

# REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

3

80

## **Opening (Agenda Item 1)**

The MEQ meeting was opened by the Chairman, Dr. Alexander V. Tkalin, on Wednesday, Oct. 13, and continued on Oct. 14. Members from all PICES member countries were present (*MEQ Endnote 1*). The proposed agenda for the meeting (*MEQ Endnote 2*) was adopted.

## **Working Group 8 report and assessment of the MEQ Practical Workshop (Agenda Items 2 and 3)**

The report of WG 8 on Practical Assessment Methodology was presented by Dr. John E. Stein (*MEQ Endnote 3*). The MEQ Practical Workshop (organized by Drs. Stein and Colin D. Levings and Ms. Carla Stehr) was held in Vancouver, Canada at the West Vancouver Laboratory of Canada's Department of Fisheries and Oceans, and hosted by Dr. Levings. Over 20 participants from all PICES countries participated in sampling and analyzing of benthos, fish and inter-tidal biota. Some preliminary results of chemical and biological analyses had been compiled, and the organisers are confident that the Workshop had yielded valuable scientific data and had provided a unique opportunity for PICES scientists to collaborate and to establish good working relationships. Dr. Richard F. Addison summarized the Workshop activities at the Opening Session of the PICES Eighth Annual Meeting in Vladivostok, and Ms. Stehr provided a more detailed description, illustrated with slides, to the Committee. Some recent data describing metal concentrations in various samples collected at the Workshop was distributed to the Working Group members by Dr. Tkalin.

It was recommended that Working Group 8 continue for one more year to oversee the assembly and publication of data from the Workshop, and that the final data set be published as a PICES Scientific Report in a format that could be cited in primary publications resulting from the Workshop. These recommendations were endorsed by the MEQ Committee. The MEQ Committee also recommended that a session be convened at the PICES Ninth Annual Meeting in Hakodate to present and discuss the Workshop results.

## **Relations with other inter-governmental bodies and programs (Agenda Items 4-6)**

Dr. Tkalin reported that PICES was asked to co-operate with the Arctic Monitoring and Assessment Program (AMAP), of which Russia, Canada and the U.S.A. are already members. The Committee agreed to this proposal.

Dr. Tkalin also described the relationship between PICES and GOOS (Global Ocean Observing System). GOOS currently has several components: Living Marine Resources (LMR), Health of the Oceans (HOTO) and Coastal GOOS, all of which will eventually be merged. Within the North East Asian Region of GOOS (NEAR-GOOS), China, Japan, Korea and Russia have already agreed to exchange data on physical oceanographic variables. These data will be held in national data bases and also at the Japan Oceanographic Data Centre (JODC) and at the Regional Real Time Data Base (RRTDB) operated by the Japan Meteorological Agency (JMA). PICES' involvement with GOOS will be coordinated through the MONITOR Task Team and there will be no direct involvement of MEQ at the moment, though this may come later.

Dr. Addison tabled correspondence with Dr. Matthiessen (Chairman, ICES Working Group on Biological Effects of Contaminants: WGBEC) concerning future joint activities with the MEQ Committee. ICES - WGBEC will propose a meeting to be held in Seattle in spring, 2001, to discuss the application of artificial intelligence to the manipulation of large data sets, probably jointly with SETAC. The MEQ Committee recognised that this was a highly specialised topic which may not appeal to many members, but agreed to support the proposal, provided that an additional day could be added to address more general aspects of PICES-ICES cooperation in the area of MEQ scientific interests.

Drs. Tkalin and Addison re-introduced the topic of PICES' interactions with GIWA (Global International Water Assessment). GIWA had made some preliminary proposals to PICES (see the PICES 1997 Annual) but had not followed these up. However, in a recent GIWA brochure, PICES was identified as a partner with GIWA. Dr. Addison undertook to work with the PICES Secretariat to clarify future connection between PICES and GIWA.

#### **Establishment of a new Working Group (Agenda Items 7 and 10)**

Dr. Tatiana Orlova introduced this topic, which followed the successful joint MEQ-BIO Topic Session on Coastal Eutrophication, Phytoplankton Dynamics, and Harmful Algal Blooms. It was recognized that there was a need for a Working Group on harmful algal bloom and that its terms of reference would reflect concerns of the MEQ, BIO and POC committees. For administrative reasons MEQ considered that it would be simpler for the Working Group to report to only one committee (MEQ) but its terms of reference would recognize the need to links concerns of the other committees. Draft terms of

reference were provided by an *ad hoc* group. Membership of the Working Group on Ecology of Harmful Algal Blooms in the North Pacific was discussed briefly prior to their presentation to Science Board. MEQ also recommended to Science Board that travel funds be allocated to allow one of the two Co-Chairmen of the proposed Working Group to travel to meet the other Co-Chairman for one inter-sessional meeting. (See MEQ recommendations to SB.)

#### **The MEQ Strategic Plan (Agenda Item 8)**

Dr. Tkalin presented a draft MEQ Strategic Plan. The document was approved by the MEQ Committee (*MEQ Endnote 4*).

#### **Review of Scientific Sessions at PICES VIII (Agenda Items 9 and 12)**

The Committee reviewed the scientific sessions at PICES VIII. A joint MEQ/BIO Topic Session on Coastal Eutrophication, Phytoplankton Dynamics, and Harmful Algal Blooms (with thirteen invited or contributed papers) was extremely successful and well attended. The MEQ Topic Session on Ecological Impacts of Oil Spills and Exploration (with twelve invited or contributed papers) was also very successful and attracted overflow attendance. A further eleven papers were presented at the MEQ Paper Session. Finally, the Committee noted with pleasure the high standard of presentations at all sessions, including that for contributed papers. This made the choice of the Best Presentation Award at the meeting extremely difficult, but after prolonged discussion, and two rounds of voting, the Committee nominated Dr. Tatiana Orlova (Russia) for the award for her paper entitled "Harmful algal blooms on the Pacific coast of Russia".

#### **Future scientific sessions (Agenda Item 11)**

The MEQ Committee discussed activities for the PICES Ninth Annual Meeting in Hakodate. In addition to the session on the MEQ Practical Workshop, to be co-convened by Ms. Carla M. Stehr (U.S.A.) and Dr. Toshihiro Horiguchi (Japan), agreed to sponsor a Topic Session on Science and Technology for Environmentally Sustainable Mariculture in Coastal Areas. Proposed Co-Convenors are Drs. John E. Stein (U.S.A.) and Colin D. Levings (Canada).

#### **Other business (Agenda Items 13 and 14)**

The Committee discussed various business items referred by the Science Board Chairman, Ms. Patricia Livingston. The Committee agreed to nominate Dr. Stein as its representative on the Steering Committee for the PICES 10<sup>th</sup> Anniversary Symposium.

