

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE



The MEQ Scientific Committee met in two sessions during PICES V in Nanaimo, British Columbia, Canada. The first session was held from 1330 to 1730 hours on Wednesday, October 16, 1996. A concluding session was convened from 1330 to 1730 hours on Thursday, October 17, 1996.

Introduction

The meeting was opened by MEQ Chairman, Dr. Richard Addison, who welcomed all participants, and asked that each introduce themselves and their affiliations. The Chairman then proposed an agenda which was unanimously accepted, and the meeting was called to order.

Best MEQ Paper Award

This was deferred until the conclusion of the MEQ second session on Thursday 10-17-96, after which MEQ members selected the winner by closed ballot. The winner of the PICES V Award for Best MEQ Paper was Dr. Yuan Gao, Research Professor at the Institute of Marine and Coastal Sciences, Rutgers University. Dr. Gao's winning paper was entitled "Cycling of contaminants through the atmosphere: long range transport vs. regional deposition".

Presentation of WG 8 Report

WG 8 Co-Chairman Dr. Stein then reported on the progress of his Working Group, which is tasked with planning and convening an MEQ Practical Workshop in Jiaozhou Bay, Qingdao, People's Republic of China. This workshop aims to harmonize approaches among PICES countries to assess ecological impacts of pollution, by working together on a single issue. The specific goal of the workshop is to assess bioaccumulation and effects of contaminants in Jiaozhou Bay ("contaminated" site), as compared to Laoshan Bay ("reference" site).

Although markedly different in their extent and types of pollutant sources, both bays are heavily focused on mariculture and are reasonably comparable in terms of oceanographic, sedimentation, and biological characteristics.

The workshop also represents the first step leading to a much larger scale project (Phase II) in the Changjiang (Yangtze) estuary, which will be conducted along a preselected gradient in the East China Sea as a contribution to baseline data for the Three Gorges Dam Project.

WG 8 convened October 11-12, at the Coast Bastion Hotel, Nanaimo, to review current progress and draft a more specific work plan. Some of the more fundamental concepts in the research design had been previously set forth at a preliminary ad hoc meeting of North American members of MEQ and WG 8, held in Seattle June 20. The Qingdao Practical Workshop will take place in May - June of 1997, and will consist of three phases.

First, a compilation of existing data and literature specific to the Qingdao marine ecosystem will be performed. This effort is currently in progress, directed by Dr. Levings with assistance from a Chinese graduate student from Qingdao, currently studying at the University of British Columbia. Concurrent with the literature review, the variables to be measured will be finalized within the research design.

The second phase, planned to begin in May, 1997, will be a field reconnaissance survey in Qingdao, to assess the feasibility of sampling, and to validate the sampling design. The reconnaissance will also serve to confirm that all necessary equipment is available and working, to field-test the sampling gear, and to set up the laboratory. This preliminary work will continue for 1-2 weeks. Three or four MEQ/PICES scientists of varying but complementary

backgrounds will work with the Chinese in this effort. It is suggested that daily e-mail reports of the reconnaissance survey be sent out daily to all workshop participants.

The third phase, scheduled for June, 1997, will be the actual implementation of the Practical Workshop in Qingdao. Within a week following the reconnaissance survey, the sampling design will be refined as appropriate and sampling will begin.

The tentative design of the research will include the following major points:

- Jiaozhou Bay and the nearby Laoshan Bay (reference site) will be sampled cooperatively by the MEQ international team of participating scientists, with headquarters and facilities under the guidance and kind cooperation of Prof. Ming-Jiang Zhou, Academia Sinica. This cooperative sampling and analysis phase will be carried out by up to 24 participants, approximately four from each PICES member country.
- Sediment and benthic invertebrates will be the primary focus. Fish and other vertebrates will serve as a secondary focus.
- Jiaozhou Bay benthos will be sampled at 5 - 7 sites, with the center of the bay serving as an integrating site for comparative purposes. Included in the peripheral sites--at a minimum-- will be specific benthic grabs from gradients off an industrial site, an agricultural runoff site, and an aquaculture site.
- At the same time, studies of primary productivity will be conducted, via an ongoing agreement between Japan and China. Dr. Watanabe (MEQ member and WG 8 member) is coordinating this phase of the study with Dr. Harada, and Prof. Ming-Jiang Zhou.

- For performing laboratory analyses of the various samples, four possibilities were set forth:

1. As many of the analyses as possible would be performed cooperatively at the Institute of Oceanology in Qingdao.
2. On a case-by case basis, certain types of analyses might necessarily be performed at other PICES-participating laboratories elsewhere in the Northwest Pacific.
3. It may also be necessary to perform some specific analyses at other locations outside PICES laboratories, with involvement of participants as feasible, and
4. certain analyses (e.g. otolith aging) which do not require inter-laboratory cooperation could be done at any convenient time and location later on.

- Immediately following the workshop, wrap-up meetings would also be held in Qingdao.

- Data exchange and interpretation, and the formulation of preliminary results would continue through summer 1997.

- At PICES VI (October 1997), MEQ /WG8 will issue a preliminary report to PICES.

- A more complete series of review and discussion of our findings will take place at PICES VII in October, 1998.

- Final publication of the results in the scientific literature will be rigorously pursued, as appropriate.

Expected products of the Workshop will be:

1. At the minimum, an improved understanding of the impacts of pollution in Jiaozhou Bay.
2. In addition, a "synergistic" output resulting from a range of techniques and approaches applied to a single issue of mutual research interest, and

- Probably most importantly, an improved appreciation of the motivations, approaches, needs and expertise of our MEQ /PICES colleagues.

