

MEQ/WG 8 Practical Workshop

Colin D. Levings
Marine Environment & Habitat Science Division
Coastal & Marine Habitat Science Section
West Vancouver Laboratory
Vancouver, B.C., CANADA. V7H 1N6
E-mail: levingsc@dfo-mpo.gc.ca

Carla M. Stehr & John E. Stein
Environmental Conservation Division
Northwest Fisheries Science Center
National Marine Fisheries Service, NOAA
Seattle, WA 98112—2097, U.S.A.
E-mail: Carla.M.Stehr@noaa.gov John.E.Stein@noaa.gov



Group photo taken in front of the West Vancouver Laboratory. Left to right – Back row: Dan Lomax (U.S.A.), Colin Levings (Canada), Alexander Tkalin (Russia), Richard Addison (Canada), Terry Sutherland (Canada). 2nd row: Zhengyan Li (China), Jihyun Yun (Korea), Tatyana Belan (Russia), Bernie Anulacion (U.S.A.), Beth Piercey (Canada), Seiichi Uno (Japan), Toshihiro Horiguchi (Japan), Stelvio Bandiera (Canada). Front row: Carla Stehr (U.S.A.), John Stein (U.S.A.), Jong Jeel Je (Korea), Gina Ylitalo (U.S.A.), Tatyana Lishavskaya (Russia), Tian Yan (China), Brian Bill (U.S.A.).

Introduction

The aim of WG 8, a Working Group under the Marine Environmental Quality Committee (MEQ), is to promote the collection and exchange of information about approaches PICES member countries use to assess the biological impact of marine pollution. A Practical Workshop was held May 24 to June 7, 1999, at West Vancouver, British Columbia, towards this goal. The Workshop was developed along the lines of the earlier IOC/GEEP workshops held in Norway and Bermuda, which were co-organized by Dr. Richard F. Addison, former MEQ Chairman. The Workshop had been planned for several years, with the active participation of the involved PICES scientists at recent Annual Meetings. The focus of the field work was Vancouver Harbour, the largest port on Canada's Pacific coast. The harbour is the site for a variety of industries, and so the group thought this area might be a suitable location to study biological effects: two locations outside the harbour were presumed reference sites. The West Vancouver Laboratory of the Department of Fisheries and Oceans (DFO) located on the outer part of the harbour, was used as base of operations and sample treatment. The NOAA research vessel "Howard W. Streeter", based in Seattle, was the vessel used in the sample collection. PICES scientists not based in Vancouver were billeted at a nearby college in North Vancouver.

Participants, sampling, and laboratory work

Dr. Colin D. Levings, Workshop Co-Chairman, hosted the workshop and arranged for laboratory space and appropriate supplies with the invaluable assistance of Beth Piercey and Christine Elliott. Co-Chairman Dr. John E. Stein and Carla M. Stehr from the United States National Marine Fisheries Service, and other staff from Seattle, provided key planning advice, logistic support from the *Streeter*, and operated the vessel. A smaller DFO vessel based in Vancouver was used for shore collections. Representatives from all PICES countries attended, with a total of 32 scientists participating in fieldwork and/or discussions.

The workshop began with a day and a half of meetings to discuss environmental monitoring approaches that are currently being used by the PICES member countries, and to review and refine specifics of the practical workshop sampling plan. Seven days were spent on fieldwork, with the remainder of the time occupied by sample pre-treatment in the laboratories. Most of the samples were freeze dried, frozen or otherwise preserved and shipped back to the participant's home laboratories for detailed analyses.

An "operations room" was set up at the laboratory with charts, maps, and facilities to plan fieldwork. Each morning the group assembled for a short meeting to discuss the objectives for

the day, to review progress and discuss new findings relevant to the workshop. Then one group of scientists would depart on the *Streeter* while another group would leave for shore collections on the small launch. Except for the first day, when a heavy westerly wind brought swells into the harbour, the weather was very good. To maintain Vancouver's reputation as a green city, there were one or two days of gentle rain.