The Committee also agreed with the suggestion that the Science Board Symposium should be moved to an earlier "slot" during the Annual Meeting, and with the proposal to encourage further inter-committee sponsored sessions.

The suggestion to eliminate the Paper Sessions excited strong disagreement:

members felt that the opportunity to offer papers outside the themes identified by the committees was an important factor in attracting younger scientists, and new ideas, to PICES. The Committee recognized the value of enhancing the status of the poster sessions, and agreed with the mechanisms proposed to achieve this. However, it felt that poster presentations were still viewed in some areas as being less significant than oral presentations, and until this way of thinking changed, the Committee agreed unanimously that it was desirable to retain the Paper Sessions in addition to enhancing the poster sessions.

The proposed amendments to the PICES Handbook were discussed: the Committee was reluctant to remove the guarantee that each Committee could invite one speaker (at PICES' expense) to the Annual Meeting, and it proposed an alternative wording which would provide the flexibility for a committee to invite more than one speaker if that were justified.

The MEQ meeting was formally closed with an expression of thanks to Dr. Tkalin for convening a very successful scientific session.

#### **MEQ Endnote 1**

#### **Participation List**

##### Canada

Richard F. Addison (Rapporteur)  
Steve C. Samis  
F.J.R. (Max) Taylor

##### China

Ming-Jiang Zhou (Co-Chairman, WG 8)

##### Japan

Makoto Shimizu  
Yoichiro Ishibashi  
Yasuwo Fukuyo

##### Korea

K.H. Kim

##### Russia

Alexander V. Tkalin (Chairman, MEQ)  
Irina G. Agafonova  
Dmitry L. Aminin  
Tatiana Orlova  
Lev M. Gramm-Osipov

##### U.S.A.

John E. Stein (Co-Chairman, WG 8)  
Carla M. Stehr

## Observer

Evgeny Shumilin (Mexico)

### **MEQ Endnote 2**

#### **Agenda**

1. Opening and introduction of members, adoption of the agenda (All).
2. Review of WG 8 report (J. Stein, M.J. Zhou).
3. Report on the MEQ Practical Workshop (C. Stehr).
4. Discussion of possible involvement in Arctic Monitoring and Assessment Program, AMAP (A. Tkalin).
5. PICES-GOOS relationships: outcome from discussion at MONITOR WS (A. Tkalin, B. Taft).
6. PICES-ICES relationships: plans for the PICES MEQ – ICES WGBEC WS (R. Addison).
7. Discussion on establishing new Working Group (All).
8. Review and adoption of MEQ Strategic Plan (R. Addison, A. Tkalin).
9. Report on MEQ Scientific Sessions (K.W. Lee, A. Tkalin, T. Orlova).
10. Proposals on publications/travel support (A. Tkalin).
11. Proposals for future MEQ Scientific Sessions (All).
12. Best Presentation Award.
13. Draft report to Science Board.
14. Other matters.

### **MEQ Endnote 3**

#### **Report of Working Group 8 on Practical Assessment Methodology**

The meeting of WG 8 was convened at 0900 on October 10, 1999 (see Annex 1 for list of participants. Ms. Carla M. Stehr agreed to serve as rapporteur.

The meeting agenda (Annex 2) was reviewed and approved. The objective of the meeting was to review status of sample analyses collected during the MEQ Practical Workshop, which was conducted in May and June of this year in Vancouver Harbour, Canada, and to begin planning for the publication and presentation of the Workshop results.

Dr. Alexander V. Tkalin presented preliminary results from analyses of sediment, mussels and fish muscle tissue for trace metals. Prof. Makoto Shimizu presented preliminary results for imposex studies of snails and analysis of mussel tissue for tributyl tin, and Ms. Carla Stehr

presented results of analysis of fish bile for exposure to polycyclic aromatic hydrocarbons and histopathological analyses of fish liver. The draft activity report was discussed, reviewed and accepted with minor revisions (Annex 4).

The other major topics were: a) presentation of the results from the MEQ Practical Workshop at the PICES Ninth Annual Meeting in Hakodate, Japan; and b) publication of data and findings.

a. Presentations: Dr. John E. Stein suggested that individual researchers or each team prepare a poster on their findings. During the proposed session there would be a short presentation (5 minutes) on each poster to brief the objective of the work, the analytical approach, and the major findings. The posters could then be viewed during the

break. The session would also include presentations of particularly interesting findings (abstracts submitted to PICES for oral presentation). To open the session, an overview presentation on the Workshop would be given.

- b. Publications: The Working Group members discussed compiling the data into a series of files, with a preface of 3-5 pages of text consisting of an introduction, materials and methods, and a brief synopsis of the results. This could be published as a PICES Science Report. Possible title for the report is "Environmental Assessment of Vancouver Harbour: Data Report for the PICES MEQ Practical Workshop". The Working Group should approach a journal editor about publishing a special issue on the Practical Workshop. Journals such as Marine Environmental Research, or Marine Pollution Bulletin were suggested as possibilities.

Potential title for a special issue is "Environmental Assessment of Vancouver Harbour: Proceedings of an International Workshop".

- c. The data report would build on the format of the database developed for English sole sampled during the workshop. Additional databases would be prepared for the following samples: 1) benthos, 2) clams/mussels, 3) fish community, 4) harmful algae, 5) imposex in *Nucella spp.*, and 6) sediment chemistry. It will be important to cross reference files such as sediment chemistry with fish data.

The Working Group members approved the draft meeting report and the recommendations to the MEQ Committee (Annex 3).

The meeting was adjourned at 1200 h on October 10, 1999.

## WG 8 Annex 1

### Participation List

#### Canada

Richard F. Addison (WG 8, MEQ)\*  
Steve C. Samis (MEQ)

#### China

Ming-Jiang Zhou, (WG 8 Co-Chairman)\*

#### Japan

Makoto Shimizu (MEQ)  
Yoichiro Ishibashi (observer)

#### Russia

Lev M. Gramm-Osipov (WG 8, MEQ)  
Alexander Tkalin (WG 8, MEQ Chairman)\*

#### U.S.A.

John E. Stein (WG 8 Co-Chairman, MEQ)\*  
Carla Stehr (U.S.A., observer, participant in Practical Workshop)

\*Member of WG 8 Implementation Group for Practical Workshop

## WG 8 Annex 2

### WG 8 Meeting Agenda

Goal of meeting: Review progress in analyses of samples collected during Practical Workshop and determine next

steps in presenting findings to PICES and for publishing data and findings.

