-day workshop on "Development of a conceptual model(s) of the eastern and western gyres", prior to the PICES Ninth Annual Meeting in Hakodate. The information that is published in the proceedings of the 1997 BASS symposium can be used as a starting point. The workshop will review and identify biological and physical oceanographic data needs for both gyres of the North Pacific (at all trophic levels), develop a conceptual model of each ecosystem, and review and discuss (with MODEL and REX) appropriate ecosystem models. Co-convenors are Richard J. Beamish (Canada), Andrey S.

Krovnin (Russia), Gordon A. MacFarlane (Canada) and Akihiko Yatsu (Japan). BASS recommends that the afternoon session on the second day be held jointly with MODEL and REX to review progress and plan modeling activities for 2001. Invited experts from each country would participate, including seabird and marine mammal experts. BASS requests that PICES support two invited speakers, preferably ECOPATH experts, to attend the workshop.

BASS proposes a 1-day joint BASS/REX workshop or symposium to be held at the next year's Annual Meeting that would examine the linkages between production in the subarctic gyres and resulting impacts on coastal and transition zone ecosystems. The proposed co-convenors are Andrey S. Krovnin (Russia), Gordon A. MacFarlane (Canada) and Akihiko Yatsu (Japan).

There was some discussion about practice to separating BASS and REX meetings at the Annual Meeting. It was recommended that discussions be carried out to identify the benefits of separate versus combined meetings.

BASS endorses a proposal by IFEP to convene a 2-day planning workshop on "Designing the iron fertilization experiment in the Subarctic Pacific" (co-sponsored by PICES and CRIEPI), prior to the PICES Ninth Annual Meeting. Co-Convenors are Drs. Shigenobu Takeda (Japan) and C.S. Wong (Canada). The objective of the workshop is to initiate planning for the experiment, including logistics and funding, etc. BASS supported a request from IFEP that PICES provide funds for three invited speakers to attend the workshop.

BASS Annex 1

Report of Iron Fertilization Experiment Advisory Panel

The Advisory Panel on "An Iron Fertilization Experiment in the Subarctic Pacific Ocean" (IFEP) met on October 14. The IFEP Co-Chairman, Dr. Shigenobu Takeda, welcomed the members of the Panel and observers and called the meeting to order. The agenda was reviewed and accepted without changes.

Drs. Takeda and Paul J. Harrison introduced the IFEP objectives reflected in the terms of reference. Iron fertilization of HNLC (High Nutrients Low Chlorophyll) water is one possible approach to remove CO₂ from the atmosphere to combat global warming caused by GHGs. Natural iron fertilization has been hypothesized to control glacial/interglacial shift in atmospheric CO₂. Iron fertilization experiments were repeatedly done in the equatorial Pacific under the IRONEX Programs I and II, and recently in the Southern Ocean. The Subarctic Pacific,

with different biology and unique water structure (e.g., strong pycnocline, fresher mixed layer) from the other two regions, is the only HNLC region without such an experiment to assess the CO₂ removal question related to iron. The Panel will (i) examine the reasoning for a subarctic iron experiment, the scale disciplines, and resources required to ensure success of the experiment, and (ii) design the experiment and its timing.

Drs. William Cochlan and Mark L. Wells gave a brief overview of IRONEX I and IRONEX II. In particular, Dr. Wells pointed out the importance of understanding the iron chemistry: What happens to the iron when it is added? Does it precipitate out?

Dr. Harrison presented physical, chemical and biological conditions at Station P, a potential site for the iron fertilization experiment in the eastern North Pacific. He

also discussed eddies forming off the Queen Charlotte Islands in winter and whether they could be used as an iron fertilization site. Dr. Josef Cherniawsky provided more details on the physics of the eddies. The IFEP members agreed that additional information is required to decide if these eddies would be a suitable fertilization site, an alternative to Station P.

