

REPORT OF THE IMPLEMENTATION PANEL ON THE CCCC PROGRAM

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The CCCC Plenary Session was held from 0830-1230 hours on October 6, 2001. The CCCC-IP Co-Chairmen, Drs. David Welch and Makoto Kashiwai, called the meeting to order and welcomed the participants (*CCCC Endnotes 1 and 2*). The CCCC-IP heard overviews of the Task Team workshops that were held on October 5 (REX Workshop on *Temporal variations in size-at-age for fish species in coastal areas around the Pacific Rim*, and BASS/MODEL Workshop to *Review ecosystem models for the subarctic Pacific gyres*). In the afternoon of October 6, the REX/MODEL Workshop to *Include higher trophic levels in the PICES NEMURO model*, and MONITOR Workshop to *Review progress in monitoring the North Pacific*, were convened. The Executive Committee of the CCCC-IP met on the afternoon of October 7, to consider the reports of the Task Team business meetings, their recommendations and planned activities for 2002.

CCCC integration

The CCCC-IP discussed the goal of the Program implementation based on a proposal to develop a CCCC Integration Plan (*CCCC Endnote 3*) and made the following recommendations:

1. The CCCC-IP recommends that a workshop be organized immediately prior to the PICES Eleventh Annual Meeting to review the CCCC structure, to evaluate how well it has met past goals, and to assess how it should be structured to carry out future tasks. It was suggested that 1 day be reserved for the Program review, and that the meeting be open to scientists attending the GLOBEC-INT Open Science Meeting as well.
2. Given the extensive work that has been conducted by the Task Teams in the last few years, the CCCC-IP recommends that as part

of their inter-session activities, Task Teams review their terms of reference and their progress in meeting them, and consider how they may need to be revised and updated, and be prepared to discuss this issue at PICES XI.

3. CCCC-IP recommends that one member of CCCC attend the ICES *Cod and climate change* Workshop (April 19-20, 2002, in Denmark), in response to an invitation from that Working Group. The purpose is to discuss possible formal collaboration between the ICES and PICES groups, and begin consultations towards putting together a joint workshop focused on a subject of mutual interest, in 2004 or 2005.
4. The membership for each Task Team should be reviewed, in order to improve participation, and to ensure that each country is represented by active members, to the greatest extent possible. The REX Task Team meeting, for instance, was not attended by representatives from either China or Korea.

GLOBEC-PICES collaboration

Drs. Roger Harris and R. Ian Perry (GLOBEC SSC members) reviewed plans for the GLOBEC-INT Open Science Meeting (OSM) to be held in Qingdao, People's Republic of China, just prior to PICES XI. Although detailed planning is not yet complete, Dr. Harris suggested that time might be available to support a CCCC/GLOBEC topic session of perhaps four 30-minute invited talks. He suggested that session themes along the lines of *ENSO and decadal scale variation in the NE Pacific ecosystem*, or *Lower trophic level versus upper trophic level responses to climate variation* might make interesting and informative sessions with considerable mutual interest. The CCCC-IP proposed to the Science Board that the CCCC Topic Session that is

normally convened during the PICES Annual Meeting should be held as a session in the GLOBEC OSM, and furthermore, the two days between the GLOBEC OSM and PICES XI could be used for activities of joint interest to GLOBEC-INT and PICES-GLOBEC, including a session on *How to do a synthesis?* since the CCCC Program is likely to move into this phase fairly soon.

Recommendations to Science Board

Proposed Workshops in 2002

MONITOR requests support to convene an inter-sessional workshop in early 2002 to identify the outline of a comprehensive monitoring package that could be readily accommodated on Voluntary Observing Ships (VOS). Attendance would be in the range of 15-30 participants. The topics are:

- To define and describe a basic suite of variables and locations to be monitored in the North Pacific; and
- To assess the measurement technologies that are available and which could be placed in a sea chest.