Discussion of WG 8 Report and Recommendations

Dr. Stein's presentation stimulated considerable discussion about the proposed Qingdao practical workshop.

Dr. Varanasi reminded the group that one of the original MEQ goals for this exercise - the comparison of methodologies - does not appear to be adequately stressed by the proposal. Inter-calibration and inter-comparisons among the various participating scientists and laboratories will be of great benefit in sharing techniques with all participating scientists, and will also generate data which are more quality assured. MEQ agreed that it will be important to do as much of the laboratory work as possible on location in Qingdao, while we all able to benefit from working closely with one another at a common facility.

Dr. Addison suggested that it would be best to do as much analyses as possible on site in Qingdao. Some of the tests, such as total fluorescence for total hydrocarbons, would be relatively quick and easy to do. For a few critical procedures, such as low level GC /MS analyses for certain pollutant suites, "Comet" assays, etc., it may be necessary to ship samples or sample extracts to other laboratories outside China. There was agreement that wherever possible, scientific and analytical work should be done together as a group in Qingdao. Since the goal of the Technical Workshop is the harmonization of techniques and methodologies among PICES member scientists, it is critical that the highly specialized and novel assessment techniques be conducted as a team on site, as much as possible.

It was suggested that we view the possible sampling of marine birds on an "opportunistic" basis. MEQ hopes that a limited number of

specimens of appropriate bird species birds can be sampled. This will be dictated largely by the results of the proposed reconnaissance survey, and local conditions during the study period. Dr. McCain asked about the status of our proposed sampling platform(s) in Qingdao. It was generally agreed that Prof. Ming-Jiang Zhou's facility at Academia Sinica would easily be able to provide us with all necessary watercraft and equipment with which to conduct reconnaissance and sampling.

Drs. Tkalin, Watson and others asked about getting proper clearance and permission from the Chinese government prior to the Workshop. As a point of clarification, Dr. Yang explained the joint agreement which KORDI has with China, relative to conducting research in Qingdao. He pointed out that as one of China's major oceanographic and marine sciences research centers, Qingdao has four different groups of scientists doing work with four separate agencies. These are: (1) First Institute of Oceanography: State Oceanographic Administration, (2) Academia Sinica (Prof. Ming-Jiang Zhou, Director), (3) Yellow Sea Fisheries Research Center, and (4) Ocean University of Qingdao. Each of these is a separate and distinct agency /facility, and Dr. Yang's formal agreement for joint research is with (1).

Dr. Yang, through his working knowledge of the various Qingdao laboratories, commented very favorably on the high quality of work and the level of instrumentation and capabilities at the Academia Sinica (#2 above) in Qingdao. In his opinion, this laboratory is generally well-equipped. Dr. Yang also favored the idea of bringing together 2-4 scientists from each PICES country. He suggested that to best foster the concept of inter-comparison among countries and laboratories, we should do our best to bring everyone together to share techniques on site, with as many techniques being performed together at Qingdao as possible. He is also concerned about QA /QC, as is MEQ as a whole.

Since PICES /MEQ is planning to conduct its workshop via the facilities and courtesy extended to us by Prof. Ming-Jiang Zhou at the Academia Sinica, it is very important that MEQ PICES make sure that the proper diplomatic channels have been contacted within the Chinese government, and that our working agreements are firmly and clearly established at all levels prior to commencing the workshop. This issue is made more urgent in light of the current lack of Chinese representation on the PICES Science Board. Consequently, MEQ/PICES strongly urged that PICES Science Board and Governing Council formally pursue this issue as soon as possible. MEQ also recommended that the PICES Science Board and Governing Council establish an agreement with the Chinese Government relative to obtaining samples, and shipping some of these samples out of China. MEQ also recommended that PICES establish a formal agreement with the Chinese government regarding the release of scientific data to interested global scientific and media parties, publication in the world literature, etc.

Dr. Tkalin reminded all participants that these issues have already been basically agreed upon, at least on an informal basis by all participating MEQ/WG 8 scientists involved. What remains is for MEQ to remind PICES of the critical importance of continued high-level dialogue with our Chinese colleagues via appropriate diplomatic channels, and that the Science Board and Governing Council make sure that any possible diplomatic, regulatory or export barriers are identified and cleared with the Chinese government prior to our actual research.

Dr. Yang stressed the importance of meeting later to discuss results; i.e., at PICES VI and VII.

Prof. Hirano highlighted the need to obtain and study existing data about the Jiaozhou and Laoshan Bay areas, and especially data regarding current and historic human impacts on these two marine ecosystems.

Presentation and Discussion of WG 8 funding request for Jiaozhou Bay Workshop

Dr. Addison then reviewed the projected funding requirements set forth by WG 8, as necessary to carry out the practical workshop. The original total estimated costs set forth by WG 8 were \$62,000 (CDN\$). For the estimated 24 participating scientists from the six PICES countries this was designed to cover travel (\$20,000), accommodation and meals for 15 days (\$36,000), supplies and shipping (\$5,000), and literature review of the Jiaozhou Bay area (\$1,000).