Dr. Wells suggested that questions be formulated in order to test specific hypothesis and then decide on needs for the measurements and personnel. The following questions were drafted:

- What are the driving hypotheses for a fertilization experiment? Is it industry driven or science driven?
- What are the motivating questions and what are the best ways to answer these questions?
- How is a fertilization experiment going to improve our understanding of the iron response and what aspects of the response do you want to examine?
- What will a fertilization experiment tell you that the bottle enrichment experiments and mesocosm experiments have not?
- Why conduct an experiment at Ocean Station PAPA and the northwest subarctic Pacific?
- What will it tell you that SOIREE, SOFeX, Caruso and IronEx have not told you?

The Panel discussed the analytical resources needed to be brought to bear on the problem. A list was created in which all recommended measurements were arranged into two groups, primary and secondary importance. The IFEP members from each country were requested to announce the experiment to colleagues, distribute the list and ask who would be interested in participating and what they could measure/contribute. A list of suggested participants should be sent to IFEP Co-Chairmen October 2000.

The Panel reviewed a draft workplan developed during 1999 by correspondence. Presently the iron fertilization experiment is planned for August 2002 at Station P in the northeast subarctic Pacific and May or June 2003 at Station KNOT in the northwest subarctic Pacific. There is a chance for a preliminary experiment in spring 2001 in the northwest subarctic Pacific. The Panel recommends to convene a 2-day planning workshop on "Designing the iron fertilization experiment in the Subarctic Pacific" (co-sponsored by PICES and CRIEPI), prior to the PICES Ninth Annual Meeting. Co-Convenors are Drs. Shigenobu Takeda (Japan) and C.S. Wong (Canada). The objective of the workshop is to initiate planning for experiment, including logistics and funding, etc. IFEP requests that PICES provide funds for three invited speakers to attend the workshop.

CCCC Endnote 4

MODEL Task Team Report

The MODEL Task Team met on October 10 (08:30-12:00). The Co-Chairmen welcomed participants and outlined the objectives of the meeting and significant issues for discussion. The agenda was approved without changes.

1999 activities and accomplishments

The report of the 1998 MODEL workshops on "Lower trophic level modeling" and "Sources of high quality nutrient data for modeling lower trophic levels" was published in PICES Scientific Report No. 11.

Dr. Makoto Kashiwai reviewed progress on preparation for the CCCC/MODEL workshop on “Lower trophic level modeling: International workshop on prototype lower trophic level ecosystem model for comparison of different marine ecosystems in the North Pacific” to be held January 31-February 3, 2000, in Nemuro, Japan. Co-Convenors are Makoto Kashiwai and Michio J. Kishi (Japan) and Daniel M. Ware (Canada). The goal of the workshop is to develop a common framework for modeling lower trophic level interactions and to do interregional comparisons. Discussion of the workshop format evolved around the objectives and goals. Participants decided the overall goal was to have a common modeling framework for lower trophic level models in order to facilitate comparative work in the North Pacific. Dr. Kishi reported that the PICES lower trophic level model should be ready in time for the workshop. It was agreed that in order to have a realistic and achievable result for the workshop, the focus should be on agreeing about the model structure and applying it to two open ocean areas in the eastern and western North Pacific. This means mean that MODEL would invite experts in lower trophic level models from those regions and biologists who could bring the appropriate data to parameterize the models. Then some discussion about the need to involve scientists from all PICES nations was brought out – is there a need to involve people from Korea and Russia and work on a coastal area model? Some people thought that there is a bigger difference between eastern and western North Pacific than between western North Pacific and Japan/East Sea area. A list of suggested participants should be sent to MODEL Co-Chairmen by the end of October. Funding for the workshop is mainly provided by the Japan Science and Technology Agency and Nemuro City. However, the Task Team recommends that PICES support two scientists to attend the workshop.

2000 planned activities and recommendations

The Task Team recommends that a Proceedings of the 2000 MODEL workshop on “Lower trophic level modeling” be published in the PICES Scientific Report Series and selected papers from the workshop be published in Fisheries Oceanography in 2001.

MODEL reviewed the current situation on higher and lower trophic level models and the integration of models and recommends convening a 2-day workshop on “Strategies for coupling higher and lower trophic level marine ecosystem models”, prior to the PICES Ninth Annual Meeting in Hakodate. The 2000 MODEL workshop in Nemuro will focus on the development and parameterization of a lower trophic level model to PICES regional ecosystems. At the end of this meeting, discussions will begin about ways to link higher level trophic models to lower level trophic models. The follow-up workshop in Hakodate will extend this initial discussion to consider viable strategies for this important linkage. MODEL requests that PICES supports the travel of two scientists to attend the workshop.