Seven stations within Vancouver Harbour and the adjacent Strait of Georgia were sampled for sediment, benthos and intertidal invertebrates. Fish were collected by otter trawl at five of these sites to assess community structure, abundance, and biomass. Except for one trawl that yielded a huge log, skillfully removed by Captain and Biologist Dan Lomax, the trawl sampling was very successful. English sole (*Pleuronectes vetulus*) were collected for chemical and histopathological analyses. Chemical analyses included enzyme activity, body burdens of persistent organics and metals. Otoliths were obtained for age analysis and stomachs were collected for diet studies. All of the dissections of the fish were conducted aboard the *Streeter*.

A Van Veen grab was used to collect sediment for biological and chemical analyses. Five replicate grabs were obtained at each station and then sieved through a 0.5 mm screen. At the West Vancouver Laboratory, PICES scientists then sorted the animals from the mud and took the samples back to their home laboratories for detailed identification and statistical analyses to study benthic community structure. Sediment was also taken for analyses of organics and metals. A separate grab was taken for mezofauna, the smaller invertebrates which would pass through a 0.5 mm screen, as well as for sediment grain size and algae.

Clams, mussels, and algae were collected at each inter-tidal site, usually by digging with a shovel or collecting from the rocky shore. A profile of the mussel community at each station



The research vessel "Howard W. Streeter" at anchor in the harbour while participants obtain bottom grab samples for sediment and organism collections. Yellow material in background is elemental sulfur.

was obtained by counting and identifying the larger animals seen in a quadrat. Clams were collected for hydrocarbon analyses. Mussels and clams were collected and preserved for later analysis of hydrocarbons, lipids, metals, condition factor and toxins associated with harmful algae. Algal toxins were also tested in the laboratory with a bioassay. Snails were collected to determine frequency of sex changes, an effect related to tributyl tin used in antifouling paint. Special collections of snails were made near Victoria and north of the reference site at Gibsons because none were found in Vancouver Harbour.

Conclusions and what is next

All participants in the Workshop thought it was a very worthwhile project, in terms of scientific advances and understanding of each country's approach to marine environmental problems. Of course there is still a lot of work to do on analyses, interpretation and reporting, but most scientists are making good progress on their projects.

Members of WG 8 met at the PICES Eighth Annual Meeting recently held in Vladivostok, to review status of data analyses, and plan for the presentation and publication of the Workshop results. There will be a special session next year at the PICES Ninth Annual Meeting in Hakodate for presentations and posters of the workshop results.

Raw data reports will be compiled and published as a PICES Scientific Report in the year 2000. In addition, peer-reviewed journal articles will be prepared, and WG 8 will approach a journal editor about publishing a special issue on the PICES Practical Workshop, tentatively named the Environmental Assessment of Vancouver Harbour: Proceedings of an International Workshop.



Map of sampling sites within Vancouver Harbour and the adjacent Strait of Georgia.



Top row:

*Mark Myers collecting tissue from English sole (*Pleuronectes vetulus*) for chemical and biological analyses (left);*

Tian Yan, Toshihiro Horiguchi and Seiichi Uno collecting intertidal algae and clams for analysis of contaminants (center);

Colin Levings, Tatyana Belan, Alexander Tkalin, and Mark Myers sieving sediment from the bottom grab to obtain benthic animals (right);

Middle row:

Colin Levings, Dan Lomax, Mark Myers, Sean Sol, and Bernie Anulacion sorting a trawl catch to enumerate fish species (left);

Jong Geel Je deploying the bottom grab used for benthic sampling (center);

Alexander Tkalin collecting mussels for metal analyses (right);

Bottom:

Colin Levings and Dan Lomax discussing locations of sample sites in the pilothouse of the research vessel.

(cont. from page 1)

Oceanography and Climate Committee's Working Group 13 on Carbon Dioxide in the North Pacific also held a multinational technical workshop this year. Their intercalibration exercise for laboratory measurements of carbon dioxide was recognized by the IOC/JGOFS Advisory Panel on Ocean Carbon Dioxide as contributing to high quality of North Pacific carbon dioxide measurements in the future, which will allow multinational synthesis and lead to improved understanding of carbon cycle processes (for details see Dr. Andrew Dickson's article in *PICES Press No. 7 (2)*). Finally, the PICES-GLOBEC Climate Change and Carrying Capacity Program (CCCC) was successful in obtaining funding from the North Pacific Marine Research Program to perform a two-year study to initiate continuous plankton recorder (CPR) monitoring in the North Pacific (for details see Drs. David Welch and Sonia Battens' article in this issue). The next challenge will be to find a way to maintain this monitoring as a long-term PICES effort.