MEQ suggested that because of the need for a reconnaissance survey prior to the sampling, the budget should be increased by \$4,200 to support three scientists for an additional two weeks in Qingdao prior to the Workshop. Also, although WG 8 had factored in no costs for laboratory facilities, MEQ suggested that \$5,000 be allocated for reimbursing Professor Ming-Jiang Zhou and Academia Sinica for their laboratory supplies and other expenditures, in appreciation of their role and services as MEQ's laboratory and scientific coordination facility in Qingdao. These additions resulted in a total estimated Workshop cost of \$71,200 (CDN\$).

Dr. Addison went on to explain that of this total, PICES Governing Council and Science Board will be formally asked by MEQ to provide support at the level of \$30,000. This leaves \$41,200 to be generated by funding sources outside PICES per se, if the practical workshop is to take place in May 1997 as planned. Dr. Addison suggested that some of the more important vending sources for us to contact would include:

1. IOC,
2. WESTPAC (which counts among its members Prof. Jia-Yi Zhou, former Chairman of MEQ /PICES),
3. CETA, and
4. the World Bank.

Dr. Tkalin indicated that the current Chair of WESTPAC is Dr. Taira, at the University of Tokyo. Also, it is his understanding that PICES has already allocated general funds for travel of Russian and Chinese scientists to PICES research venues, and perhaps this can be used in part to support our MEQ Practical Workshop.

Dr. Varanasi suggested that each MEQ member formally approach their respective sponsoring Agencies, and ask that travel funds be set aside for PICES- related research such as Jiaozhou Bay. Perhaps the \$30,000 PICES funding can be used for leverage with these various other PICES-nation agencies.

Prof. Hirano suggested that we keep the workshop open to the possibility of inviting a small number of non-PICES scientists, in case such a need arises. For example, if WESTPAC were to help fund the Practical Workshop, and wished to send a small number of participating scientists, MEQ/PICES should be prepared to accommodate them in our plan.

Recommendations of MEQ Committee to PICES Science Board

After much discussion, the MEQ formulated two recommendations to the Science Board. These were:

1. The MEQ Committee accepts the report of WG 8 and recommends that PICES allocate \$30k as its contribution to support the proposed MEQ Practical Workshop in Jiaozhou Bay scheduled for May/June 1997, at the invitation of the Institute of Oceanology, Academia Sinica, Qingdao, People's Republic of China. Total cost of the Workshop is estimated at \$71.2 K.
2. The MEQ Committee recommends that PICES contact the proper Chinese authorities to arrange all necessary approvals and permits for conducting a cooperative scientific study (a "Practical Workshop") in May/June 1997.

Other Business

Pre-Workshop Timelines

Considerable discussion was generated about the need for the WG 8 Ad Hoc Implementation Group to set up a timeline, and milestones, for the process of gathering technical information and completing other necessary preparatory steps toward carrying out the actual Workshop.

It was agreed upon that a reasonable timeline for obtaining essential preliminary background information about Jiaozhou and Laoshan Bays would be December 1, 1996. This information would consist of two parts: Part A would include the completion of a review of published scientific information in the bay (responsibility; Dr. Levings, with the assistance of a graduate student familiar with Qingdao). Part B would include a summary of pollution sources which impact the bay(s), including mapped information, point sources and quantities discharged, and other locally relevant information about pollution sources (responsibility; Professor Ming-Jiang Zhou).

MEQ topics proposed for PICES VI, Pusan, Korea

Drs. Addison and Stein raised the possibility of MEQ sponsoring a joint symposium with BIO at PICES VI. A suggested topic would be Harmful /Noxious Algal Blooms. It was agreed that MEQ will participate with BIO in this proposed joint symposium, and that the topic will be Harmful Algal Blooms.

Suggestions for PICES VI MEQ-sponsored paper and platform topics included trans-boundary exchange of pollutants (air-sea and land-sea exchange), the impact of human influence on nearshore ecosystems, and impacts of aquaculture.

It was also stressed that in Korea, aquaculture, red tides, and wetlands are extremely critical issues. This is especially the case in highly industrialized areas like Chinhae Bay, which

adjoins the Korea Strait near Pusan. Korea suggested two titles: Jiaozhou Bay, and General Topics. Under the General Topics, Korea also suggested a session topic addressing the ecological functions of coastal wetlands as filters for chemicals, and a session focusing on the habitat value of wetland ecosystems.

Mindful that the charge of MEQ symposium at PICES V was "Processes of Contaminant Cycling", Mr. Harding suggested that MEQ could continue to adhere to this general theme, while focusing on specific sub-areas like boundary exchange, aquaculture, wetland ecosystems, etc.

After some discussion, Dr. Addison then summarized MEQ's proposed topics for PICES VI as follow:

- MEQ will sponsor a joint symposium with BIO. The topic will be "Harmful Algal Blooms".
- MEQ will also sponsor a session focusing on "Processes of Contaminant Cycling".
- At PICES VI, MEQ will also generate and present a draft report of preliminary results from the Jiaozhou Bay Practical Workshop, as mentioned previously.

Presentation by TCODE Chair

MEQ was then given a brief presentation by Mr. Robin Brown, Chairman of the PICES Technical Committee on Data Exchange (TCODE). Mr. Brown explained that the preliminary TCODE Inventory of Long Term Time Series data, which is now available on the World Wide Web Server via the PICES Home Page, represents a significant area of progress for TCODE. Mr.

Brown explained the various functions of TCODE, and its specific physical and chemical oceanographic data sets.

The main value of TCODE is to provide a forum, especially via the World Wide Web, where scientists who are interested in the various PICES-generated data can be in contact with those who actually hold the data.