Discussion was initiated on model structure. In Russia, ECOPATH is being used for a higher and lower trophic level modeling. A simple NPZD model was adapted to the Okhotsk Sea a long time ago but it did not show good results. Recently a more precise empirical model has been applied to the Japan/East Sea. The REX Task Team is interested in small pelagic fishes and an appropriate model must be developed. As to higher trophic level models, Individual Based Models (IBM) are widely used in NOAA Fishery Research Oceanography Coordinated Investigations (FOCI) and U.S. GLOBEC. Also ECOPATH has been adapted to various regions in northern

Pacific, i.e., Vancouver Island and the Bering Sea areas.

The goal of next few years for the MODEL Task Team is to construct a prototype lower trophic level model which can be applied to basin scale northern Pacific. After that it should be modified to regional models.

Consequently, the Task Team should coordinate its activities with BASS and REX.

MODEL recommends that the Science Board and CCCC/IP should seek ways to improve connections and communication between BASS, REX and MONITOR Task Teams and POC to MODEL, since activity of MODEL supports all these groups.

CCCC Endnote 5

MONITOR Task Team Report

The MONITOR Task Team met on October 10, 1999, to summarize results from a PICES-GOOS workshop and review 1999 activities and plans for 2000. The members in attendance were: Drs. Bruce A. Taft and Yasunori Sakurai (Co-Chairmen), Vyacheslav B. Lobanov, Thomas C. Royer, David W. Welch, Warren .S. Wooster. Dr. Sonia D. Batten was invited as a guest expert on zooplankton sampling.

1999 activities and accomplishments

The report of the 1998 MONITOR workshop on "Designing of a monitoring system for PICES" was published in PICES Scientific Report No. 11.

A PICES-GOOS workshop was convened prior to the PICES Eighth Annual Meeting. The purpose of the workshop was to provide a forum for PICES scientists to learn about GOOS and to develop recommendations for PICES future involvement in the GOOS effort. The workshop attracted attendance of about 30 scientists and was very successful (see *Annex 1*).

The Science Board Symposium on "The nature and impacts of North Pacific climate regime shifts" (a MONITOR Task Team initiative) was convened at the PICES Eighth Annual Meeting.

Selection of papers from the symposium will be published in a special issue of *Progress in Oceanography*.

A program on "Continuous Plankton Recorder Monitoring for the eastern North Pacific and Southern Bering Sea" was developed and awarded funding for a two-year pilot project through the North Pacific Marine Research Initiative (see *Annex 2*).

2000 planned activities and recommendations

The Task Team reviewed the outcome from the PICES-GOOS workshop and recommends (see *Annex 1* for details):

- to publish report of the workshop in the PICES Scientific Report Series;
- to modify the terms of reference for the MONITOR Task Team to include the requirement to develop a PICES GOOS action plan;
- to assist in the future development of the LMR-GOOS by identifying pilot projects and components in the PICES region for incorporation in the Initial Observing System of GOOS;
- to assist, by all possible means, in implementation of ARGO.

MONITOR discussed plans for biophysical moorings in the North Pacific: to what extent

do they satisfy our needs? Dr. Taft provided information on PMEL moorings on stations P and M, Dr. Yukihiko Nojiri – on moorings in the western North Pacific, and Mr. Robin Brown – on Canadian moorings in the eastern North Pacific and progress of the Data Buoy Cooperation panel. The Task Team felt that moorings with a full suite of meteorological and oceanographic sensors is a very attractive way to look at the linkages between atmospheric forcing, and ocean physical, chemical and biological response. Unless the spectrum of variability is resolved, the linkages will not clearly be delineated. If the pilot results are promising, the Task Team strongly recommends that the measurements be continued on climate time scales.