MONITOR also proposes to hold a full-day workshop (or two half-day workshops) addressing two topics (either or both could be held jointly with the GLOBEC-INT Open Science Meeting):

- *Requirements and methods for early detection of ocean changes*; and
- *Monitoring from moored and drifting buoys*

BASS requests support for a one-day (or half-day) session at PICES XI on *Role of predation in the regulation of populations*". BASS proposes that this topic session be jointly sponsored with FIS¹.

BASS requests support for a combined BASS/MODEL/REX joint session at PICES XI (with GLOBEC-INT participation) to *Examine approaches for linking basin scale models to*

*coastal ecosystem models*². The session would focus on finalizing hypothesis testing, and would continue to parameterize the western gyre models, if possible, by calibrating the NEMURO model to the Station A7 data, which is more appropriate for this region. The hypotheses to be tested should focus on climate change scenarios, and final data synthesis for the marine birds and mammals should be completed prior to the workshop. The products of the meeting should include a PICES scientific report describing the two baseline models, the results and interpretations of hypothesis testing, and a data inventory.

MODEL and GLOBEC-INT Focus Group 3 (Modeling and Forecasting) should begin planning a joint session in Qingdao. A topic of mutual interest will be determined via e-mail by the summer of 2002 (e.g., open ocean-coastal coupling or methods to couple lower trophic and upper trophic level models).

MODEL and REX propose to jointly build a nutrient-phytoplankton-zooplankton-fish (NPZF) model of the North Pacific coastal ecosystem to examine regional and temporal variation in fish growth. The initial effort will be directed at incorporating herring as the model fish (*REX Endnote 2*). Support is requested for a Workshop to implement improvements to the PICES NEMURO model and to extend the NEMURO model to include herring and perhaps other planktivorous fish species (date and duration subject to external funding support being obtained; Co-Convenors: Michio J. Kishi and Bernard A. Megrey).

Science Board Symposium

The CCCC-IP suggested that a possible topic for the Science Board Symposium be developed inter-sessionally in consultation with Dr. Roger Harris and the GLOBEC-INT SSC, who are also in the early stages of developing the GLOBEC OSM agenda for their meeting in Qingdao. Efforts should be made to capitalize on the opportunity provided by the juxtaposition of the PICES and GLOBEC meetings in 2002, and to

¹ Became the BIO/FIS/CCCC Topic Session on *Responses of upper trophic level predators to variability in prey availability: An examination of trophic linkages*

² Deferred by the Science Board to PICES XII

encourage closer cooperation between the two organizations.

Requests for travel funding

- 1 invited speaker to attend the joint CCCC-GLOBEC session in Qingdao;
- CCCC-IP Co-Chairman to attend the ICES *Cod and climate change* Workshop (April 19-20, 2002, in Denmark);
- 3 scientists to attend the inter-sessional MONITOR Workshop on *Voluntary observing systems* (February 2002, in Corvallis, Oregon, or Seattle, Washington, U.S.A.);
- 1 scientist to attend the MONITOR Workshop at PICES XI;
- 1 scientist to attend the joint BASS/MODEL/REX workshop at PICES XI;
- 2 scientists to attend the inter-sessional BASS/MODEL Workshop on *Using models to test hypotheses on effects of climate change on the North Pacific subarctic gyre system* (April 2002, in La Paz, Mexico).

Changes in chairmanship

- CCCC-IP nominates Dr. Harold P. Batchelder (U.S.A.) to replace the outgoing North American Co-Chairman, Dr. David W. Welch (Canada), who completed his term of office.
- BASS requests that the CCCC-IP Co-Chairmen approach member countries to nominate a Co-Chairman to replace Dr. Andrey S. Krovnin (Russia). It is proposed that Dr. Gordon A. McFarlane (Canada) will remain as Co-Chairman for one more year to provide continuity during the final phase of BASS/MODEL joint activities.
- MODEL requests that Dr. Michio J. Kishi (Japan) be replaced by Dr. Francisco E. Werner (U.S.A.) as Co-Chairman, with Dr. Bernard A. Megrey (U.S.A.) to be replaced the following year by a Co-Chairman to be selected from the western Pacific.
- MODEL also requests that Ms. Patricia Livingston be replaced by Dr. Thomas C. Wainwright as a U.S.A. representative on the MODEL Task Team.