Start date/time: 09:00, October 10, 1999

1. Welcome and logistics
2. Introductions of members and observers
3. Discuss and adopt agenda
4. Appoint Rapporteur
5. Review progress of analysis of samples from Practical Workshop
6. Review and revise draft report on activities during Practical Workshop
7. Discuss PICES IX Session for presenting results of Practical Workshop
8. Discuss Workshop Technical Report
9. Other business
10. Consideration, review and approval of recommendations to MEQ
11. Closure of the meeting

## WG 8 Annex 3

### Recommendations to MEQ Committee

1. It was the conclusion of WG 8 that the first objective WG 8, to plan and hold the MEQ Practical Workshop, was achieved, and that the Workshop was a success. The publication of the data and findings from the Workshop is warranted. We therefore recommend that WG 8 continue for one more year to oversee the publication of the results.
2. WG 8 also recommends that the full data set from the MEQ Practical Workshop be published as a PICES Scientific Report, and that PICES consider archiving the data from the Workshop in electronic form as permanent record of PICES activities. It is anticipated that the Scientific Report could be more than 100 pages.
3. All analyses of samples collected during the MEQ Practical Workshop will be completed by June 2000. The WG 8 recommends a one half-day or a whole day special session at the PICES Ninth Annual Meeting on findings from the Workshop. The recommended session title is: Environmental Assessment of Vancouver Harbour Canada: Results from the PICES Practical Workshop.

## WG 8 Annex 4

### PICES Practical Workshop Interim Report

#### Part A – Minutes of meetings and summary of field activities during the MEQ Practical Workshop

*Day 1, May 24, 1999, 1300 h*

##### Agenda

1. Introductions of workshop participants;
2. Safety video (Workplace Hazardous Materials Information System video);
3. Laboratory tour;
4. Description of geographic and oceanographic features of Burrard Inlet.

##### Minutes

1. Colin Levings and John Stein thanked Carla Stehr, Christine Elliott, and Beth Piercey for their efforts to date on logistics, daily work planning, and acquisition of workshop supplies. Their efforts have been key to implementing the MEQ Practical Workshop. Each participant then gave a brief introduction of his or her professional associations,

scientific expertise, and objectives for the workshop. Those in attendance were: Colin Levings, Canada;

Christine Elliott, Canada; Beth Piercey, Canada; John Stein, US; Carla Stehr, US; Alexander Tkalin, Russia; Makoto Shimizu, Japan; Munetaka Shimizu, Japan; Tatyana Belan, Russia; Tatyana Lishavskaya, Russia; Michael Watson, U.S.A.; Toshihiro Horiguchi, Japan; Seiichi Uno, Japan; Tian Yan, China; Zhengyan Li, China; and Jihyum Yun, Korea.

2. Ms. Christine Elliott discussed laboratory safety and showed the WHMIS video, demonstrating the safe use of chemicals. She emphasized that there is no eating, drinking or smoking in any of the laboratories. It was also noted that Material Safety Data Sheets (MSDS) are available for all chemicals

used in the laboratories or on the R/V *Harold W. Streeter*.

3. Ms. Elliott and Piercey conducted a tour of the laboratories available to the participants for the duration of the workshop.
4. Colin Levings gave a short presentation on the general geography and oceanography of the Burrard Inlet to acquaint the participants with features of the sampling sites. He explained that intertidal collections would be done from an 8m outboard-powered launch (boat operator provided by DFO Habitat and Enhancement Branch) that could put scientists on the beach for collecting.

**Day 2, May 25, 1999, 0830 h**

#### Agenda

1. Introductions of participants;
2. National Presentations (1 hour each):  
Canada - Richard Addison, Janice Boyd, Darcy Goyette, Environment Canada.  
China - Tian Yan, Zheng-Yan Li  
Japan - Makoto Shimizu  
Russia - Alexander Tkalin  
United States - John Stein

Dr. Jong Geel Je will give the formal presentation by Korea after he arrives on May 28, 1999. Dr. Sung-Bum Hur of Korea (in the group as an observer) kindly agreed to give a short presentation on current issues associated with aquaculture in Korea. Dr. Hur is a visiting scientist at IOS in Sidney, B.C., Canada.

3. Overview of Puget Sound Protocols: sediment and fish collection - Carla Stehr, U.S.A.;
4. Discussion of previous contaminant monitoring studies in Burrard Inlet. Darcy Goyette, Environment Canada;

5. Specific discussion of workshop sampling plan and greater detail on sampling site characteristics;
6. *R/V Harold W. Streeter* arrives from the U.S.A.

#### Minutes

1. For the benefit of participants arriving today there were brief introductions. Additional scientists joining the Workshop for the day were Sung-Bum Hur (Korea), Tracy Collier (U.S.A.), Janice Boyd (Canada) and Darcy Goyette (Canada). Additional scientists present today for the rest of the Workshop were Richard Addison (Canada) and Stelvio Bandiera (Canada).
2. Summary of presentations

#### *Canada:*

Richard Addison presented an overview of marine environmental monitoring by federal and provincial agencies, and presented representative results from research projects that were pertinent to subjects of interest at the workshop, e.g., TBT and dioxin and furans. There was also a presentation on the BC Environmental Effects Monitoring (EEM) Program. This program is addressing minimizing effects of pulp mill discharges on biota in receiving waters.

#### *China:*

Tian Yan described Chinese programs on marine environmental monitoring of pollution and seafood safety (biotoxins) and briefly discussed a marine reserves program. She followed with highlights of research on effects of TBT on marine species and of studies to measure effects on marine species from marine phycotoxins.



Zheng-Yan Li presented a chronology of the development of marine pollution regulations and programs in Hong Kong. Monitoring efforts are directed towards assessing water quality, the impacts of dredging, and disposal of dredged material. Li also described briefly some of the techniques being used to assess sediment quality and recent results of water quality compliance monitoring.

*Japan:*

Makoto Shimizu gave a complete overview of marine environmental monitoring in Japan. He presented information on individual projects, the responsible agency, project objective, survey areas, frequency of sampling, and measurements made in water, sediment and biota. Janice Boyd (Canada) initiated discussion on the differences in what is classified as ocean disposal in the different PICES countries. For example, disposal in Japan is predominantly in deeper water, while in North America, disposal has occurred in more shallow water.

*Korea:*

Workshop participants appreciated the willingness of Dr. Hur to give, on short notice, brief comments on Korean aquaculture programs and his related research. Currently there are concerns about the degradation of coastal environmental quality and its effect on aquaculture productivity. Specifically, an important cultured molluscan shellfish species is declining and the cause is currently unknown. Research is underway to identify the cause.

*Russia:*

Alexander Tkalin presented a description of the organizational structure of the Far Eastern Regional Hydrometeorological Research Institute in Vladivostok, Russia and the relationships between monitoring and research activities. He also introduced

results of selected research projects that highlighted marine environmental quality.

*United States:*

John Stein started with a brief overview of the federal, state and local (county) agencies with regulatory and monitoring responsibility along the West Coast of the United States. He presented highlights of findings from coastwide and more local (e.g., Puget Sound) monitoring and research studies assessing linkages between marine contamination and effects on marine and anadromous fish species. He emphasized how monitoring results are being used in support of environmental management actions.