Dr. Welch summarized present ocean monitoring in the subarctic North Pacific. Additional information on various ship-of-opportunity programs and monitoring efforts in the western North Pacific was provided by Dr. Nojiri. The Task Team is encouraged that funding was obtained for a 2-year pilot project to measure near-surface zooplankton abundance in the North Pacific with the Continuous Plankton Recorder (see *Annex 2* for details). MONITOR has attached a high priority to these measurements which will assist in designing a monitoring scheme for the eastern North Pacific. In discussion, it was noted that it would be useful to consider the conceptual optimal sampling scheme. Once such a scheme is outlined it would be easier to identify the significant departures between what we have and what we need. This process would result in an improved monitoring plan.

The Task Team recommends that an Advisory Panel be established under MONITOR to review and advise on the most appropriate locations, timing and frequency of routes for the PICES CPR pilot project; and provide technical advice on parameters

to be measured for additional monitoring initiatives.

Zooplankton time series are flawed by systematic errors as many types of gear have been used for collecting samples, and adequate intercalibration data for these sampling systems do not exist. One set of intercalibration data on two types of sampling gear was presented to the Task Team by Dr. Stewart M. McKinnell. A full list of the historical data that must be calibrated will be assembled in the inter-session period and be discussed at the next year's meeting. Dr. Jeffrey M. Napp will be asked to prepare this list and to make suggestions on how to assemble the necessary manpower and ship time.

MONITOR was unable to arrange a discussion of secondary production at this meeting. Dr. William T. Peterson will be asked to prepare an inter-session paper on the subject. The arguments for making it a part of the monitoring array will be reviewed at the next year's meeting.

The Task Team recommends to convene a 2-day workshop on "Progress in monitoring North Pacific", prior to the PICES Ninth Annual Meeting in Hakodate. Co-Convenors are Drs. Yasunori Sakurai (Japan) and Bruce A. Taft (U.S.A.). The major topics to be discussed at the workshop are the new results of the North Pacific CPR zooplankton sampling program, a long-term direction for the zoo-plankton monitoring program, results and future plans of mooring programs in the subarctic Pacific, and development of a strategy for addressing the calibration of various types of zooplankton sampling gear. The Task Team requests that PICES support one outside expert (with expertise in mooring observations or design of observational arrays) to attend the workshop.

Dr. McKinnell has joined the PICES Secretariat and is no longer a member of

the Task Team. A Canadian replacement

for Dr. McKinnell will be sought.

MONITOR Annex 1

Report on PICES/GOOS Workshop

The Global Ocean Observing System (GOOS), sponsored by IOC, WMO, UNEP, and ICSU, is a scientifically-based, long-term international program that seeks to provide practical benefits to society through the collection and timely distribution of oceanic data and products, including assessments, assimilation of data into numerical prediction models, the development and transfer of technology, and capacity building.

At the first international agreement meeting of GOOS, there was strong international support for at least some of the GOOS modules, which presently include Climate, Health of the Oceans, Living Marine Resources, Coastal, and Services modules. In the North Atlantic, ICES has recently formed a steering group on GOOS that has developed a set of recommendations with regard to their involvement in GOOS activities. PICES nations in the western Pacific are involved in one of the most advanced regional components of GOOS, North-East Asian Regional GOOS. Presently, PICES Scientific Committees and CCCC Program are involved in activities that are related to GOOS. It is time to initiate discussion of how the Organization should move towards advancing a North Pacific GOOS program that meets the needs of PICES member countries.

The purpose of the workshop was to provide a forum for PICES scientists to learn about GOOS and to develop recommendations for PICES future involvement in the GOOS effort. The first day of the workshop was devoted to presentations on international, regional, and national components of GOOS and the second day to discussions about the

monitoring effort in the North Pacific and future prospects.

There is ample opportunity for closer cooperation between PICES and GOOS. One outcome from the workshop was the recognition that existing PICES activities, particularly those of the MONITOR Task Team, are extremely relevant to GOOS and that key CCCC activities in this regard will eventually be transferred into GOOS. Therefore, it was proposed that the terms of reference for the MONITOR Task Team be modified to include the requirement for the Task Team to develop an action plan for how PICES should take an active and leading role in further development and implementation of GOOS at a North Pacific level. The action plan would: 1) identify existing ocean observations in the coastal and open North Pacific that are relevant to GOOS, 2) develop a PICES-GOOS implementation plan based on existing routine observations and augmented by new observations as appropriate, 3) provide a structured plan on how to transfer relevant CCCC program activities to a PICES-GOOS program.

