

REPORT OF MARINE ENVIRONMENTAL QUALITY COMMITTEE

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The meeting of the MEQ Committee was held from 1330-1700 hours on October 22, 2000, and from 0900-1130 hours on October 25, 2000. The Chairman-designate, Dr. John E. Stein, called the meeting to order and welcomed the participants (*MEQ Endnote 1*). The Committee reviewed the draft agenda and it was adopted after revision (*MEQ Endnote 2*).

Sessions at future Annual Meetings (Agenda Item 6)

MEQ Topic Sessions at PICES X: MEQ recommended convening the following sessions:

Sediment contamination – the science behind remediation standards. Convenors: Steve Samis (Canada) and Dong-Beom Yang (Korea). (½ day)

Scientific criteria for the regulatory management of contaminated aquatic sediments are being developed in various jurisdictions around the North Pacific. Approaches to criteria setting for sediment quality evaluation and protection vary based on the legislative regime, the contamination history of regions, aquatic life at risk, human use of fish and economic factors. A number of other factors need to be defined, such as: appropriate thresholds for triggering remedial actions, dealing with mixtures of contaminants while using numeric criteria, definition of baseline or background conditions, importance of bioavailability, inter-calibration of bioassay test organisms and the use of risk assessment in lieu of numeric sediment criteria. Risk assessment is driven in part by socio-economic factors, but from a scientific perspective, contaminants that cause endocrine disruption in fish or that bioaccumulate in tissues will also drive regulatory decision-making. From an ecological standpoint no observable effects in receptor biota is a reference point that can be implemented through the regulatory application of the lowest observable response level in carefully selected species.

These and other factors will form the crux of a debate that this session and others that follow will need to foster.

Emerging issues for MEQ: A 10-year perspective. Convenors: Richard F. Addison (Canada) and Ming-Jiang Zhou (China). (½ day)

PICES' tenth anniversary is a suitable occasion on which to look forward to issues which MEQ will face over the next decade. This session will build on the PICES X special symposium and will focus in greater detail on evaluating the importance of emerging issues of pollution (e.g., "new" chemicals), marine resource use (e.g., the shift from commercial fishing to mariculture; offshore oil and gas or mining development), and projected impacts of onshore development on coastal systems.

Physical oceanography to societal valuation: Assessing the factors affecting coastal environments. Convenors: Julia K. Parrish and John E. Stein (U.S.A.). (½ day)

The Pacific Northwest Coastal Ecosystems Regional Study (PNCERS) is a five year, multi-investigator, multi-disciplinary exploration of the natural and human-mediated factors affecting the health and sustainability of estuarine and nearshore environments in Oregon and Washington. Individual research projects include the physical oceanography of nearshore-estuarine linkages, the use of salmon, seabirds, and benthic invertebrates as bio-indicators of system change, and the dichotomy between human uses and expectations of the local marine environment. This session would highlight the results of individual projects as well as those emerging from cross-disciplinary efforts. The latter include how spatio-temporal patterns of mesoscale circulation translate into differential crab and oyster production, the use of hydroacoustically determined biomass estimates as predictors of upper trophic distribution and

abundance, and the development of indicators and indices of system integrity. Although PNCERS concentrates on a part of the California Current System, the comprehensive approach, including bottom-up, top-down, and human-mediated factors, is a model for future programs throughout the North Pacific.

MEQ contributed papers. Convenor: John E. Stein (U.S.A.). (½ day)

Joint session at PICES X: MEQ proposed a joint session with POC and BIO:

Physical, chemical and biological interactions during harmful algal blooms. Convenors: Hak-Gyoon Kim (Korea), F.J.R. (Max) Taylor (Canada), and Vera L. Trainer (U.S.A.). (½ day)

Physical processes play vital roles in the coastal environments in which HABs develop. The degree of vertical mixing strongly determines whether diatoms or flagellates will predominate. The former is favoured by high surface nutrients resulting from upwelling and small-scale turbulence. The latter can exploit stratification with low surface nutrients and a relatively shallow nutricline. Blooms are frequently advected by along-shore buoyant plumes from seed sites and frontal aggregations are common. The nature of the light regime is also a critical factor. The goal of this session will be to foster co-operation between physical and biological oceanographers.

MEQ sessions at future Annual Meetings: Two possible themes for future PICES meetings were considered:

- a. Harmful algal blooms in eutrophic conditions;
- b. Long-range transport of chemical contaminants on trans-Pacific scales.

Requests for funding: WG 15 proposed to hold a Practical Workshop on “Taxonomy and identification of HAB species” just prior to PICES X, and MEQ requests travel support for one scientist with expertise in molecular biology of phytoplankton to attend the Workshop.