It was the general consensus of MEQ that at this time, it is too soon to attempt to integrate MEQ data into TCODE. However, the upcoming research proposed by MEQ in the Northwest Pacific (e.g., Jiaozhou Bay Practical Workshop, and the subsequent MEQ research proposed for the mouth of the Changjiang, East China Sea) would no doubt generate much valuable and interesting data regarding marine pollution and biological effects. After peer review and publication, these data would no doubt be very useful and relevant to TCODE, and the PICES Web Site.

Dr. Stein suggested that MEQ explore this issue further via a questionnaire, which will be sent out to MEQ membership by Dr. Addison later in the year. We will then advise TCODE as appropriate, and hopefully be able to eventually share various of our environmental data from the North Pacific, after our MEQ Workshop and subsequent activities have generated their results.

Adjournment

The MEQ Scientific Committee concluded its business meetings for PICES V, and was adjourned by Chairman Dr. Addison at 1730 hours on Thursday, October 17, 1996.

Endnote 1

Participants and Observers

Canada

Richard F. Addison
Lee Harding
Robert C.H. Wilson

Japan

Toshiyuki Hirano**
Makoto Shimizu**

Korea

Dong-Beom Yang
Kwang Woo Lee

Russia

Alexander V. Tkalin**
Evgeny Shumiln**

U.S.A.

Usha Varanasi
C. Michael Watson

Observers

Yuan Gao (U.S.A.)
Jong-Geel Je (Korea)
Hee Sook Kang (Korea)
Makoto Kashiwai (Chairman, Science Board)
Colin D. Levings** (Canada)
John Stein** (Co-Chairman, WG 8)
Bruce B. McCain (U.S.A.)

** Member of Working Group 8

Endnote 2

Report of Working Report 8 Practical Assessment Methodology

The meeting of WG 8 was convened at 0900 on October 11, 1996. Attendees are given at the end. The other Co-Chairman, Prof. Ming-Jiang Zhou, regrettably could not attend due to other commitments.

Dr. Colin Levings agreed to serve as rapporteur with the assistance of Ms. Carla Stehr.

The meeting agenda (Appendix 1) was reviewed and approved. The overall objective of the meeting was to review and refine the draft workplan for convening a Practical Workshop in Jiaozhou Bay, Qingdao, China aimed at harmonizing approaches among PICES countries when assessing ecological impacts of pollution. This workshop represents the first step leading to a much larger scale project (Phase II) in the Changjiang estuary. The Phase II project is proposed to be conducted along a preselected gradient in the East China Sea as a contribution to baseline data for the Three Gorges Project.

Dr. Stein reviewed the Working Group's Terms of Reference and the steps taken in developing the current draft of the workplan.

The Working developed recommendations (Appendix 2) to the MEQ Committee, requesting that the Committee submit a proposal to the PICES Science Board for funding one-half of the expected cost to conduct the Workshop. The remaining funding for the workshop would be solicited by PICES-member

country agencies or other institutions. The recommendations are accompanied by a summary of the process leading to the development of the current draft of the workplan (Appendix 3), a summary of the workplan, products expected from the workshop, and a draft budget (Appendix 4).

Considerable time was dedicated to refining the workplan (purpose and goals, sampling design, analyses to be conducted, and logistical issues), and identifying PICES scientists who would conduct specific analyses. The products (Appendix 5) were: a flowchart for key events; site selection criteria; revised workshop description and tables of target species, samples to be collected, analyses to be performed and the scientists responsible for them; and a timetable for implementing and conducting the workshop. Dr. Stein agreed to have a US colleague serve as the data coordinator for the workshop. Prof. M.J. Zhou has agreed previously to compile existing information on the study area.

The draft meeting report and recommendations to the MEQ Committee were approved by the working group for submission to the MEQ.

There was no other business raised for discussion.

The meeting was adjourned at 1530 h on October 12, 1996.

Appendix 1

WG 8 Working Group Meeting Agenda

October 11 and 12, 1996

1. Welcome and introductions of members and observers.
2. Appoint Rapporteur.
3. Adopt Agenda.
4. Review goal of meeting and anticipated products.
 - a) **Meeting Goals**
 - (1) Revise and refine workplan for the Practical Workshop and establish schedule for implementing the workshop.
 - (2) Develop recommendations to the MEQ requesting support for funding of the workshop by the PICES Science Board.
 - b) **Anticipated Products**
 - (1) Revised workplan and implementation schedule for Practical Workshop.
 - (2) Recommendations to the MEQ, and a summary of the Workplan to be included as an annex to the Recommendations.
5. Review development of current draft of workplan.
6. Workplan review and revision as follows:
 - a) Goals and Objectives
 - b) Sampling Strategy (sites, species, logistics)
 - c) Field Data
 - d) Biological and Chemical Analyses
 - e) Logistics for analysis of samples during practical workshop at host lab
 - f) Analysis of samples following workshop, not at host lab.
 - g) Other items, such as data management, statistical analyses, report preparation etc.
 - h) Budget
7. Develop timeline for implementing the Practical workshop.
8. Determine next steps or actions to be taken.
9. Develop WG8 recommendations to MEQ committee on request for funding to support the practical workshop and the benefits to PICES of granting the request.
10. Consideration and approval of the meeting report.
11. Consideration, review and approval of the recommendations.
12. Other business.
13. Closure of the meeting.