In the development of the Living Marine Resources Panel of GOOS (LMR-GOOS), some existing programs have been nominated as components of the Initial Observing System (IOS) and several in the Pacific Ocean and Southern Ocean are under consideration. A few pilot projects were recommended for incorporation in the IOS, and the Continuous Plankton Recorder (CPR) program, now funded in the northeast Pacific, could be identified as such a pilot project (see Annex 2). PICES can help to identify other components of the IOS and other pilot projects in its region,

can furnish suggestions for the list of desired measurements and preferred methods of making them, and can otherwise assist in the future development of the LMR module.

The participants were impressed by the scope and efficiency of the NEAR GOOS data center. In order to fully serve its scientific and industrial constituency, it should develop the means to acquire biological data.

ARGO (Array for Real-time Geostrophic Oceanography) envisages a deployment of

3,000 floats globally in preparation for GODAE (Global Ocean Data assimilation Experiment). The time of the GODAE is slated to be 2003-2005. Deployment in the Pacific will commence next year in the southeast region and subsequently move into the lower latitudes of the northern hemisphere; deployments in the PICES area probably will start in 2-3 years. These temperature/salinity data will have a large scientific impact on our understanding of ocean dynamics in the subarctic North Pacific. Every effort should be made by PICES to assist in the implementation of this program.

MONITOR Annex 2

Pilot Continuous Plankton Recorder Monitoring Program

At the 1998 MONITOR Task Team meeting at PICES VII, members recognised that there was insufficient zooplankton monitoring in the open eastern North Pacific and concluded with a recommendation that the Continuous Plankton Recorder (CPR) approach should be adopted, since it is a deployable technology. To this end a proposal was submitted in April 1999 to the North Pacific Marine Research Initiative program and subsequently awarded funding for a two-year pilot CPR project (PIs are Drs. David W. Welch (Canada) and Sonia D. Batten (UK)). The MONITOR TT had identified two routes as priorities, one running north-south from the Gulf of Alaska (Prince William Sound) to California and one east-west from the vicinity of Vancouver Island on a great circle line. As well as this spatial coverage, identifying the seasonality of the plankton is also an important component and originally the intention was to run each route six times a year. A discussion on the appropriate balance of sampling was necessary to evaluate the best sampling scenario possible with the awarded funding. The conclusion was that five north-south CPR tows could be run per year (to establish seasonal variation) and

one east-west, CPR tow per year (to establish spatial scale). The latter run will extend as far as the southern Bering Sea. All coastal/shelf samples would be analysed on these routes, providing 18 km spatial resolution. Only every fourth oceanic sample collected on 4 of the north-south tows and the east-west tow will be enumerated (the other samples will be archived), providing 72 km spacing. The remaining N-S tow would have alternate samples analysed (36 km resolution) to try to identify the spatial scales of patchiness. The first N-S tow will take place in March 2000, followed by April, May, late June and early August. It is intended that the late June tow coincide with the east-west tow and the Line P cruise run from Victoria to Station P. This N-S tow will be the one with more detailed sample analysis. In this way the spatial information on zooplankton available for this one time period will be maximized. The sampling regime will be repeated in 2001.

It was also suggested, and agreed, that the separate copepodite stages of *Neocalanus plumchrus* be enumerated to enable extrapolation of the precise timing of the

main peak of its abundance, following the work of Mackas et al. (1998). This study showed that the abundance peak had shifted in time by almost two months and since this copepod makes up much of the

mesozooplankton biomass in the region, therefore identification of its development, timing and appearance in surface waters appear to be crucial.