3. Carla Stehr presented an overview of the relevant fish and sediment sampling protocols from the "Puget Sound Protocols" and background information on choosing fish species as indicators. She also described, with appropriate photos, how sediment and fish tissues are collected using the R/V *Harold W. Streeter*. The Puget Sound Protocols were developed from inter-agency efforts in the United States to standardize sampling and analysis methodology to improve Puget Sound environmental monitoring data quality.
4. Darcy Goyette, Environment Canada, discussed post-monitoring activities in Burrard Inlet, including information on physical and biological characteristics that proved valuable in fine-tuning the sampling protocol for the workshop.
5. Colin Levings led a discussion of the biota and sediment sampling issues, and answered questions on the sampling sites. The discussion was initiated by a presentation of a table showing the types and numbers of sediment and fish tissue samples to be

taken (necropsy procedure). The table was generated from email exchanges on samples of interest for each investigator.

It was agreed to focus chemistry analyses on fish tissues, rather than a surrogate (e.g. crab hepatopancreas) even though crabs may also be available. Fish age will be determined at the Pacific Biological Station, Nanaimo.

For sediment, it was agreed to follow Puget Sound protocols for chemical analyses. A sediment sample for chemistry will be taken from each of 3 Van Veen grabs to be collected at each site. These grabs will be taken in the same location and at the same time as the benthos sediment grabs. Five grabs per site will be taken for benthos. Five samples for meiofauna will be taken from one grab at each site. Three samples for toxic algae will also be collected.

6. R/V *Harold W. Streeter* arrived from the United States at approximately 1430. Scientists who accompanied the *Streeter* and participated in the first few days of the workshop included Paul Plesha, Dan Lomax, Bernadita Anulacion, and Sean Sol; all research scientists/field biologists from the National Marine Fisheries Service (NOAA) in Seattle.

### ***Day 3, May 26, 1999, Intersessional MEQ Meeting***

The opportunity was taken to hold an intersessional meeting of the MEQ Committee, because several committee members were present for the Workshop.

Attendees - Committee members: R. Addison, M. Shimizu, J. Stein, A. Tkalin, and M. Watson; observers: C. Levings.

### Agenda

1. MEQ Strategic Plan;
2. Publication of MEQ Practical Workshop results;
3. MEQ Sessions;
4. New MEQ Working Group;
5. MEQ interactions with GIWA, ICES, GOOS.

### Minutes

1. The draft MEQ Strategic Plan prepared by Drs. Addison and Tkalin was reviewed. The major components of the plan were briefly discussed. There was agreement on the content. Dr. Stein offered a set of potential broad topic areas for consideration for inclusion in the plan. Suggested topics included: long range transport of contaminants, contaminate effects in highly migratory species, trophic transfer of contaminants, and impact of natural toxins on marine species.
2. Each country agreed to draft a short report for the 1999 Annual Report describing their participation in the workshop and schedule for analyses. Drs. Levings and Stein agreed to draft a short article for PICES Press on the Workshop; the article will include, perhaps, one group photo of the participants and one photo of sampling.
3. Dr. Tkalin reported that satisfactory progress in identifying keynote speakers for the MEQ Topic Sessions at PICES VIII. Dr. Bruce Wright of U.S.A. and Prof. Kazuichi Hayakawa of Japan have agreed to give talks at the session on Ecological Impacts of Oil Spills and Exploration. Dr. David Garrison of U.S.A. has agreed to co-convene the joint MEQ/BIO session on Coastal Eutrophication, Phytoplankton Dynamics, and Harmful Algal Blooms.

4. There was discussion of potential new topics for a new Working Group to be sponsored by the MEQ Committee. Two possible topics for consideration at PICES VIII are harmful algal blooms, and long-range transport of contaminants. It was agreed that topic(s) for new working group(s) will be an agenda item for the MEQ Committee at PICES VIII.

5. There was considerable discussion of potential interactions between the MEQ Committee and other Organizations and Programs. A few possibilities currently before the Committee are: 1) continuing to explore interactions with GIWA, 2) more formal coordination with GOOS, and 3) a joint meeting with the ICES Working Group on Biological Effects of Contaminants.

Dr. Addison will continue communication on potential interactions with GIWA. Presently GIWA has an Executive Secretary and is apparently hiring secretarial staff.

Several members of the MEQ Committee have attended variously GOOS meetings or workshops, and there was agreement that there is a potential for collaboration between the MEQ Committee and the coastal oriented GOOS projects [e.g., North East Asia Regional – GOOS, (NEAR-GOOS)]. Further discussions will be needed at the PICES VIII meeting on interactions with GOOS.

***Days 3 – 14, May 26 - June 6, 1999, MEQ Practical Workshop field activities***

May 26 - Prepared supplies and equipment for sample collection. Received safety training concerning the research vessel.

May 27 - Sample collection at trawl and sediment site 49, and intertidal site I-1 (West Vancouver Lab).

May 28 - Sample collection at trawl and sediment site 11B and intertidal site I-3 (Longsdale Quay). DFO launch operator Bruce Clark and Beth Piercey briefed intertidal collectors on small boat safety and issued PFDs (lifejackets).

May 29 - Sample collection at trawl and sediment site 38, intertidal site I-5 (Port Moody), sediment site 41B (Ioco) and intertidal site I-6.

May 30 - Sample collection at trawl and sediment site 48 and intertidal site I-4 (Indian Arm).

May 31 - free day except for scientists Horiguchi and Li, who traveled to Victoria to look for snails for imposex research since none have been observed at any of the planned sites. Snails were successfully located at four sites in Victoria.

June 1 - Sample collection at sediment sites 3A (Sulfur Dock), intertidal site I-2, and return to site 11B for additional trawls for length/weight flatfish community data. Dr. Jong Jeel Je arrived from Korea.

June 2 - Sample collection at trawl and sediment site 50 (Gibsons) and intertidal site I-7, and snail collection at Mission Point, near Sechelt. Part of the group traveled by ferry/van, others via the R/V *Streeter*.

June 3 - Return to site T-49 to get additional length/weight data for fish community research. Additional sediment grabs and fishing operations were conducted for interested scientists. Research vessel departed for return transit to Seattle.

June 4-6 - Sample processing in the laboratory, and preparation of samples for shipping to the participants laboratories.

June 7 - Final meeting and barbecue at Co-Chairman Colin Levings' house.

Sample collection Synopsis:

- Seven sites were sampled for sediment and benthic invertebrates;
- Five sites were sampled for fish;
- Seven sites were sampled for intertidal invertebrates and algae;
- Four sites on Vancouver Island and one near Sechart (north of Howe Sound) were added for snail imposex determinations;
- The total number of samples collected are summarized in the minutes of June 7, 1999.