Appendix 2

Recommendation to MEQ

Recognizing the terms of reference from MEQ concerning the need to work toward harmonizing approaches to assessing marine pollution among PICES countries, Working Group 8 recommends that the MEQ forward a request to the Science Board to allocate \$30,000 (Can.) in support of a workshop to contribute to

an environmental assessment of Jiaozhou Bay (Qingdao) China.

The funds requested represent less than half of the funds required to support the workshop. Implementation team members are actively seeking additional support from agencies other than PICES and from their own national

organizations. In order to garner support from other groups, it is essential that we can demonstrate that their funds will be leveraged by funds from PICES supporting this initiative.

This workshop is a necessary step in establishing scientific cooperation for future collaborative efforts in the Changjiang estuary to investigate environmental impacts of the Three Gorges Project, and in the harmonization of approaches by PICES member countries in

assessing the broader scale impacts from human activities on North Pacific marine habitats essential to living marine resources. The workshop will provide an opportunity for participants from PICES member countries to work cooperatively to assess pollution impacts in a coastal bay receiving multiple pollutants, while collecting and analyzing a variety of samples from both contaminated and reference sites.

Appendix 3

Background on Workshop Development

PICES WG 8 (formerly WG 2) has discussed approaches to fulfilling its terms of reference at meetings in Seattle, Nemuro, Qingdao, and Nanaimo (coinciding with the PICES Second, Third, Fourth and Fifth Annual Meetings). Briefly the aim of WG 8 is to promote the collection and exchange of information about approaches for assessing the impact of marine pollution, between the PICES member countries. WG 8 agreed to approach this by organizing a *practical* Workshop at a contaminated site, during which participants could work together on samples of various types from both contaminated and "reference" sites and could gain first-hand knowledge of each others use of methods and tools for assessing the impact of human activities and pollution on quality of marine habitat and the health of indigenous species. The format of the Workshop is being developed to follow that of the successful Intergovernmental Oceanographic Commission/Group of Experts on the Effects of Pollutants (IOC/GEPP) workshops whose results have been published in Marine Ecology Progress Series (vol. 46 (1988) and vol. 91 (1992)) and in the Journal of Experimental Marine Biology and Ecology (vol. 138 (1990)).

Jiaozhou Bay, China, was selected for this workshop, because part of the bay is influenced by run-off from various sources including pesticide factories, oil refineries and electroplating plants, activities associated with

commercial shipping, and contaminant non-point sources, such as sewage outfalls. The site, therefore, presents a range of specific pollutant "stresses" that can be measured, which affect coastal waters of PICES countries. Extensive mariculture is also carried out in the Bay. These mariculture operations could provide appropriate samples for use in the practical workshop. In addition, extensive data sets describing biota and contamination in the Bay are available from both the Institute of Oceanology and the State Oceanic Administration (SOA).

In regard to the logistics for conducting the workshop, Prof. Ming-Jiang Zhou has extended an invitation to use the facilities and research vessels of the Institute of Oceanology, Academia Sinica, for the workshop. In addition, Dr. D.B. Yang from Korea Ocean Research and Development Institute (KORDI) has subsequently confirmed that the KORDI installation in Qingdao may be able to offer back-up facilities. These facilities are critical in carrying out a core set of analyses during the workshop, thus in allowing first-hand observation and exchange in a wide range of sampling and analytical techniques.

An informal Workshop Implementation Team was formed by the MEQ and WG 8 at the PICES Fourth Annual meeting. The team has had ongoing correspondence, and an informal *ad hoc* meeting of some of the North American

members was held in Seattle in June 1996 to develop a work plan. Implementation team members tentatively identified the kinds of sampling and analyses to be carried out and suggested possible participants from all the PICES member countries. This draft list and tables outlining the suite of analyses proposed was sent to the Workshop Implementation Team

members in Russia, Japan, China and Korea that were unable to attend the *ad hoc* meeting. Their review, advice and suggestions were sought and comments incorporated into a revised draft workplan. The revised workplan was further refined and adopted by WG 8 at PICES V, Nanaimo, Canada.

Appendix 4

Workplan for Practical Workshop in Jiaozhou Bay (October, 1996)

Purpose

Work towards harmonizing approaches used in assessing ecological impacts of human activities on the environmental quality of North Pacific marine ecosystems.

Objective

To work cooperatively in assessing contaminant distributions that occur within Jiaozhou Bay and the ecological impacts to the benthic invertebrate and fish communities.

Specific Goals

1. Assess bioaccumulation of chemical contaminants through a food web study.
2. Assess ecological effects of chemical contaminant exposure.

Study Parameters

1. Following data compilation and literature review, the workshop will commence with a reconnaissance survey to assess the feasibility of sampling sediment, fish and invertebrate species to validate the sample design. Duration of this preliminary work will be 1-2 weeks. 3-4 people of variety of background will work with the Chinese. Daily cruise reports might be sent out by email by Prof. Zhou M.J. to workshop participants. A brief period after reconnaissance survey (1 week), refine sampling design based on information collected during reconnaissance survey. Begin cooperative workshop sampling and analysis 1 to 2 weeks after reconnaissance survey.

