

## PICES workshop discusses Oceanic Ecodynamics Comparison in the Subarctic Pacific (OECOS) - a project proposal

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Workshop organizers, Drs. Ikeda and Miller, with rooster-hat death mask.

*Dr. Tsutomu (Tom) Ikeda is a plankton biologist specializing in experiment-oriented research on zooplankton ecology. He has worked at the University of Miami, the Australian Institute of Marine Science, Australian Antarctic Division, the Research Institute of the Japanese Fisheries Agency (at Niigata, Nagasaki, Hiroshima), and is now a professor at Hokkaido University. His major achievement to date includes the evaluation of unique biology and physiology of Antarctic krill through the development of a long-term lab maintenance technique, establishment of metabolism-body mass-habitat temperature equations of epipelagic mesozooplankton across polar to tropical waters, and life history patterns of various zooplankton in the Japan Sea and Oyashio region. Within PICES, he has been a member of the Biological Oceanography Committee and served as the Chairman of the Committee from 1999-2001.*

*Dr. Charles Miller is a biological oceanographer specializing in studies of zooplankton, particularly in subarctic habitats of the Pacific and Atlantic Oceans. Much of this work has emphasized the importance and flexibility of diapause phases. He and co-workers have contributed life history analyses for copepod species dominant in the Gulf of Alaska, and studies of lower trophic level ecodynamics in that area. As a member of the SUPER program in the 1980s, he contributed to the current (if incomplete) understanding of processes in HNLC pelagic ecosystems. He is currently a professor emeritus at the Oregon State University, where 32 years of teaching enabled writing of a recent textbook titled "Biological Oceanography" (2004, Blackwell, Oxford). Charlie is also the Chairman of the PICES Advisory Panel on the Continuous Plankton Recorder Survey in the North Pacific.*

The Oregon State University (OSU, Corvallis) was the site of an international workshop sponsored by PICES (with assistance from the OSU Research Office and the OSU College of Oceanic and Atmospheric Sciences) on May 23-24, 2005. Japanese and North American scientists (see table and picture on next page) discussed the fundamental questions and observational details of proposed comparative studies of ecological processes in the upper waters of the oceanic subarctic Pacific.

It is established that the high-nitrate, low-chlorophyll (HNLC) character of these waters is attributable to the limited availability of iron in the euphotic zone. Several mesoscale iron-addition experiments (the Japanese Subarctic Pacific Iron Experiment for Ecosystem Dynamic Study – SEEDS, in the western subarctic Pacific, and the Canadian Subarctic Ecosystem Response to Iron Enrichment Study – SERIES, in the eastern subarctic Pacific) have shown that adding soluble iron induces strong increases in standing stocks of microplanktonic diatoms and algae, that without iron addition, are present in very low abundance. With iron-limitation firmly established, it

remains to explain fully the processes and variations of the lower trophic levels under normal circumstances without iron addition. OECOS proposes that much can be learned from parallel studies and comparisons of processes in the eastern and western subarctic sectors, taking advantage of both differences and similarities between them.

While much planning remains, the initial notion is to study a site in the western subarctic receiving sufficient iron to support a spring phytoplankton bloom with HNLC conditions established afterward, and to compare that to an eastern site (Station P or similar) that exhibits continuously HNLC conditions. Both sites would be examined by high-resolution time-series sampling in the April-May period of the spring transition, when the water column above the permanent halocline (~100 m) becomes divided by a seasonal thermocline (~35 m). This is the time of the spring bloom in the west and of a sharp increase in phytoplankton production rates in the oceanic east. At both sites the time-series of measurements will establish the relations among light, stratification, iron availability (amounts and chemical speciation), nitrogen dynamics,

algal floristics, algal growth rates, microheterotroph grazing and phytoplankton stocks.

These contrasting sites, and the entire region, have a common list of zooplankton species dominant during spring (five species of copepod). Preliminary data suggest

that the difference in phytoplankton species and standing stocks, perhaps a difference in the length of their food chain, causes these zooplankton to have very different growth rates, fast in the west, and much slower in the east. Measuring these growth rates by common methods will be a focus of studies at both sites.



*OECOS/PICES workshop participants: (back row from left) Cowles, Ikeda, Strutton, Miller, Furuya, Saitoh, Batchelder; (middle row) Cullen, Chase, Dagg, Welschmeyer, Selph; (front row) Kuma, Kobari, Yamaguchi, Ota, Strom, Erdner.*

#### **OECOS workshop participants:**

Harold Batchelder (Oregon State University) – modeling, possibly observations  
 Zana Chase (Oregon State University) – aspects of iron chemistry  
 Tim Cowles (Oregon State University) – mixing physics and fine scale profiling of phytoplankton  
 Jay T. Cullen, (University of Victoria) – iron availability and iron cycling  
 Michael Dagg (Louisiana Universities Marine Consortium) – mesozooplankton feeding  
 Deana Erdner (Woods Hole Oceanographic Institution) – *in situ* indices of iron limitation in phytoplankton  
 Ken Furuya (University of Tokyo) – phytoplankton production and ecology  
 Moira Galbraith (Institute of Ocean Sciences, Fisheries and Oceans Canada) – mesozooplankton distribution pattern  
 Tsutomu Ikeda (Hokkaido University) – zooplankton production and respiration  
 Toru Kobari (Kagoshima University) – zooplankton development and growth  
 Kenshi Kuma (Hokkaido University) – marine chemistry (iron)  
 David Mackas (Institute of Ocean Sciences, Fisheries and Oceans Canada) – mesozooplankton distribution pattern  
 Charles Miller (Oregon State University) – mesozooplankton growth rates  
 Takashi Ota (Ishinomaki Senshu University) – microzooplankton  
 Sei-ichi Saitoh (Hokkaido University) – satellite evaluation of phytoplankton and physics  
 Karen Selph (University of Hawaii) – phytoplankton biomass and systematics with flowcytometry and microscopy  
 Suzanne Strom (Western Washington University) – microzooplankton variability and activity  
 Peter Strutton (Oregon State University) – water column monitoring from station-marking floats  
 Nicholas Welschmeyer (Moss Landing Marine Laboratories) – phytoplankton growth rates ( $^{14}\text{C}$  and  $^{14}\text{C}$ -dilution experiments)  
 Atsushi Yamaguchi (Hokkaido University) – macro/mesozooplankton

*(cont. on page 23)*