**Day 15, June 7, 1999, Review of field activities and plans for sample analysis and overview of Practical Workshop activities**

Agenda for morning session: Review of field activities and plans for sample analysis;

1. View photos/slides of Practical Workshop activities;
2. Data review: - list samples taken
3. Preliminary discussion of next steps
  - Analyses - deadlines
  - Where do we go from here?
  - MEQ Strategic Plan

### Minutes

1. Ms. Stehr, who had been photographing the workshop activities, showed 35 mm slides from the previous 2 weeks. These slides provided documentation of workshop activities.
2. A list of samples collected during the Practical Workshop:

### Fish

- 162 Otoliths (Canada)
- 152 Histology (liver, kidney, gonads) (US)
- 35 Plasma for vitellogenin (US & Japan)

- 143 Bile for fluorescent aromatic compound (FACs) analyses (some fish did not have bile) (US)
- 150 Liver for organic analyses (US)
- 93 Liver organic analyses (Japan)
- 25 Muscle for trace metals analyses (Russia)
- 49 Muscle for organic analyses (Japan)
- 150 Gonads for organic analyses (Japan)
- 60 Liver for Cytochrome P450 1-A (CYP1A) (Canada)
- 60 Liver for DNA adducts (US)
- 95 Stomachs for taxonomy of contents (Canada)
- 500 Length/weight of English sole (Canada)
- 25 (trawls) species composition, biomass data collected (Canada)

### Sediment

#### *Benthos*

- 35 grabs (0.1 m<sup>2</sup>), Benthic community (Russia & Korea)

#### *Sediment Chemistry*

- 21 sediments for trace metals (Russia)
- 21 sediments for TOC, TN (US & Canada) (C,H,N - need to discuss who will do total nitrogen)
- 21 sediments for organic (US)

#### *Meiofauna & grain size*

- 245 sediment samples (one grab at each site, 5 samples/grab, 7 slices from each sample with 4 for meiofauna, 3 for grain size) (Canada and Korea).

#### *Microalgae*

- 9 sediment samples (3 sites, 3 reps/site) to culture microalgae from surficial sediments (China and Canada).

### Intertidal

#### *Mussels - 7 sites*

- 30/site trace metal (Russia)
- 500 g/site whole mussel for algal toxin. (China)
- 50 animals/site (9 sites) for organotin\* (Japan) (2 extra sites: Clover Point, Victoria, and Sechart)

- 50 animals/site for OCs and PAHs and lipids (8 sites) (Japan)
- 4 sites sampled for mussel community using quadrates (Korea)
- 100 random mussels from 7 sites for condition factor, lipid (Korea)

\* composites will be analyzed

*Molluscs for organotin analyses (Japan)*

site	Bivalve collected
I-1	mussel, oysters
I-2	mussel, littleneck, butter, pointed macoma
I-3a	mussel
I-3b	mussel
I-3c	mussel
I-4a	mussel, littleneck, butter, pointed macoma, cockle
I-4b	littleneck, butter, pointed macoma, cockle, horse clam
I-5	mussel
I-6	mussel, mya, littleneck, butter clam, oyster
I-7	mussel, softshell, dark mahogany clam, oyster

Oyden Pt. - Nucella spp.  
 Clover Pt. - Nucella spp., mussel  
 10 Mile Pt - Nucella spp.  
 Missions Pt. - Nucella spp

(mussel = Mytilus trossulus)  
 (oysters = Crassostrea gigas)  
 (native littleneck clam = Protothaca staminea)  
 (butter clam = Saxidomus giganteus)  
 (cockle = Clinocardium nuttali)  
 (horse clam = Tresus capax)  
 (softshell clam = Mya arenaria)

*Snails for imposex analyses (Japan and China)*

300-400 snails were collected at 3 sites in Victoria including: Ogden Pt., Clover Pt., and Ten-mile Pt., and one site at Mission Pt. Sechelt. Of those collected, approximately 80 were Nucella e., 80 were Nucella l.,

and 100 were Nucella c. The Nucella c. could also be Nucella lima; Jong will do chromosome test for species ID.

3. The following tentative analysis deadlines were established:

- Otoliths, length frequency, fish community analyses – September 1999 (Canada)
- Vitellogenin - September 1999 (Japan), June 2000 (US)
- Bile - September 1999 (US)
- Liver organics - June 2000 (US, Japan)
- Fish muscle trace metals - December 1999 (Russia)
- Fish muscle organics - June 2000 (Japan)
- Fish gonad organics - June 2000 (Japan)
- Fish liver CYP1A - September 1999 (Canada)
- Fish liver DNA adducts - December 1999 (US)
- Benthos species list - September 1999 (Korea and Russia)
- Benthos statistics - December 1999 (Korea and Russia)
- Sediment metals - September 1999 (Russia)
- Sediment organics - June 2000 (US)
- Sediment Total Organic Carbon - June 2000 (US)
- Meiofauna and sediment grain size - June 2000 (Canada)
- Grow out cysts from sediment - December 1999 (Canada)
- Biotoxin analyses of molluscs - June 2000 (China)
- ARTOX analyses of microalgae - September 2000 (China)
- Mussel trace metals - December 1999 (Russia)
- Mollusks - TBT June 2000 (Japan)
- Snails, imposex - June 2000 (Japan, China)
- Bivalve organics - June 2000 (Japan)

Mussel community data, condition factor  
- June 2000 (Korea)

Agenda for afternoon session: Overview of  
Practical Workshop activities

1. Report on Workshop activities
2. Sampling overview
3. Publications
4. Future – Strategic Plan discussion

Minutes

1. Carla Stehr presented the workshop slide show again as a visual aid to describe workshop activities for Dr. Alexander Bychkov, PICES Executive Secretary.
2. Richard Addison provided a summary of sampling sites, samples taken, and anticipated completion dates for analyses.
3. Discussion on publications from the MEQ Practical Workshop resulted as follows:

John Stein and Colin Levings will draft an article for PICES Press. The article is due to the Secretariat in late September 1999. A lead scientist was delegated to develop a 1-2 page summary of samples and analyses to date. The summary is due to Levings and Stein on September 20, 1999. The teams and team leads are:

<u>Team</u>	<u>Lead Scientists</u>
Fish	Stehr
Benthos	Je
Imposex	Horiguchi
Algal Toxins	Yan
Mussels	Tkalin
Clam	Uno

Participants also consider developing a PICES Scientific Report. A final decision will be made at PICES VIII in

Vladivostok, in October 1999. This would be a possible venue for presenting the full data sets from the Practical Workshop. Data sets are to be completed by June 2000.

A “primary” publication in a special issue of a scientific journal was discussed. Whether a special issue will be possible will depend on the findings from the workshop. Potential journals to consider: Marine Environmental Research, Marine Pollution Bulletin, Environmental Pollution.

