
Climate, biodiversity and ecosystems of the North Pacific

The land of Aloha welcomed over 60 participants to the workshop on the “Impact of Climate Variability on Observation and Prediction of Ecosystem and Biodiversity Changes in the North Pacific”. This workshop was jointly sponsored by PICES, the International Pacific Research Center (IPRC) based in Honolulu, and the Census of Marine Life (CoML), and was held March 7-9, 2001, in Honolulu. The organizers were Vera Alexander (PICES Vice-Chairman) and Patricia Livingston (PICES Science Board Chairman). Attendees included many members of PICES Committees, Working Groups, Advisory Panels, and the PICES-GLOBEC Climate Change and Carrying Capacity Program, in addition to other members of the North Pacific marine scientific community. Representatives of many marine organizations participated, including those from CLIVAR, CoML, DBCP, GEM, GOOS, IATTC, IPHC, IPRC, and POGO.

The Census of Marine Life seeks to answer the broad question of what did live, what does live, and what will live in the oceans. This goal complements the PICES

objective of advancing scientific knowledge about the ocean environment, weather and climate change, living resources and their ecosystem,s and the impacts of human activities. In order to understand past, present, and future biodiversity, we need to understand and predict climate influences on marine ecosystems.

This workshop was a first step in reviewing the goals and strategies for observing North Pacific marine ecosystems and their biodiversity in order to improve our ability to predict ecosystem change. Participants described time series that are presently available for all parts of North Pacific ecosystems, including: 1) physical/chemical oceanography and climate, 2) phytoplankton, zooplankton, micronekton and benthos, 3) fish, squid, crabs and shrimps, and 4) migratory fish, bird, and mammals. Presentations also included discussion of possible factors responsible for observed trends in the data. Predictive and explanatory models (from purely physical to coupled biophysical models) were also presented.

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(bychkov@pices.int; mckinnell@pices.int; christina@pices.int; secretariat@pices.int; intern@pices.int)

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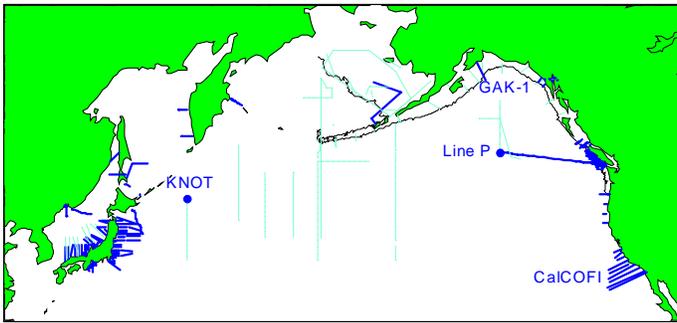


Fig. 1 All locations that are sampled at least once per year. Those sampled more frequently than once per year appear in dark blue.

Many examples of change in animal distribution, abundance, or survival in relationship to local climatic factors such as temperature or transport, or to large-scale regional climate indices were shown. It was evident from maps of where data had been collected in the North Pacific Ocean that the open ocean is less well-sampled than the shelf regions for all types of physical, chemical and biological observations (Fig. 1). For lower trophic level species such as phytoplankton and zooplankton, it appears that one of the biggest gaps was taxonomic analysis and methods for standardization/inter-comparison of sampling gears. Recommendations were made for candidate indicator species and sensitive measures of change for higher trophic level species such as fish, squid, mammals and birds. It was noted that reproductive success is one of the most sensitive indicators for these groups.

One of the main purposes of the workshop was to facilitate the compilation of data and knowledge of the status and trends of North Pacific ecosystem components into a North Pacific Ecosystem Status Report. This concept was brought to the attention of the PICES scientific community and Governing Council at the PICES Ninth Annual Meeting. A study group is now using the results and recommendations from this workshop to refine the concept and to determine how to compile such a report. The purpose of the North Pacific Ecosystem Status Report is to integrate our collective scientific knowledge of the North Pacific and its changes, and to inform the scientific community and policy- and decision-makers in the North Pacific region of ecosystem changes and the factors influencing change. Ultimately, the goal is to provide predictions of change that can be used to move towards ecosystem-based marine policy- and decision-making.

Workshop recommendations mostly dealt with the steps to be taken to produce a North Pacific Ecosystem Status Report. Many recommendations made in each of the breakout group discussions were specific to each particular group. However, some of the recommendations that were discussed in the closing plenary session covered all disciplines. One main recommendation was to include all the information regarding time series data that was identified at the workshop into the North Pacific Ecosystem Meta-database, presently maintained by U.S. researchers Allen Macklin and Bernard Megrey. The

meta-database contains information about the data, but does not include the data. Compiling information on existing time series data will be very useful when structuring the North Pacific Ecosystem Status Report.

Participants recognized the need for PICES member nations to pool observational resources to provide a complete sampling program in the open ocean areas of the North Pacific. It was also recommended that PICES make formal connections with programs that are planning coordinated, technologically-advanced observation and communication systems, such as the NEPTUNE underwater observatory for the northeast Pacific. A variety of technological advancements in monitoring efforts from physics to upper-trophic level species were recommended as pilot projects for PICES scientists and groups to consider in the near future. These included putting instruments on ships-of-opportunity, putting biological sensors on buoys, improving sampling methodology for small pelagic fishes, and video monitoring of birds and mammals on continuous plankton recorder cruises.

The concept of Regional Analysis Centers (RACs) was discussed as a way for PICES to focus the work involved in producing a North Pacific Ecosystem Status Report. Two ways of viewing these centers were mentioned. One type of RAC would be an actual geographic location and building with staff assigned to it. Another type would be more of a “virtual” RAC that would rely heavily on a distributed network of scientists to contribute to the work. It seemed clear from the organization examples mentioned in discussion, that even a “virtual” RAC would still need some central support to accomplish the task.

The full report of this workshop is being compiled and is scheduled for publication before the PICES Tenth Anniversary Meeting. The North Pacific Ecosystem Status Report and Regional Analysis Center Study Group, formed by PICES in 2000, will be considering the recommendations and discussions of this workshop in order: (1) to prepare a detailed outline for the first Status Report, (2) to identify of key contributors and data sources and how the data would be synthesized into the report, (3) to estimate costs, and 4) to evaluate possible role of RACs, for consideration by the PICES scientific community. Hopefully, work can begin on compiling the North Pacific Ecosystem Status Report after PICES X.

The report was prepared by **Patricia Livingston** (Pat.Livingston@noaa.gov), Chairman of the PICES Science Board and co-convenor of the 2001 Census of Marine Life workshop in Honolulu.