2. Sample 5-7 sites within Jiaozhou Bay. Sites will be selected according to criteria listed in Table 1. One site will be centre of the bay as a potential integrating site of pollutant inputs. Other sites may include an industrial site, an agricultural runoff site, and an aquaculture site within Jiaozhou Bay. Sample 1-3 reference sites in Laoshan Bay.
3. Replicate sediment samples and samples of tissues from a variety of target species (wild and cultured invertebrates, fish) will be collected for sediment contaminant analyses and bioaccumulation contaminants and responses at the tissue and cellular level. Replicate samples will be collected to allow scientists to analyze the same sample for intercomparison of results. These data will also be used for interpretation of organismal, population, and community responses.
4. Chemical contaminants to be analyzed include polycyclic aromatic hydrocarbon (PAHs), pesticides, chlorinated hydrocarbons, selected metals and tributyl tin (TBT).
5. Biological responses measured will include primary production; benthic community structure; invertebrate mortality/growth (bioassays); demersal fish abundance, feeding and growth rates; and biochemical changes (e.g., CYP1A induction, AChE inhibition).

6. During the cooperative sampling and analysis phase there will be up to 24 participants, approximately 4 from each PICES member country. This effort may be augmented by other scientists at their expense. Under a separate Chinese-Japan project, primary productivity effects may be assessed using mesocosm and in situ measurements.
7. Analyses will be carried out in four steps:
 - i. cooperatively at the Institute of Oceanology in Qingdao;
 - ii. cooperatively at another laboratory/institute in the northwest Pacific;
 - iii. other locations with involvement of participants as feasible;
 - iv. routine analyses (e.g. aging) that do not involve cooperation.
8. The workplan is being developed to primarily encourage "intercomparison" of analyses of all participating institutions/laboratories, and will involve analyses of split-samples (replicates) as part of intercomparison exercises of chemical and appropriate biological variables. However, all work is being designed to be scientifically sound and publishable.
9. The preferable time for the Workshop is May to early June 1997, or possibly between mid September and the end of October 1997. The cooperative workshop sampling and analysis phase will be 2-3 weeks in duration.
10. It is necessary to have wrap up meetings for the workshop. In October 1997 at PICES 6 we would review preliminary results and discuss the format of a descriptive report on the field work possibly to be published in

the PICES Scientific report series. It is proposed to have a more complete discussion of results during the PICES 7 meeting in October 1998. Final publication of results in the scientific literature, as appropriate, to follow soon after.

Figures and Tables in Appendix 5 expand on the information presented above, and include: a flowchart for the Workshop and follow-up activities; sampling-site selection criteria; tables describing samples to be taken, analyses to be conducted, and responsible investigators; and a timeline for implementing and conducting the workshop.

Expected Products of Jiaozhou Bay Practical Workshop

1. An improved understanding of the range and impact of contaminants in Jiaozhou Bay. Although this is site specific, the generic results should be applicable to other industrialized ports and coastal areas in the PICES area of interest.
2. An improved appreciation by PICES participants of the approaches and techniques used by other member countries to assess marine pollution, and improved cultural understanding and technology transfer.
3. Cruise report, archived data accessible by PICES country scientists and depending on the results, a series of papers characterizing the effects of pollution on aspects of the ecology of Jiaozhou Bay. These reports are anticipated to resemble those produced for workshops in Bermuda, Norway and Bremerhaven (IOC/GEOP).

Appendix 4

Estimated Costs for Jiaozhou Bay Practical Workshop (CDN\$)

1. Travel	
8 participants (4 each Canada and U.S.) round trip air fare \$1500 each person	<u>total air fare \$12,000</u>
16 participants (4 each from China, Russia, Japan and Korea round trip air fare \$500 each person	<u>total air fare \$8,000</u>
2. Accommodation and meals	
a. Reconnaissance Survey: 3 participants for 14 days \$100 dollars/day each person	<u>total room and board \$4,200</u>
b. Practical Workshop 24 participants for 15 days \$100 dollars/day each person;	<u>total room and board \$36,000</u>
3. Supplies and shipping \$10000	<u>total supplies and shipping \$10,000</u>
4. Contract for literature review on Jiaozhou Bay \$1000	<u>total lit. review contract \$1,000</u>

TOTAL ESTIMATED COST: \$71,2000

Publication costs, costs of any subsequent travel, etc. to work up samples in participants labs, or "wrap-up" conferences are not included above. In previous IOC/GEEP workshops, all these items have been considered desirable, although most of the costs have usually been borne by individual investigators or their agency. It is proposed that the "wrap-up" symposium be