4. Future MEQ activities were also a topic of discussion. Alexander Tkalin discussed in general terms the potential interactions with other scientific organizations. Alexander Bychkov presented current status of interactions between ICES and GOOS and possible discussions between PICES and GOOS to consider a more specific relationship. The discussions may be initiated in the MONITOR Task Team Workshop at PICES VIII.

The former MEQ chairman, Richard Addison, has also been contacted by ICES members to explore possible interactions with MEQ on a novel approach to evaluate environmental monitoring data. The possibility of holding a joint PICES, ICES and SETAC workshop will be discussed in the near future. The workshop could be held in the Pacific Northwest.

Colin Levings proposed consideration of pursuing contacts with LOICZ, because of the similarities with the goals of MEQ. No conclusion was reached on the next step for external relations. Alexander Bychkov will keep us informed of discussions taking place at the level of the Secretariat.

There are other possibilities for interactions of MEQ with a range of organizations. This will be a major topic for the MEQ Committee to work on at PICES VIII.

Alexander Tkalin then gave an overview of discussions within MEQ on topics to be considered for new Working Groups to be sponsored by MEQ. The possible Working Groups are:

- HABs: atlas and training workshop organization;
- Long range transport of contaminants and nutrients.

The status of WG 8 was discussed. The question is whether to continue WG 8 until the results are published. It was agreed that this item will be formally

#### **Part B - Status reports on sample analyses**

##### 1. Summary of status of analyses of samples

###### Benthos Team

Korea and Russia - Benthic community data: species list and statistics expected December 99.

Canada – Meiobenthos: data expected June 2000

###### Sediment Chemistry

Russia - Metals analyses of sediment complete.

US - Aromatic and chlorinated hydrocarbon analyses of sediment are in process: data expected Jan. 15, 2000.

US - Total organic carbon analyses of sediment complete.

###### Mussel Team

Russia - Metals analysis on mussels have been completed. One site had particularly high concentrations of Al, Cu, Pb and Fe compared to the reference sites.

discussed at PICES VIII, in regard to overseeing the publication of the Practical Workshop findings.

Alexander Bychkov provided his view on the success of the Practical Workshop and expressed thanks for the efforts of Colin Levings in organizing the Workshop and being a very good host. Bychkov said, clearly, the Workshop was a great success. Alexander Tkalin also thanked Carla Stehr and John Stein and the other US participants for providing the R/V *Streeter* and their expertise in sampling. Colin Levings expressed his thanks to all participants for attending the workshop and making it a great success. The Practical Workshop was formally adjourned at 1500.

Japan - Organic chemical analyses and lipid content in mussels expected to be complete in June 2000.

Japan - Organotin compounds in *Mytilus trossulus* has been completed, with the highest levels evident at all of the non-reference sites in Vancouver Harbor.

Korea - Condition factor and community analyses expected June 2000.

###### Clam Team

Japan - Analyses for organotin compounds clams expected to be completed in the next few months.

Japan - Organic chemical analyses expected June 2000.

###### Harmful Algal Team

China - Harmful Algae. Standard Artemia Toxicity Test (ARTOX) was performed during the workshop to detect harmful microalgae in Vancouver Harbor. Microalgal cells were scraped from macroalgae and concentrated. Positive results of samples from Lonsdale Quay suggested that *Heterosigma* or the DSP

producer *Prorocentrum* might be present.

China - Shellfish samples (both intertidal and species) collected and frozen during the workshop will be analyzed for Paralytic Shellfish Poison using HPLC in the next few months.

Canada - surficial sediment was incubated for 3 weeks, and samples collected every few days and preserved. These samples will be analyzed for phytoplankton abundance and composition over the next few months.

#### Imposex Team

Japan - Two species of dogwinkle were examined for imposex. 72 to 100% of the snails examined at all four sites (three sites near Victoria, and one site in Howe Sound) were affected. Additional species of snails will be examined in the next few months.

China - Imposex data expected in the next few months.

Japan - Analyses for Organotin compounds in *Nucella* will be completed soon.

#### Fish Team

US - Fish histopathology. Most of slides read - preliminary data available. Liver lesions were not observed in fish examined at the reference sites, however 24 % of fish at the three test sites had one or more types of lesions known to be associated with contaminant exposure.

Canada - Fish age. Otoliths have been read. Results suggest that there is some density dependence, possibly because this is an unfished population. Fish are older than expected based on size.

Canada - Sites were plotted and charted by GIS. Tables of trawl and grab location data are complete.

Canada - Fish community data are expected to be complete by March 2000.

Russia - Metals analyses of fish muscle are complete.

Japan - Vitellogenin analyses (2 sites). Blood plasma collected from English sole at two sites was analyzed during the workshop. No vitellogenin was observed in any of the samples, except for one individual from the reference site. Reconfirmation of the sex (histology), and check for cross reactivity by immunoblotting needs to be done to rule out an error in sex determination or non-specific cross reactivity.

US - Vitellogenin analyses (2 sites). Data expected December 1999.

Canada - CYP1A in fish liver data are expected December 1999.

Japan - Organic chemical analyses of fish muscle, liver and gonad are expected June 2000.

US - Chlorinated hydrocarbon analyses of fish liver are expected January 2000.

US - PAH metabolites in bile, the data are available.

US - DNA adducts in liver (2 sites) data are expected in June 2000.

## 2. Individual Status Reports

### Benthos Team Status Report

Benthic community identification and statistical analysis (Russia and Korea) are in process and expected December 99.

Meiobenthos (Canada) are in process and are expected June 2000

### Sediment Chemistry Status Report

Dr. Stein's Lab: TOC analyses (seven sites) - data completed and available at the PICES VIII meeting.

Dr. Stein's Lab: AH and CH analyses: Samples from all 7 sites have been extracted and are in the process of being analyzed, estimated data availability is January 15, 2000.



Dr. Tkalin's Lab: Metal analyses are completed.

Mussel Team Status Report

Mussel collecting group consisted of Beth Piercey (Canada), Seiichi Uno (Japan), Ji-Hyun Yun (Korea), Alexander Tkalin and Tatiana Lishavskaya (Russia). During the Workshop, mussels *Mytilus trossolus* were collected at low tide at seven locations

(Table 1). Collected samples were used to characterize community structure (Beth Piercey and Ji Hyun Yun). Content of organic pollutants (PAHs, organochlorines, butyltin compounds, etc.) will be analyzed in Japan (Seiichi Uno) and trace metal concentrations will be determined by a few labs in Vladivostok, Russia. Metals analyses of mussels by Dr. Tkalin's Lab and TBT analyses of mussels by Dr. Horiguchi are complete.