- REX requests that Dr. Yoshiro Watanabe (Japan) replace Dr. Tokimasa Kobayashi (Japan) as Co-Chairman. Additionally, REX requests that the term of Dr. William T. Peterson (U.S.A.) be extended until PICES XI when a new Co-Chairman from U.S.A. or Canada will be selected at PICES XI.

Other requests

MODEL requests access to the PICES web site, so that they may update model coding, documentation, and output runs for the models that have been developed to date, and to make the models more accessible to the scientific community.

Relations with other organizations, programs and projects

The Panel identified linkages with ICES, GLOBEC, and the Exxon Valdez Oil Spill - Gulf Ecosystem Monitoring (GEM) initiatives as high priorities for the coming year. The continued development of closer links with GOOS and the Sloan Foundation's Census of Marine Life initiative are also viewed as a promising area to support. Dr. Pentti Mälkki, President of ICES, arrived after the conclusion of the CCCC-IP meetings and indicated the interest of ICES in developing further contacts with PICES in areas of mutual interest. The CCCC-IP strongly supports the development of such links because there are many areas of common research that would benefit from a "two-ocean" comparison.

Best Presentation Award

Mr. Takehiro Iida of the Laboratory of Marine Environment and Resource Sensing, University of Hokkaido, Japan, received the CCCC Best Presentation Award for his paper entitled "Temporal and spatial variability of coccolithophore blooms in the eastern Bering Sea shelf".

CCCC Endnote 1

CCCC Implementation Panel Meeting Agenda

October 6 - CCCC Plenary Session

1. Opening Remarks
2. Overview of BASS workshop and activities
3. Overview of MODEL workshop and activities
4. Overview of MONITOR workshop and activities
5. Overview of REX workshop and activities
6. Review of informal discussions for future collaborations between the PICES CCCC and ICES/CCC Programs and development of a joint proposal for ICES/PICES workshop to review areas of common interest and collaboration
7. Current initiatives under IGBP/SCOR GLOBEC, and some thoughts on our future
8. A proposal to develop an Integration Plan for CCCC Program and suggestions for the future

9. Other possible opportunities for scientific collaboration and future directions
10. Discussion of future directions

October 7 - CCCC IP/Executive Committee Meeting

1. BASS report and recommendations
2. MODEL report and recommendations
3. MONITOR report and recommendations
4. REX report and recommendations
5. Discussion and action items:
 - International GLOBEC: Plans for Open Science Meeting
 - NPAFC/NASCO/IBSFC Workshop on *Causes of marine mortality of salmon*
6. International Organizations - Which are most important to CCCC?
7. Other issues

CCCC Endnote 1

Participation List

Executive Committee members:

Makoto Kashiwai (CCCC-IP Co-Chairman)
David W. Welch (CCCC-IP Co-Chairman)
Andrei S. Krovnin (BASS Co-Chairman)
Gordon A. McFarlane (BASS Co-Chairman)
Michio J Kishi (MODEL Co-Chairman)
Bernard A. Megrey (MODEL Co-Chairman)
David L. Mackas (MONITOR Co-Chairman)
Sei-ichi Saitoh (MONITOR Co-Chairman)
William T. Peterson (REX Co-Chairman)
Vladimir I. Karpenko (NPAFC representative)
R. Ian Perry (national representative of Canada)

Others:

Harold P. Batchelder (U.S.A., CCCC-IP Co-Chairman-elect)
Roger Harris (GLOBEC SSC Chairman)
Patricia Livingston (Science Board Chairman)
Stewart (Skip) M. McKinnell (Assistant Executive Secretary)
Takashige Sugimoto (Japan)
Al Tyler (U.S.A., national member)