Relations with other organizations, programs and projects (Agenda Item 4)

ICES: Dr. Richard F. Addison reported that the proposed joint meeting between the ICES Working Group on the Biological Effects of Contaminants and PICES MEQ had to be postponed because ICES was unable to mount a workshop on data management which was to be the focus of the meeting. During later discussions on the programme for PICES X, a Topic Session on sediment quality (*Sediment contamination – the science behind remediation standards*) was proposed to which some ICES representative would be invited.

GIWA: Dr. Skip McKinnell reported that GIWA appeared to be dormant and seemed likely to remain so. MEQ would take no further action but Dr. McKinnell would continue to stay in touch with GIWA.

AMAP: No action required at this stage.

Best Presentation Award (Agenda Item 3)

Prof. Ming-Jiang Zhou (China) and Makoto Shimizu (Japan) agreed to assess the presentations. They recommended that the MEQ Best Presentation Award be given to Drs. Kazufumi Takaynagi and Kazumasa Hirakawa for their paper entitled “Water quality criteria to manage sustainable aquaculture in Japan”.

Election of Chairman (Agenda Item 2)

Dr. Alexander V. Tkalin had resigned as MEQ Chairman to take up other duties. A single candidate, Dr. John E. Stein (U.S.A.) was nominated and unanimously elected as the new MEQ Chairman.

MEQ Strategic Plan (Agenda Item 5)

It was agreed that Drs. Stein and Addison would update the MEQ Strategic Plan (*MEQ Endnote 3*). The preamble was revised and future concerns would include:

- Ecological and environmental impacts of aquaculture;
- Impacts of trawling on benthic habitat;
- Contaminant accumulation and transport by migratory species;
- Emerging chemicals of concern.

Science Board (Agenda Item 7)

- i. MEQ supported in general the development of a North Pacific Ecosystem Status Report as a high priority PICES project. Dr. Addison will represent MEQ on a 1-year Study Group to consider the needs for implementation of the North Pacific Ecosystem Status Report and Regional Analysis Center.
- ii. MEQ noted the importance to establish an International Zooplankton Monitoring Program for the North Pacific. Prof. M.J. Zhou will represent MEQ interests in a group working on the program.
- iii. MEQ wishes to build stronger co-operation with SCOR to allow interactions between WG 15 and the GEOHAB programme.

Report of Working Group on Practical Assessment Methodology (Agenda Items 8, 9, 10)

MEQ endorsed the WG 8 report presented by Ms. Carla M. Stehr (*MEQ Endnote 4*) and considered WG 8's recommendation for funding to support an assistant to organize the Vancouver Workshop data for publication in the PICES Scientific Report series. Later, the

Committee was informed by Science Board that this would not be feasible. The Committee noted that this was the last meeting of WG 8 and congratulated the Working Group on its work in organising the MEQ Practical Workshop and Ms. Stehr and Dr. Toshihiro Horiguchi in convening a very successful Topic Session on the Environmental Assessment of Vancouver Harbour.

Report of Working Group on Ecology of Harmful Algal Blooms in the N. Pacific (Agenda Item 11)

The WG 15 report (presented by Prof. Max Taylor) is attached as *MEQ Endnote 5*. Individual country reports are available only in hard copy format (except for that of China). WG 15 proposed convening a session (jointly with POC and BIO) on "Physical, chemical and biological interactions during harmful algal blooms" at PICES X, and organizing a 2-day Practical Workshop on "Taxonomy and identification of harmful algal bloom species" immediately prior to the Annual Meeting. MEQ endorsed WG 15's recommendations and will carry them forward to Science Board.

Report on MEQ Scientific Sessions at PICES IX (Agenda Item 12)

Prof. Makoto Shimizu and Dr. Horiguchi reviewed MEQ Scientific Sessions at PICES IX. The Committee expressed its thanks to the local organizers for arranging interesting and instructive sessions and providing travel support for invited speakers. The Committee also noted that Prof. Shimizu would be retiring this year, and expressed its thanks for his contribution to MEQ activities, and offered its best wishes for his retirement. Prof. Shimizu will represent MEQ on the Organizing Committee for the Science Board Symposium on "Ecosystem processes in marginal seas of the North Pacific" to be held at PICES X.

MEQ Endnote 1

Participation List

Canada

Richard F. Addison (rappourter)
Steve C. Samis

Japan

Makoto Shimizu
Masataka Watanabe

People's Republic of China

Republic of Korea

Dong-Beom Yang

Russian Federation

Tatiana A. Belan
Lev M. Gramm-Osipov
Alexander V. Tkalin

U.S.A.