A lot of PICES scientific effort was brought to completion in 1999 by the publication of results in either the PICES Scientific Report Series, in special journal volumes, or as books. The proceedings of the 1997 Science Board Symposium on "Ecosystem dynamics in the eastern and western gyres of the subarctic Pacific" was published in volume 43(2-4) of *Progress in Oceanography*, and the final endpoint of the Science Board's Working Group 5 on the Bering Sea came with the publication of the book "Dynamics of the Bering Sea" by University of Alaska Sea Grant. Three volumes of the PICES Scientific Report series were produced in 1999: Number 10 has the proceedings of the 1998 Science Board Symposium on El Niño 1997-98 events, Number 11 has the proceedings of the 1998 PICES-GLOBEC CCCC Program MODEL, REX, and MONITOR workshops, and Number 12 has the proceedings of the Second PICES Workshop on the Okhotsk Sea and adjacent areas.

Several Working Groups completed their work in 1999 and will be making final preparation for publication of results in 2000. The Physical Oceanography and Climate Committee's Working Group 10 on Circulation and Ventilation in the Japan/East Sea will place their report on the PICES web site as a revisable, living document. The Fishery Science Committee's Working Group 12 on Crabs and Shrimps, and the Biological Oceanography Committee's Working Group 11 on Consumption of Marine Resources by Marine Mammals and Seabirds will also be working towards publication of their final results in the year 2000.

The PICES-GLOBEC CCCC Program continues its work on integrating and stimulating national GLOBEC research efforts in the North Pacific. The Regional Experiments (REX) Task Team is presently focusing on comparative work on herring in the North Pacific. They just completed an interesting workshop on "Herring and Euphausiids" and are planning a

follow-on workshop for 2000, that will examine herring population trends and trophodynamics. Basin Scale Studies (BASS) Task Team has an Iron Fertilization Panel that is planning international field experiments in the subarctic North Pacific to understand the role of iron in influencing production. The MODEL Task Team is undertaking two workshops in the coming year, one to build lower trophic level models in several areas of the North Pacific and the second one to link these models to upper trophic level models. The MONITOR Task Team just completed a successful workshop to learn about the Global Ocean Observing System (GOOS) and to examine the future role of PICES in this growing international program. As an outcome of the workshop, PICES will be developing an action plan that will outline how PICES will be taking an active and leading role in the implementation of GOOS at a North Pacific level.

New collaborations and working groups will begin in the year 2000. An Advisory Panel on Continuous Plankton Recorder (CPR) survey in the North Pacific was formed, which will advise the MONITOR Task Team on the design of its CPR experiments and work. Marine mammal and bird experts now have their own Advisory Panel under the Biological Oceanography Committee (BIO). They will be providing scientific advice to BIO and CCCC, and providing leadership to marine mammal and bird scientists in the North Pacific in the area of ecosystem research. The Marine Environmental Quality Committee has just formed a Working Group to examine the ecology of harmful algal blooms in the North Pacific, and the Fisheries Science Committee has formed a Working Group to consider the implications of climate change to fisheries management. These groups will be working hard in the coming years to bring useful scientific products to the PICES community.

The PICES Science Board has approved many exciting topic sessions for next year's meeting, to be held October 20-28, 2000, in Hakodate, Japan. The details of the sessions are now being worked on in preparation for the first meeting announcement. You can look forward to a slightly different meeting format, with the Science Board Symposium taking place on the first day and much more attention being given to poster presentations. We are also beginning to plan the PICES Tenth Annual Meeting, which will be held at the site of the Secretariat in Victoria, Canada. We hope to have this Anniversary Meeting focus on the progress of PICES science in the last decade and its future direction for the coming decade.

Patricia Livingston
PICES Science Board Chairman
Alaska Fisheries Science Center
NMFS, NOAA,
Seattle, WA 98115-0070, U.S.A.
E-mail: Pat.Livingston@noaa.gov