CCCC Endnote 3

Proposal to develop CCCC Integration Plan (Abstract)

Background

In 1993, PICES and GLOBEC agreed to jointly organize an international science program on Climate Change and Carrying Capacity (CCCC) in the temperate and subarctic region of the

North Pacific Ocean. The CCCC Program is addressing how climate change affects ecosystem structure, and the productivity of key biological species at all trophic levels in the open and coastal North Pacific ecosystems. The Science Plan was drafted at the 1994 PICES-

GLOBEC Workshop and approved at PICES III. The Implementation Plan (Phase I) was drafted at the first meeting of the Implementation Panel (CCCC-IP) Executive Committee (EC) held in 1995, submitted to PICES IV, and approved for publication. The Task Teams; MODEL, BASS and REX were established as sub-structure of CCCC-IP at PICES-IV. The Implementation Plan (Phase II) was not drafted explicitly, but a revised statement of purpose and terms of reference for the program and re-formation of CCCC-IP structure, and establishment of MONITOR Task Team were approved in 1997, at PICES VI. The terms of reference for MONITOR were revised as decision 99/S/4.

In 1995, GLOBEC became one of the 9 core projects of the International Geosphere-Biosphere Program (IGBP), an interdisciplinary scientific activity established and sponsored by the International Council for Science (ICSU). The IGBP program is focused on acquiring basic scientific knowledge about the interactive processes of biology and chemistry of the earth as they relate to Global Change. IGBP is now entering its second decade of global change research. The first 10 years produced much innovative and exciting science. But new questions have arisen, demanding new approaches. To meet these challenges, IGBP is evolving towards a new structure, to be launched in early 2003.

The CCCC Program is going to enter its Phase III Implementation, in which we need to integrate and synthesize Program activities and results into the goals to be achieved; and to design the second decade's plan of the CCCC Program or a new research program by evaluating identified and demanded scientific questions. Here we need an Integration Plan.

Achievement of CCCC Program and outline of Integration Plan

The possible achievements of CCCC Program may include:

- Providing answers to the scientific questions originally posed for the CCCC Program;

- Providing guidance for the implementation and use of methods for the early detection and forecasting of changes in the North Pacific (contributing to the North Pacific Ecosystem Status Report); and
- Re-evaluating the original scientific questions of CCCC, evaluating where we stand in addressing these questions, and whether they remain the correct questions.

Thus, an outline of an Integration Plan could be to:

- Evaluate, reconfirm and expand, if desired, the CCCC questions, hypotheses, and goals;
- Allocate addressed Key Scientific Questions and Program Goals among Task Teams;
- Design Work Plan for each Task Team;
- Review the progress of the CCCC Program referring to the designed Work Plans; and
- Design the procedures and schedule for integrating activities.

A 1-day workshop to develop the Integration Plan is proposed to be held in conjunction with PICES XI.

Work Plan for Task Teams

Breaking down program achievements, we need to compose a Work Plan for each Task Team.

BASS

- Define scientifically the addressed questions and identify working hypotheses;
- Answer the addressed questions by integrating results of retrospective analyses;
- Identify focal field process studies for the addressed questions, and promote their implementation;
- Answer the addressed questions by model experiments;
- Work closely with NPAFC in answering the salmon related questions; and
- Contribute to the North Pacific Ecosystem Status Report by challenging revised scientific questions on early detection and long-term prediction.

REX

- Define scientifically the addressed questions and identify working hypotheses;
- Answer the addressed questions through comparative retrospective analyses;
- Identify focal field process studies for the addressed questions, and promote their implementation;
- Answer the addressed questions through comparative model experiments; and
- Contribute to the North Pacific Ecosystem Status Report by challenging revised scientific questions on early detection and long-term prediction.

