PICES Climate Change and Carrying Capacity Program Action Plan

Mission

The mission of the Climate Change and Carrying Capacity (CCCC) program is similar to the overall PICES mission, but more limited in scope. CCCC's mission is to promote, coordinate, integrate and synthesize interdisciplinary studies linking climate change and variability to physical conditions and ecosystem structure and function in the North Pacific and it's adjacent marginal seas. An ultimate goal of the CCCC program is "to forecast the consequences of climate variability on the ecosystems of the subarctic Pacific". The program has focused on four central scientific issues: physical forcing, lower trophic level responses, higher trophic level responses, and ecosystem interactions.

Strategy of the CCCC Scientific Program

The PICES mission is built upon five central themes. Specific goals are identified within each of these themes, and actions of the CCCC Program endeavor to meet these goals. Specific actions are identified with either the Climate Forcing and Marine Ecosystems (CFAME) or Modelling (MODEL) task teams or being activities of both or CCCC generally (CCCC).

Theme A. Advancing scientific knowledge

Goal 1. Understand the physical, chemical, and biological functioning of marine ecosystems

Action 1.1 Improve our understanding of North Pacific ecology.

Task 1.1.1 Contribute as cosponsor to sessions at PICES XV titled "Boundary current ecosystems", and "Synchronous and asynchronous responses of North Pacific boundary current systems to climate variability". This task applies also to Goal 2.

Task 1.1.2 Co-convene (with BIO-IFEP) a workshop at PICES XV titled "Modeling iron biogeochemistry and ocean ecosystems".

Task 1.1.3 Hold a 2-day CFAME workshop in January 2006 in Tokyo titled "A comparison of regional mechanisms for fish production: ecosystem perspectives".

Task 1.1.4 Convene a major international symposium titled, "PICES/GLOBEC Symposium on Climate Variability and

Ecosystem Impacts on the North Pacific: A Basin-Scale Synthesis". Symposium will occur in April 2006 in Honolulu, HI, USA. A special issue of the journal Progress in Oceanography will be dedicated to publish the proceedings of this symposium.

Task 1.1.5 Work closely with the Ecosystem Studies of Sub-Arctic Seas (ESSAS) program of GLOBEC International to develop the datasets and synthesis needed to better understand high-latitude ecosystems globally (including several within the North Pacific). Workshop to likely be held in June 2006 in St. Petersburg, Russia.

Goal 2. Understand and quantify the impacts of human activities and climate on marine ecosystems

Action 2.1 Investigate impacts of climate change and variability on ecosystems and selected important fish populations in the North Pacific.

Task 2.1.1 Hold a half day Topic Session at PICES XV on "Modeling and historical data analysis of pelagic fish, with special focus on sardine and anchovy".

Task 2.1.2 Convene a one day topic session at PICES XV on "Key recruitment processes and life history strategies: bridging the temporal and spatial gap between models and data".

Task 2.1.3 Apply NEMURO and NEMURO.FISH to elucidate geographic variations in fish growth (MODEL Task Team).

Task 2.1.4 Apply NEMURO and NEMURO.FISH to elucidate global climate change effects on energy pathways and fish production (MODEL Task Team).

Task 2.1.5 Apply NEMURO and NEMURO.FISH to understand regime shifts (MODEL Task Team).

Task 2.1.6 Develop new theoretical and mathematical frameworks to extend the single species concept of carrying capacity and management to multiple species and ecosystem domains. A workshop will be held at PICES XV directed toward this goal.

Task 2.1.7 The synthesis and summary of the NEMURO model and its results (based on work accomplished in several of the Tasks above) will be submitted for peer review and publication (see Task 8.1.4).

Goal 3. Provide advice on methods and tools to guide scientific activities

Action 3.1 Provide a lower trophic level modeling framework that is capable and easy to use.

Task 3.1.1 Provide broader access to NEMURO and NEMURO.FISH model codes and develop a user's manual and documentation for the codes (to be distributed via the web).

Task 3.1.2 Translate NEMURO code into "software framework" systems and enable it to be used by non-professional programmers.

Action 3.2 Contribute to the activities of the Study Group on Future Integrative Scientific Programs (SGFISP).