Table 1. Sampling locations (I=intertidal)

Sample code	Date	Location	Additional information
I-1	May 27	PEI site, West Vancouver Lab.	Reference site
I-3A	May 28	Lonsdale Quay, Seaboard Int.	
I-5B	May 29	Port Moody	
I-6	May 30	Port Moody (loco)	
I-2A	May 30	Sulphur Dock, Brockton Pt.	
I-4	June 1	Indian Arm, Cates Park	
I-7	June 2	Howe Sound	Reference site

Clam Team Status Report

Japan - organic chemical analyses and lipid analyses expected by June 2000.

Japan - TBT analyses to be completed in the next few months.

Harmful Algal Team Status Report

Tian Yan: Shellfish samples have been collected during the workshop for algal toxin analysis, including intertidal and benthic species. About 500g whole mussels *Mytilus edulis* were collected at each intertidal sampling site to study algal toxin distribution in Vancouver Bay. Clam samples were also got from some intertidal beach (*Ruditapes philippinarium*, *Venerupis staninea*) and from benthic trawl sampling (*Clinocardium*

*nuttallii*, *Yoldia sp.*). Samples were processed immediately after collected and put into deep freezer for later lyophilizing. Paralytic Shellfish Poison (PSP) of each sample will be analyzed using HPLC.

Tian Yan: Standard Artemia Toxicity Test (ARTOX) has been performed during the workshop to detect harmful microalgae in Vancouver Bay. Main species of macroalgae including *Ulva lactuca*, *Fucus gardneri*, *Laminaria saccharina*, *Iridaea cordata*, *Dilsea californica*, *Gigartina exaparata*, *Saragassum muticum*, *Pylaiella littoralis* at each sampling site were collected. Attached microalgal cells were scraped from macroalgae and concentrated for ARTOX. Positive results of sample from Lonsdale Quay indicated that toxic algae such as *Heterosigma* or DSP producer *Prorocentrum lima* might be present in the water.

Terri Sutherland: Replicate sediment core samples have been collected from three sampling sites within Vancouver Harbour. The surficial sediment of each core was incubated using phytoplankton growth medium and optimal light conditions for approximately 3 weeks. Subsamples were collected every few days and preserved in Lugol's Solution. These samples will be analyzed for phytoplankton abundance and composition over the next few months. The germination of potentially harmful phytoplankton will be documented.

### Imposex Team Status Report

A list of specimens taken around Vancouver, May 24 - June 7, Dr. Toshihiro Horiguchi:

May 27

I-1 Foolish Mussel (*Mytilus trossulus*)  
Pacific Oyster (*Crassostrea gigas*)

May 28

I-3-A Foolish Mussel (*Mytilus trossulus*)  
I-3-B Foolish Mussel (*Mytilus trossulus*)  
I-3-C Foolish Mussel (*Mytilus trossulus*)

May 29

I-5-B Foolish Mussel (*Mytilus trossulus*)  
I-6 Foolish Mussel (*Mytilus trossulus*)  
Softshell-Clam (*Mya arenaria*)  
Japanese Littleneck (*Venerupis philippinarum*)  
Pacific Littleneck (*Protothaca staminea*)  
Butter Clam (*Saxidomus gigantea*)  
Pacific Oyster (*Crassostrea gigas*)

May 30

I-4-A Foolish Mussel (*Mytilus trossulus*)  
Pacific Littleneck (*Protothaca staminea*)  
Butter Clam (*Saxidomus gigantea*)  
Pointed Macoma (*Macoma inquinata*)  
Nuttall's Cockle (*Clinocardium nuttallii*)

I-4-B Pacific Littleneck (*Protothaca staminea*)  
Butter Clam (*Saxidomus gigantea*)  
Pointed Macoma (*Macoma inquinata*)  
Nuttall's Cockle (*Clinocardium nuttallii*)  
Horse Clam (*Tresus capax*)

May 31

VictoriaOgden Point  
File Dogwinkle (*Nucella lima*)  
Frieded Dogwinkle (*N. lamellosa*)

Clover Point

Striped Dogwinkle (*Nucella emarginata*)  
File Dogwinkle (*N. lima*)  
Frieded Dogwinkle (*N. lamellosa*)  
Foolish Mussel (*Mytilus trossulus*(?))

Ten-mile Point

File Dogwinkle (*Nucella lima*)  
Frieded Dogwinkle (*N. lamellosa*)

June 1

I-2 Foolish Mussel (*Mytilus trossulus*)  
Pacific Littleneck (*Protothaca staminea*)  
Butter Clam (*Saxidomus gigantea*)  
Pointed Macoma (*Macoma inquinata*)

June 2

Wilson Creek, Mission Point  
File Dogwinkle (*Nucella lima*) (?)  
Frieded Dogwinkle (*N. lamellosa*)

I-7

Foolish Mussel (*Mytilus trossulus*)  
Softshell-Clam (*Mya arenaria*)  
Dark Mahogany-Clam (*Nuttalia obscurata*)  
Pacific Oyster (*Crassostrea gigas*)

June 3

T-49 Milky Venus (*Compsomyax subdiaphana*)

Imposex examinations on *Nucella lima* and *Nucella lamellosa* are complete. Organotin analyses in tissue of the foolish mussel, *Mytilus trossulus* are also complete.

Future studies:

- 1.1 Examination of imposex symptoms in a few species of *Nucella*
  - 1.2 Comparison of imposex symptoms among *Nucella* species
  - 1.3 Determination of organotins in tissue of *Nucella* species
  - 1.4 Comparison of organotin contamination and imposex symptoms in *Nucella* species with those in Japanese gastropods, such as the rock shell, *Thais clavigera*
- 
- 2.1 Determination of organotins in tissue of other bivalve molluscs
  - 2.2 Comparison of organotin accumulation among the bivalve species
  - 2.3 Comparison of organotin contamination levels observed in bivalves around with those in Japan

#### Fish Team Status Report

Tissues were sampled from English sole at 5 sites during the workshop. The sites were: T-49, West Van. Lab; T-11B, Lonsdale Quay; T-38, Port Moody; T-48, Indian Arm; T-50, Gibsons, Howe Sound.

Status of fish tissue analyses:

Dr. Uno:

CHs and AH metabolites in fish tissues (liver, gonad, muscle) to be completed by June 2000

#### **MEQ Endnote 4**

1. Review of activities

Dr. Stein's group:

CH analyses of fish liver (5 sites) original deadline was June 2000. Revised date of data availability estimated to be Jan 15, 2000.

PAH metabolites in bile (5 sites) - complete data will be available at the PICES VIII meeting.

Histopathology (5 sites) of English sole liver, kidney and gonad: tissues have been embedded and sectioned, most slides have been read. Preliminary data summary will be available at the meeting.

Plasma Vitellogenin (2 sites) - expect to be completed in December 1999.

DNA adducts in liver (2 sites) - expect to be completed in March 2000.

Dr. Tkalin's group:

Metals analyses of fish muscle (5 sites) - complete; data will be presented at the PICES VIII meeting.