MODEL

- Define scientifically the addressed questions, and identify working hypotheses and ecosystem models necessary in answering them;
- Develop necessary types of ecosystem models in answering the addressed questions;
- Answer the addressed questions through model experiments jointly with BASS and REX; and
- Contribute to the North Pacific Ecosystem Status Report by challenging revised scientific questions on early detection and long-term prediction.

MONITOR

- Identify existing ocean observation in the coastal and open North Pacific that are relevant to GOOS;
- Develop a PICES-GOOS implementation plan based on existing routine observations and augmented by new observations as appropriate;
- Provide a structured plan on how to transfer relevant CCCC activities to a PICES-GOOS program;
- Identify field program for inter-calibration of methods for ecosystem monitoring;
- Define scientifically the scientific questions on early detection and long-term prediction, and identify working hypotheses and ecosystem models necessary in answering them;

- Develop methods and/or models for early detection and long-term prediction; and
- Preparation of North Pacific Ecosystem Status Report and identification of feedbacks to the program.

Review progress of Program implementation

The progress in CCCC Program implementation can be reviewed by referring to the Work Plans for Task Teams.

Work flow and time schedule

A series of Workshops will need to be planned and scheduled, and will produce a series of scientific publication synthesizing (first decade) results of the CCCC Program.

Design the second decade of the CCCC Program implementation or on a new research program

A Workshop to design a plan for the second decade of the CCCC Program or a new research program, and complete with defined scientific questions, needs to be convened by the decision of the Science Board.

The Key Scientific Questions addressed by Science Plan

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?
- 2a. Are regime shifts in the eastern and western sides of the North Pacific basin in-phase? Do they have the same or opposite sign?
- 2b. Methods are required for both short-term detection and longer-term prediction of climate regime shifts.
- 3a. How are the open and coastal North Pacific ecosystems structured?
- 3b. Methods are required for both short-term detection and longer-term prediction of changes in ecosystem structure, stability and productivity.
4. What impact do variations in flow and dynamics of eastern and western boundary

currents have on the productivity of Pacific Rim coastal ecosystem? Do the strengths of the Alaska and California currents vary inversely? How are their dynamics related to those of the Kuroshio and Oyashio Current?

5. What factor affect current trends in the productivity of the North Pacific Ocean and their impacts on salmonid carrying capacity? To what extent do the seasonally migrating species such as Pacific pomfret, neon squid and Pacific saury compete with salmonids in the Subarctic Pacific?
6. What factor affect changes in biological characteristics of Pacific salmon? These characteristics include growth, size at

maturity, age at maturity, ocean distribution, survival, and abundance? (This is also a critical question for all key species of the Subarctic Pacific.)

- 7a. How do responses to regime state differ among potential dominant species? How do abundances, migratory patterns, and stock-recruitment relationships change? Is the response of key species to regime change characteristic and consistent over several cycles?
- 7b. What limits primary production during each regime?
8. What are the causes and consequences of spatial shifts in pelagic ecosystems?

Table 1 Tentative allocation of Key Scientific Questions among Task Teams.

Task Teams	Key Scientific Questions										
	1	2a	2b	3a	3b	4	5	6	7a	7b	8
BASS		YY	Y	YY	Y		YY	YY			
REX		YY	Y	YY	Y	YY		YY	YY		YY
MODEL	YY		Y		Y	Y	Y	Y		YY	
MONITOR		Y	YY		YY						Y
(NPAFC)*							YY	YY			Y

Tentative agenda for CCCC-IP Workshop to develop CCCC Integration Plan

1. Reconfirmation of Program goals
 - Review, revision and addition of Key Scientific Questions
 - Allocation of Key Scientific Questions among Task Teams
 - North Pacific Ecosystem Status Report as one of the Program goals/products
2. Evaluation of structure of the CCCC Program, including Task Teams
3. Procedure of integration
 - Work Plans for Task Teams
4. Review of progress
 - Review of progress in Program Implementation by referring to the Work Plans for task Teams
5. Work flow and time schedule

