

EXECUTIVE SUMMARY

This report summarizes the results of three PICES-GLOBEC Climate Change and Carrying Capacity (CCCC) Task Team (TT) workshops held at the PICES Tenth Annual Meeting in October 2001, in Victoria, British Columbia, Canada and a joint MODEL/REX workshop held in Nemuro, Japan, in January 2002. The three workshops during the Annual Meeting were: 1) a 1-day joint BASS/MODEL workshop to *review ecosystem models for the subarctic Pacific gyres*, 2) a 1-day MONITOR workshop to *review progress in monitoring the North Pacific*, and 3) a 1-day REX workshop on *temporal variations in size-at-age for fish species in coastal areas around the Pacific rim*. Each of these workshops addressed the core activities of these Task Teams; moreover, they continue a trend of having joint workshops of multiple Task Teams, which provides opportunities to broaden the scope of the discussions and lead to synthesis. This trend to multi-Task Team workshops is timely because during the coming year, and particularly at the PICES Eleventh Annual Meeting (Qingdao, People's Republic of China), CCCC will be examining progress achieved during the past decade, documenting its successes and failures in answering the scientific questions posed initially, and evaluating whether the current structure of Task Teams and Advisory Panels is the most suitable to carry CCCC research forward into the next decade.

The joint BASS/MODEL workshop focused on two ECOPATH equilibrium models describing energy flow through the eastern and western subarctic gyres, and explored the dynamics of energy flow in these two systems using ECOPATH/ECOSIM formulations. The equilibrium models suggest that biomass in the western subarctic gyre (WSA) is higher than in the eastern subarctic gyre (ESA). Biomasses of several species (flying squid, pomfret, chaetognaths and salmon) were higher in the WSA than in the ESA. A conclusion of these ECOPATH investigations was that estimates of diet compositions for many of the species were poorly known. Several recommendations regarding future research resulted from the workshop, including improving the quality of available input data sets (like diet). BASS and MODEL plan to continue their joint work on this project by linking the ECOPATH/ECOSIM higher trophic model to the NEMURO model of lower trophic levels dynamically. Since the NEMURO model is forced by ocean conditions (mixed layer depth, temperature, insolation, etc.), this linking of models will provide a method for exploring the results of various climate change scenarios on higher trophic levels in the WSA and ESA.

The MONITOR workshop was focused on reviewing the need and capability of sustained, long-term monitoring of ocean and ecosystem conditions in the PICES region, especially considering the recent emphasis within PICES on producing a North Pacific Ecosystem Status Report. Presentations at the workshop summarized some of the tools that are available now or could be put into place to assist this effort - including both regional networks of coastal observing systems, Continuous Plankton Recording (CPR) across the gyres, and data management. Among other recommendations, MONITOR would like to develop a closer liaison with regional (Gulf Ecosystem Monitoring [GEM]) and international (Data Buoy Cooperation Panel [DBCP], Coastal Global Ocean Observing System [C-GOOS]) providers of ocean data, and extend CPR observations of the subarctic gyres to other ancillary data types beyond zooplankton biomass and species composition.

The REX workshop summarized historical datasets on salmon and herring populations across the Pacific, with additional contributions on a few other species. Several key themes that emerged from the workshop were: 1) the importance of understanding the spatial coherence and scales of size-at-age patterns, 2) the search for mechanistic (causal) as opposed to correlational explanations of common temporal trends between the environmental variables and size-at-age data, and 3) the influence of density-dependence and the mechanisms through which it affects size-at-age changes through time.

The fourth report is the result of a joint MODEL/REX workshop that brought scientists involved in developing the NEMURO model together with experts on saury and herring growth. The principal objective was to include a fish growth model into the lower trophic level NEMURO model. For efficiency, the group focused on modeling the growth of a single fish using input data on prey abundances and temperature provided by the NEMURO model. A previously published clupeid bioenergetics model (from the Atlantic) was adapted to two different important fish in the North Pacific, Pacific herring and Pacific saury. These two species have contrasting life histories and growth rates; however, by tuning the parameters of the model to each species, growth curves were obtained that match observations reasonably well. A few longer term, multicohort (where each year one fish is modeled) simulations of the saury model indicated some interannual variability in growth as a result of environmental forcing of temperature and prey fields.

The four Task Teams of CCCC are beginning to coordinate their activities in ways that will hopefully provide answers to many of the CCCC scientific questions, and to develop or coordinate an ecosystem monitoring network. This network will provide information to PICES that is essential in preparing regularly updated North Pacific Ecosystem Status Reports. The final recommendations from each of the CCCC Task Teams can be found in the PICES 2001 Annual Report.

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