Drs. Addison and Bandiera:

CYP1A of fish liver (5 sites) expect to be completed in November or December 1999.

Dr. Munetaka Shimizu:

Vitellogenin (2 sites) - analyses were completed during the workshop, a preliminary report will be available at the workshop.

Dr. Levings' group:

Otoliths (age) - otoliths have been read, and data is being entered into a database.

#### **MEQ Strategic Plan**

The first MEQ meetings at Victoria, Canada (1992) and Seattle, U.S.A. (1993), were largely focused on identifying common

problems of marine pollution in the North Pacific. It was decided that MEQ should concentrate its efforts on coastal pollution problems (instead of open ocean processes). The preliminary focus was on "Interdisciplinary methodology to better assess and predict the impacts of pollutants on structure and function of marine ecosystems". Two areas were mentioned as particularly important: algal blooms and chemical and biological contaminants. In 1992, Working Group 2 (WG 2) on Development of Common Assessment Methodology for Marine Pollution was established under the leadership of Dr. Richard F. Addison, Canada. Prof. Jia-Yi Zhou, China, was elected MEQ Chairman in 1992.

At PICES III (1994), MEQ held a symposium on "Interdisciplinary methodology to better assess and predict the impact of pollutants on structure and function of marine ecosystems." It was decided also to organize a Practical Workshop at one of the impacted coastal ecosystems of the western North Pacific to work on common methodology of marine environment quality assessment. The proposed preliminary workshop site was the Yangtze estuary, East China Sea. After the meeting, Working Group 2 was disbanded and Working Group 8 on Practical Assessment Methodology was established to prepare and organize the Practical Workshop.

At PICES IV (1995), MEQ held a symposium on "Sources, transport, and impact of chemical contaminants." WG 8 recommended organizing Practical Workshop in Jiaozhou Bay, China (instead of Yangtze estuary) to trace the ecological impacts along the gradient of chemical contamination. Dr. Addison was elected the new MEQ Chairman.

At PICES V (1996), MEQ held a session on "Processes of contaminant cycling." WG 8

developed a Scientific Workplan to hold the Practical Workshop in Qingdao, China, in 1997. Harmful algal blooms and environmental impacts of aquaculture were considered as possible topics for future MEQ sessions.

At PICES VI (1997), MEQ held a session on "Processes of contaminant cycling." Three priority areas were identified for inter-sessional activities: 1) Environmentally sound mari-culture: status and technology needs; 2) Harmful algal blooms; and 3) MEQ/PICES interactions with GIWA (Global Assessment of International Waters): a feasibility study. The WG 8 report on preparation of Practical Workshop in Jiaozhou Bay, China, was also approved. Following the WG 8 meeting, the Chinese authorities informed PICES that "... the present situation in Jiaozhou Bay is not suitable to hold the workshop...", and after some discussion within MEQ, the proposed site was moved to Vancouver.

At PICES VII (1998), MEQ discussed the report of WG 8 on preparation for the Practical Workshop in Vancouver Harbor in May-June 1999. The MEQ topic session was on "Science and technology for environmentally-sustainable mariculture". Joint MEQ/BIO Session was devoted to "Contaminants in high trophic level biota - linkages between individual and population responses". Dr. Alexander V. Tkalin was elected as new MEQ Chairman.

In summary, over the past years, the Marine Environment Quality Committee of PICES has focused its activities on coastal pollution problems and common methodology to estimate the state of marine ecosystems under anthropogenic pressure. Closer links between marine chemists and marine biologists working on pollution problems in PICES member countries have been established.

2. The future

The main goal of MEQ, as part of PICES, is to improve "scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impacts of human activities". Increasing information exchange and collaboration between scientists of PICES countries will be of mutual benefit to their people and will help to sustainable development of these countries.

For the coming years, the following scientific themes are considered of high priority to MEQ:

- Coastal pollution: eutrophication, phytoplankton dynamics and harmful algal events (joint MEQ/BIO session to be held at PICES VIII in Vladivostok);
- Ecological impacts of oil spills, oil exploration, land reclamation and other man-made activities (aspects addressed in MEQ topic session, PICES VIII, Vladivostok);
- Science and technology for environmentally sustainable mariculture: impacts and mitigation in coastal areas (MEQ topic session, PICES IX, Japan);
- Impacts of climate change on coastal ecosystems;
- Biological and physical transport of anthropogenic substances in the North Pacific;
- Assessment of the impacts of human activities on marine ecosystem integrity and harmonization of existing methodologies used in PICES countries.

Diseases in marine species: population level effects and the role of human activities in their occurrence.

MEQ should work to establish links with relevant international organizations/programs (GIWA, GOOS, ICES, NOWPAP). Preliminary discussions with GIWA have not been productive: although a presentation on behalf of GIWA was made at PICES VI (Pusan). The GOOS program may be of more direct relevance to PICES interests, especially as some member countries already have developed GOOS components, and in the short term, GOOS may be a more appropriate vehicle for PICES to use to establish international connections. In addition, Dr. Addison has been contacted by the Chairman of the ICES Working Group on the Biological Effects of Contaminants (WGBEC), which is the ICES "equivalent" to PICES MEQ, with the aim of establishing common interests of the two groups, which could lead to future joint meetings. It is also important to broaden interest in MEQ within PICES countries and through the scientific disciplines (e.g., marine mammals, birds, etc.) by bringing new people to PICES meetings and inviting prominent scientists from all over the world.

As a forum of international experts, MEQ should identify priorities for interdisciplinary research in the PICES area for a better understanding of structure, function, and health of marine ecosystems under anthropogenic pressure.

## MEQ Endnote 5

### MEQ Recommendations to Science Board

1. WG 8 should remain established for one more year to complete collation, editing and publication of results from the MEQ Practical Workshop (expected

completion date fall 2000). (Recommendation forwarded from WG 8).

2. At the PICES Ninth Annual Meeting in Hakodate MEQ should
  - sponsor one half- or full- day session, co-convened by Dr. Toshihiro Horiguchi (Japan) and Ms. Carla M. Stehr (U.S.A.) for detailed presentations of results from the MEQ Practical Workshop. (Recommendation forwarded from WG 8);
  - co-sponsor with BIO a topic session entitled “Science and technology for environmentally-sustainable mariculture in coastal areas” (Co-convenors: Drs. Colin D. Levings (Canada) and John E. Stein (U.S.A.)).
3. PICES should publish the full data set from the MEQ Practical Workshop as a PICES Scientific Report, in which data would be available for citation in publications in the primary refereed literature. PICES consider archiving the data from the Workshop in electronic form as permanent record of PICES activities. (Recommendation forwarded from WG 8).
4. PICES should provide travel support to allow one of the two Co-Chairmen of the new Working Group on Ecology of Harmful Algal Blooms in the North Pacific to visit the other Co-Chairman for one inter-sessional meeting before PICES IX.