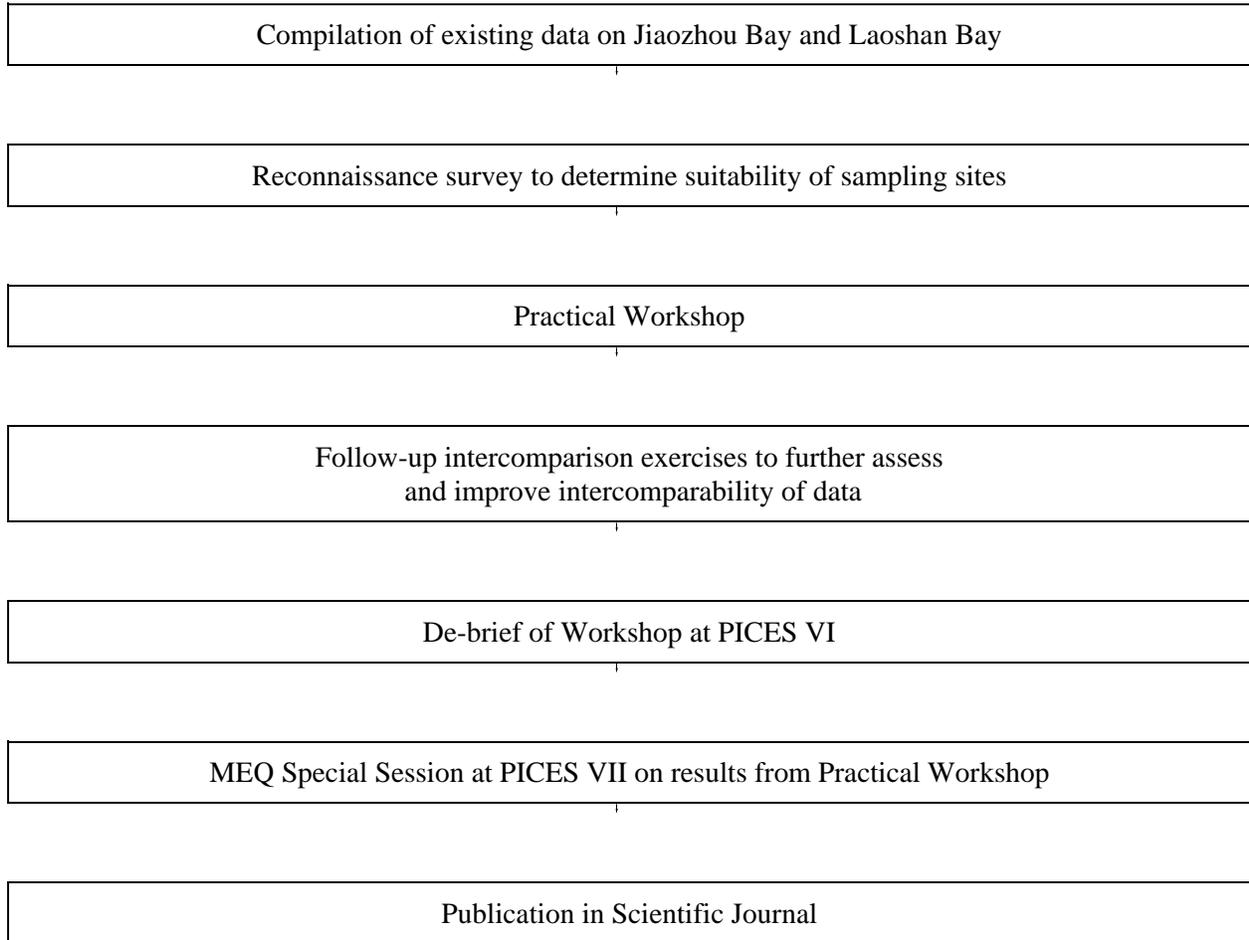
conducted as part of PICES VII. Availability of PICES travel funds will be important to insure that participants can attend PICES VI and VII, so that an initial assessment of the workshop can be conducted and additional planning can take place (PICES VI), and that the "wrap-up" conference (PICES VII) will be well attended.

Appendix 5

Figures and Tables for Workplan for Practical Workshop

Appendix 5.1

Flowchart for Jiaozhou Bay Workshop



Appendix 5.2

Criteria for selection of sites in Jiaozhou Bay and the reference site, Laoshan Bay

- 5 to 7 meter depth (the majority of Jiaozhou Bay)
- "muddy sediment"
- potential different pollution sources
- intertidal invertebrates present (e.g. gastropods)
- avoid dredged areas or shipping lanes
- at least two sites with fish present
- comparable oceanography (estuarine circulation)
- aquaculture bivalve species similar
- similar wild mollusc species (e.g. *Crassostrea gigas*)

Appendix 5.3

**Analyses to be conducted under Specific Goal #1
Bioaccumulation of contaminants: Food Web Study**

<u>Compartment</u>	<u>Sample Type</u>	<u>Analyses</u> (listed in order of priority)	<u>Individuals Responsible</u>
Sediment	grab sample	<ul style="list-style-type: none"> •pesticides, metals •CHs, PCBs, PAHs, metals •TOC, grain size •mineralogy •TBT •PCDD/F 	Russia (Tkalin, Shumilin) Korea (Yang)/US (Loma) China (TBD) if not, Korea (Je) Russia (Shumilin) US (Stein)/Japan(TBD) Canada (Addison)
Biota	mollusc - feral (e.g., gastropod and oyster), aquaculture (scallops)	<ul style="list-style-type: none"> •pesticides, metals •CHs, PAHs, metals •TBT 	Russia (Tkalin) US (Stein) Japan (TBD)
Biota	fish - demersal (maybe rockfish or a species of flatfish, or the intertidal goby)	<ul style="list-style-type: none"> •tissue CHs, PAHs •bile FAC •stomach content CHs, PAHs •stomach taxonomy 	US (Stein)/Korea (Yang) US (Stein) US (Stein) Canada (Levings)/China (Yang J.)
Biota	birds (cormorants, gulls) opportunistic, preliminary work	<ul style="list-style-type: none"> •contaminants in egg yolk sac •opportunistic collection of moribund and dead birds 	Canada (Elliott)/ China (Liu) Korea (Yoo)

Abbreviations:

CHs = chlorinated hydrocarbons

FACs = fluorescent aromatic hydrocarbons in bile

PAHs = polycyclic aromatic hydrocarbons

PCDDs/Fs = polychlorinated dibenzodioxins/furans

TBT = tributyltin

TOC = total organic carbon

TBD= to be determined

**Analyses to be conducted under Specific Goal #2
Ecological effects of contaminant exposure**

<u>Compartment</u>	<u>Sample Type</u>	<u>Analyse (listed in order of priority)</u>	<u>Individuals Responsible</u>
Water	algal spp. zooplankton	•primary/ secondary productivity	Japan (Harada) [mesocosm] (discuss in November in China/Japan meeting)
Biota	mollusc - feral and aquaculture	<ul style="list-style-type: none"> •chambering (oyster) •imposex (gastropod) •age/size relationships, growth rate •Biomarkers (e.g. comet assay) 	Canada (Levings) Korea (Oh) China (aging lab, TBD) US (Sanders/Steinert)
Biota	flatfish - demersal (perhaps flatfish, or rockfish; determine during preliminary study)	<ul style="list-style-type: none"> •age/size relationships Biomarkers: <ul style="list-style-type: none"> •CYP1A •AChE (brain/muscle) •DNA adducts •histopathology 	China (fish aging lab, TBD) Canada (Addison)/US (Stein) Canada (TBD) US (Stein) US (Stein)
Benthic Community		<ul style="list-style-type: none"> •abundance/diversity •bioassays 	Russia (Tkalin)/China (Zhou)/Korea (Je) Canada (Levings)

Abbreviations:

AChE = Acetylcholinesterase

CYP1A = cytochrome P4501A

TBD = to be determined

Appendix 5.5

Parameters to be measured on site during the Practical Workshop

Biological Parameters	Information needed	Data processing needed	Who will be responsible for collecting data?
<u>Species identification</u>	observation at time of collection (use photographs)	data recorded	Canada (Levings) China (Yang J) Korea (Je; invertebrates)
<u>Length and weight</u>	measurements conducted at time of collection	data recorded	Investigator (TBD)
<u>Sex</u>	observation at time of collection	data recorded	Investigator (TBD)
<u>*Age</u>	collection of otoliths or shells	otoliths or shells processed and read	China (aging lab, TBD)
<u>maturation stage</u>	observation at time of collection	data recorded	Investigator (TBD)
<u>*Stomach fullness, weight of contents</u>	observation at time of collection	data recorded, forage ratio computed	China (stomach lab, TBD)
<u>*Stomach taxonomy</u>	stomach samples preserved	samples processed for taxonomy	Canada (Levings) China (Yang J)
<u>*Condition factor</u>	whole body and gutted body weight at time of necropsy	data recorded and condition factor calculated	Investigator
<u>Other observations:</u> e.g. observable lesions, parasites, deformities, etc.	observations conducted at time of collection (use photographs)	data recorded at time of collection	Investigator (TBD)- using standard protocols
Sediment Characteristics (separate worksheet)	observations on sediment characteristics (use photographs)	data recorded at time of collection	Investigator (TBD)
Physical Water Parameters: Seawater temperature, salinity, Dissolved oxygen, turbidity, CTD profile (separate worksheet)	measurements conducted at time of collection	data recorded at time of collection	China/Korea (TBD)
Identification parameters:** e.g. sample number, date collected, site location, method of collection, DGPS water depth, etc.	observations conducted at time of collection	data recorded at time of collection	Investigator (TBD)

* Two step process involved, collection of samples indicated in data collection spread sheet, followed by laboratory analysis or data calculation later after sample collection completed.

Separate spread sheets will also need to be developed for aquaculture samples.

Data Coordinator will be US (Stein). Data coordinator will be responsible for preparing data collection sheets and incorporating measurements and calculations done in the various laboratories after initial sample collection is completed.

** The numbering scheme will be devised to ensure that all samples are handled “blind” by the researchers conducting analyses (i.e., without the participants knowing the origin of the sample or relation to pollutant sources).

TBD = to be determined

Appendix 5.6

Timeline for Jiaozhou Bay Workshop

October 1996 Contact with Head of China PICES Delegation.	-1-2 weeks; preliminary survey; confirm supplies on site, equipment operational
October 1996 Allocation of PICES money.	-1 week; revised workshop cruise plan; revisions made by steering group and crew of preliminary survey
December 1, 1996 Data compilation, pollution sources, biology, oceanography, translation and distribution (contract established in consultation with M.J. Zhou). Includes both published and unpublished data.	-2-3 week; conduct Workshop -supplies returned; if appropriate
January 1, 1997 On site equipment and supplies confirmed and necessary approvals granted.	Late June, 1997 Draft Cruise report.
March 1, 1997 Final draft workplan to be completed by the workshop steering group (<i>ad hoc</i> Implementation Team).	October 1997 Present at the PICES VI Working Group meeting -preliminary results -data archive and distribution -follow up analyses preliminary results -outline publication format
March 15, 1997 Final budget.	December 1997 Publish final cruise report, perhaps as a PICES publication.
March 31, 1997 Complete draft survey cruise plan; "crew" will be small group of people with field experience.	June 1997 Finalize results and statistical analyses.
April 15, 1997 Supplies for workshop on site.	October 1998 Presentation of Workshop results at PICES 7 meeting in 1998 followed by publication of papers.
May or early June, 1997	

Appendix 6

Participants and Observers

Canada

Richard Addison (Chairman, MEQ, Oct. 12 only)
Colin Levings*

Japan

Shigeki Harada*
Toshiyuki Hirano
Makoto Shimizu

Korea

Jong-Geel Je (representing Dr. D.B. Yang*)

Russia

Evgeny Shumilin (Oct 12 on;y)
Alexander Tkalin*

U.S.A.

John Stein (Co-Chairman)*

Observer

Carla Stehr (U.S.A.)

*Member WG 8 Implementation Group for Practical Workshop