Task 3.2.1 As the only existing Scientific Program in PICES, CCCC will provide significant input to the development of the next scientific program. Several of the original suggestions, including our favorite, "Forecasting and Understanding The Uncertainty and Responses of Ecosystems", aka FUTURE, came from active CCCC scientists.

Theme B. Applying scientific knowledge

Goal 4. Provide scientific advice towards wise use of the North Pacific Ocean

Action 4.1 Respond to requests for scientific advice and contribute to future North Pacific Ecosystem Status Reports.

Task 4.1.1 Provide possible implications of ecosystem structure, function and responses to climate change and human activities for sustainable use of marine living resources, as was done for the recent US request for advice (Fisheries and Ecosystems Responses to Recent Regime Shifts analysis).

Task 4.1.2 CCCC contributed to the North Pacific Ecosystem Status Report, and will do so for future updates of this important PICES product.

Theme C. Fostering partnerships

Goal 5. Promote collaboration with organizations, scientific programs, and stakeholders that are relevant to the PICES goals

Action 5.1 Collaborate with organizations with goals related to CCCC activities.

Task 5.1.1 Coordinate North Pacific climate change research on marine ecosystems.

Task 5.1.2 Collaborate with other organizations (GLOBEC International; US GLOBEC, etc.) to synthesize North Pacific climate-ocean-ecosystem studies at basin and sub-basin scales at an international symposium (see Task 1.1.4).

Task 5.1.3 Continue discussions with ICES Cod and Climate Change program regarding common goals and synthesis of impacts of variability of climate and it's impacts on marine ecosystems.

Task 5.1.4 Continue discussions with GLOBEC SPACC, APN, and IAI scientists to build a multi-species fish model especially for sardine and anchovy (see Task 2.1.1 and 2.16)

Task 5.1.5 Continue to foster and encourage joint surveys among member nations to facilitate large scale spatial and temporal data collection on various ecosystem components and processes.

Goal 6. Promote collaboration among scientists within PICES

Action 6.1 Encourage active participation from all PICES countries in CCCC activities and in the development of future scientific programs.

Task 6.1.1 Convene a workshop to discuss standard methods for studies of vital rate processes (growth, egg production, molting) of euphausiids, with a goal of organizing a coordinated concurrent program of observations through an entire year at many sampling sites across the North Pacific (pan-Pacific Year of the Euphausiid).

Task 6.1.2 After completing a NEMURO User's Manual in English (Tasks 3.1.1 and 8.1.5), consider desirability and need for translation of the User's Manual into other languages (Chinese, Korean, Russian and Japanese).

Action 6.2 Encourage active participation in CCCC activities of young scientists.

Task 6.2.1 Continue to contribute to organization of the ICES-PICES young scientist conference.

Task 6.2.2 Maintain CCCC contributed paper or poster sessions at PICES meetings.

Task 6.2.3 Contribute a presentation on NEMURO and NEMURO.FISH to the PICES/POC summer school in Korea (23-25 August 2006).

Theme D. Ensuring a modern organization in support of PICES activities

Goal 7. Provide an effective infrastructure to support PICES programs

Action 7.1 Maintain an active infrastructure for CCCC.

Task 7.1.1 Continue to work closely with the PICES Secretariat and Science Board to maintain active representation from all member nations on all task teams and the Implementation Panel.

Theme E. Distributing PICES scientific information

Goal 8. Make the scientific products of PICES accessible

Action 8.1 Distribute PICES scientific results broadly.

Task 8.1.1. CCCC is holding an international Symposium in April 2006.

Task 8.1.2 CCCC will publish the proceedings of its Synthesis Symposium as a special issue of Progress in Oceanography.

Task 8.1.3 Exchange methodologies and results of comparative studies on ecosystem structure, function and responses among member countries, particularly thorough comparative studies.

Task 8.1.4 NEMURO model and its results will be submitted for peer review and publication in *Ecological Modelling* in 2006.

Task 8.1.5 User's manual and documentation for NEMURO and NEMURO.FISH (pdf on web) in 2006.

Task 8.1.6 MODEL task team of CCCC is working with TCODE to make NEMURO and successor codes available via the web.