

Appendix A.

Summary of PICES Working Group 13 activities (1998 – 2001)

The PICES Working Group 13 on *CO₂ in the North Pacific* was established in 1998 under the direction of the Physical Oceanography and Climate Committee, and was co-chaired by Dr. Richard A. Feely of the Pacific Marine Environmental Laboratory (Seattle, U.S.A.) and Dr. Yukihiro Nojiri of the National Institute for Environmental Studies (Tsukuba, Japan). Table 5 provides a list of the Working Group members. The terms of reference for the Working Group were the following:

1. Review the present level of knowledge on the processes controlling CO₂ in the North Pacific, and identify the gaps and problems;
2. Review the existing methodology of CO₂ measurements, including the preparation of standards and reference materials, and advise on intercalibration and quality control procedures;
3. Identify and encourage ongoing and planned national and international CO₂-related scientific programs in the North Pacific region, including long-term time-series observations; and

4. In coordination with TCODE (PICES Technical Committee on Data Exchange), identify available and suitable data sets on the oceanic CO₂ system and recommend the mechanisms of data and information exchange.

Table 6 summarizes activities of the Working Group in chronological order; several of those were conducted jointly with the JGOFS North Pacific Task Team (NPTT). The Working Group met each year at the PICES Annual Meeting to coordinate research activities, exchange data and work to integrate the large-scale CO₂ data sets from the North Pacific. The meetings were well attended as each member presented a summary of country's research directions in carbon cycling, and invitees provided detailed information on ongoing and planned national and international CO₂-related scientific programs in the region. As a direct outcome, the Working Group recommended the re-occupation of, and exchange of samples during, the repeat WOCE/JGOFS sections P1, P2 and P16N in the North Pacific.

Table 5 Members of PICES Working Group 13.

Name	Affiliation	Country
Richard A. Feely	Pacific Marine Environmental Laboratory, NOAA	USA
Yukihiro Nojiri	National Institute for Environmental Studies	Japan
Andrew Dickson	University of California, San Diego	USA
Myung-Woo Han	Inha University	Republic of Korea
Akihiko Murata	Japan Marine Science and Technology Center	Japan
Galina Yu. Pavlova	Pacific Oceanological Institute	Russia
Paul Quay	University of Washington	USA
Igor Semiletov	Pacific Oceanological Institute	Russia
Pavel Tishchenko	Pacific Oceanological Institute	Russia
Zhang-Gui Wang	National Research Center for Marine Env. Forecast	People's Republic of China
C. S. Wong	Institute of Ocean Sciences	Canada

Table 6 Summary of PICES Working Group 13 activities (1998 – 2001).

Time	Location	Activity
October 1998	Fairbanks, U.S.A.	Working Group 13 Annual Meeting
January 1999	Tsukuba, Japan	<i>CO₂ in the Oceans</i> Symposium
April 1999	Tsukuba, Japan	<i>DIC Intercomparison</i> Workshop
October 1999	Vladivostok, Russia	Working Group 13 Annual Meeting
October 2000	Tsukuba, Japan	<i>Talk Intercomparison</i> Workshop
October 2000	Tsukuba, Japan	<i>North Pacific CO₂ Data Synthesis</i> Symposium
October 2000	Hakodate, Japan	Working Group 13 Annual Meeting
October 2002	Hakodate, Japan	PICES/JGOFS Topic Session on <i>carbon cycling</i>
January 2001	Sidney, Canada	<i>CO₂ Data</i> Planning Workshop
August 2001	Tokyo, Japan	<i>CO₂ Data Integration</i> Workshop
October 2001	Victoria, Canada	Working Group 13 Annual Meeting

To improve the existing methodology of CO₂ measurements, the Working Group supported three international CO₂ measurement inter-comparison studies: for dissolved inorganic carbon (DIC), total alkalinity (TALK) and the ¹³C/¹²C ratio of the inorganic carbon in seawater. The first two, each followed up with a Technical Workshop, were completed in April 1999 and October 2000 (see summary in *Appendix B*). The third inter-comparison was initiated in late 2001 and is still ongoing. Participants have been identified (8 laboratories from Canada, Japan, U.S.A., Australia, Germany, France and China-Taipei), and samples were distributed in the beginning of December 2001, and analyzed during 2002. This activity will be continued and summarized by a new Working Group on *Biogeochemical data integration and synthesis* (WG 17) established to retain a scientific focus on the carbon cycle within PICES. A workshop, if needed, will be organized to discuss the results from the ¹³C/¹²C inter-comparison. The Working Group 17 has supported an on-land inter-comparison of underway and drifting/mooring *pCO₂* measurement systems held in spring of 2003, in Japan, with participants from PICES countries as well as from Europe and Australia.

To review the present level of knowledge on the processes controlling CO₂ in the North Pacific, the Working Group co-sponsored an international symposium on *CO₂ in the Oceans* (January 1999, Tsukuba, Japan) and organized, jointly with the JGOFS NPTT, a Topic Session on *North Pacific carbon cycling and ecosystem dynamics* at PICES IX (October 2000, Hakodate, Japan) and an international *North Pacific CO₂ Data Synthesis* Symposium (October 2000, Tsukuba, Japan).

At the latter symposium, co-sponsored by the JST/CREST Program and hosted by the National Institute of Environmental Studies (Japan), a clear need was recognized to conduct an effort to bring scientists and data managers together to discuss the procedures for developing a North Pacific CO₂ database. This was implemented in 2001 as a series of two workshops that were organized jointly with TCODE. The first *CO₂ Data* Planning Workshop was held at the Institute of Ocean Sciences (Sidney, Canada) in January 2001, to discuss the likely technical issues involved in such a project, and to plan a second more detailed workshop that was held at the Japan Oceanographic Data Center (Tokyo, Japan) in August 2001. The objective for the

CO₂ Data Integration Workshop was to develop strategies for the exchange of CO₂ and related data at the international level, and to examine the technical issues in integrating presently available data into a uniform data structure or database. Both workshops met their goals (see summary in Appendix C), and PICES now has a unified plan for data submission and exchange. The PICES Working Group 17, in association with existing Data Centers, will continue this work to complete the North Pacific database for ocean CO₂ and related parameters and to ensure its continuous update.

Activities of the PICES Working Group 13 were recognized by the IOC-SCOR Ocean Carbon Advisory Panel as essential for improving the overall quality of oceanic CO₂ measurements, resolving data synthesis issues and developing strong collaborations for the integration of the large CO₂ data set in the North Pacific. The Panel emphasized the importance of international participation in the design of Ocean Carbon Observation System and supported PICES as an excellent forum for the Pacific region.