CCCC Endnote 6

REX Task Team Report

The REX Task Team met in the morning of October 10, 1999. Dr. William T. Peterson called the meeting to order. After welcoming remarks by Dr. Vladimir I. Radchenko, all present members and observers introduced themselves. Discussion at the meeting was focussed on accomplishments in 1999 and activities planned for 2000. The meeting ended with a presentation by A. J. Paul on "Over-winter energy changes in herring from Prince William Sound, Alaska". Due to visa and airline reservation problems Dr. Paul was unable to attend the 1999 REX workshop, therefore he gave his talk to the REX Task Team.

1999 activities and accomplishments

The report of the 1998 REX workshop on "Small pelagics and climate change in the North Pacific Ocean" was published in PICES Scientific Report No. 11.

A 2-day REX workshop on "Herring and euphausiids population dynamics" was convened prior to the PICES Eighth Annual Meeting in Vladivostok (October 8-9, 1999). The workshop was highly successful thanks to 16 excellent presentations and the spirited discussions from the 20-30 participants.

A scientific session highlighting recent findings of GLOBEC and GLOBEC-like programs in the North Pacific was co-convened (with BIO) at the PICES Eighth Annual Meeting.

Dr. Tokio Wada reported that compiling a summary of the sampling strategies and methods used to assess the stocks of small pelagic species would be completed during the inter-sessional period. REX scientists from each member country will be requested to contribute to the report. Dr. Wada will collate all responses by next summer and the report will be discussed at the next year's REX meeting in Hakodate.

The Task Team reviewed progress on "compiling a catalogue of historical samples and data sets which are not yet analysed" and deferred this item because the MONITOR Task Team is working on a similar issue. This will be considered after reviewing the MONITOR report.

2000 planned activities and recommendations

The Task Team recommends that a Proceedings of the 1999 REX workshop on "Herring and euphausiids population dynamics" be published in the PICES Scientific Report Series.

After the successful Herring-Euphausiid workshop, the Task Team felt strongly that the next step should be to convene a 2-day workshop on "Trends in herring populations and trophodynamics", prior to the PICES Ninth Annual Meeting in Hakodate. This workshop would examine trends in herring populations and in particular, consider the reasons for the observation that most herring stocks around the Pacific Rim are at or near their historical high levels. Day 1

would focus on comparisons of key biological data related to changes in abundance and distribution of stocks, especially with respect to issues of current interest to PICES including regime shifts. Day 2 would focus on trophodynamic interactions in ecosystems that support herring populations. REX recommends that the second day of the workshop be held in collaboration with MODEL and BASS, and that activities for this day be co-ordinated by Co-Chairmen of each of the three Task Teams. REX requests that PICES support two invited speakers to attend this workshop.

REX discussed the possibility of convening a workshop on smelts (*Osmeridae*) and other nearshore small planktivorous pelagic species. Dr. Peterson, will request that Drs. Douglas E. Hay and A.J. Paul poll the community of fish ecologists to determine the level of interest in such a workshop. A report on this issue will be completed by next spring and results of the study will be presented at the next year's REX meeting.

REX reviewed a proposal by BASS to co-convene a workshop or symposium at the next year's Annual Meeting that would examine linkages between production in subarctic gyres and resulting impacts in coastal and transition zones. REX is very interested in the biological responses in the coastal regions to physical changes within the gyres, and resolved to support this idea.

The Task Team discussed the value of paleoceanographic studies as an aid to producing data on past fluctuations in fish stocks on time scale 100-1000 years (from analysis of fish scales and other debris in sediments of anoxic basins) and recommends that paleoceanographic research be incorporated under the umbrella of REX, and participation by paleoceanographers in PICES activities be encouraged.

Dr. Koji Iida reported that a workshop on fisheries acoustics is being planned by Hokkaido University, to be held on the weekend following the PICES Ninth Annual Meeting. Since many REX scientists are interested in this topic, the Task Team agreed that the workshop be very relevant to goals of the Organization and recommends that PICES endorse the workshop.

Dr. Wada requested that the Task Team accept his resignation as Co-Chairman of REX. The Task Team recognized that Dr. Wada has served PICES for many years and was instrumental in founding REX, and expressed its gratitude for Dr. Wada's leadership and efforts. REX recommends that Dr. Tokimasa Kobayashi (Hokkaido National Fisheries Research Institute, Kushiro, Japan) be appointed the new Co-Chairman.