John E. Stein (Chairman)
Michael C. Watson

Observers

Irina G. Agafanova (Russia)
Dmitry L. Aminin (Russia, WG 15)
Stelvio M. Bandiera (Canada)
Elizabeth A. Bornhold (Canada)
Toshihiro Horiguchi (Japan, WG 8)
Jong-Geel Je (Korea, WG 8)
Lyndal L. Johnson (U.S.A.)
Sam Guen Lee (Korea)
Sathy A. Naidu (U.S.A.)
Maurice Levasseur (Canada, WG 15)
Colin D. Levings (Canada, WG 8)
Tatiana Yu. Orlova (Russia, WG 8)
Carla M. Stehr (U.S.A., WG 8)
C.G. Satuito (Japan)
F.J.R. (Max) Taylor (Canada, WG 15)
Vera L. Trainer (U.S.A., WG 15)
Tian Yan (China, WG 15)
Ming-Jiang Zhou (China, WG 8)

MEQ Endnote 2

Agenda

1. Opening and introduction of members, adoption of the agenda and appoint rapporteur. (All)
2. Select a new MEQ Chairman. (All)
3. Select MEQ members to serve as reviewers for the Best Presentation Award.
4. Discuss working relations of PICES with other international organizations. (All)
5. Review MEQ Strategic Plan. (All)
6. Proposals for future MEQ scientific sessions. (All)
7. Discuss the role of MEQ in high priority scientific projects: (All)
 - i. North Pacific Ecosystem Status Report;
 - ii. International zooplankton monitoring program for the North Pacific;
 - iii. Workshop/Symposium series on "Effects of human and climate interactions on fish production".
8. Review of WG 8 (on Practical Assessment Methodology) report. (Stehr)
9. Status report on WG 8, plans for publishing data and papers. (Stehr and Levings)
10. Discuss publication of Vancouver workshop papers in a peer-reviewed journal. (All)
11. Review of WG 15 (on Ecology of Harmful Algal Bloom in the North Pacific) report. (Taylor and Orlova)
12. Report on MEQ Scientific Sessions at PICES IX. (Shimizu and Horiguchi)
13. Draft report to Science Board.
14. Other matters.

MEQ Endnote 3

Strategic Plan (updated October 2000)

The MEQ Committee's area of responsibility is to promote and coordinate marine environmental quality and interdisciplinary research in the North Pacific. Marine environmental quality has an interactive role with the other PICES committees to assess status and trends in environmental and biological conditions as affected by human activities. The coordination and research includes: understanding the sources, transport, and fates of contaminants found in the marine environment; the ecology and oceanography of harmful algal blooms; the biological effects of natural and anthropogenic toxic substances; the effects of mariculture on coastal environment; and the transport, introduction, and ecological effects of non-indigenous species and stocks.

Review of activities

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) was established (Development of Common Assessment Methodology for Marine Pollution) under the leadership of Dr. Richard F. Addison (Canada) and Prof. Ming-Jiang Zhou (China). Prof. Jia-Yi Zhou (China) was elected MEQ Chairman in 1992.

At PICES III in Nemuro, Japan (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 was established to prepare and organize the Practical Workshop.

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

At PICES V in Nanaimo, Canada (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 in Pusan Korea (1997), MEQ held a session on "Processes of contaminant cycling". Three priority areas were identified for inter-sessional activities: (i) Environmentally sound mariculture: status and technology needs; (ii) Harmful algal blooms; and (iii) MEQ/PICES interactions with GIWA (Global Assessment of International Waters): a feasibility study. The WG 8 report on preparation of the 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 in Fairbanks, U.S.A. (1998), MEQ discussed the report of WG 8 on preparation for the Practical Workshop in Vancouver Harbor in May-June 1999. MEQ held a topic session on “Science and technology for environmentally-sustainable mariculture” and a joint session with BIO on “Contaminants in high trophic level biota – linkages between individual and population responses”. Dr. Alexander V. Tkalin was elected the new MEQ Chairman.

At PICES VIII in Vladivostok, Russia (1999), MEQ convened a topic session on “Ecological impacts of oil spills, oil exploration, land reclamation and other man-made activities” and a joint session with BIO on “Coastal pollution: eutrophication, phytoplankton dynamics and harmful algal events”. The WG 8 Practical Workshop was held from May 24-June 7, 1999, in Vancouver Harbour.

At PICES IX in Hakodate, Japan (2000), MEQ held topics sessions on “Science and technology for environmentally sustainable mariculture: impacts and mitigation in coastal areas” and on “Environmental assessment of Vancouver Harbour: results of an inter-national workshop”. Dr. John E. Stein was elected the new MEQ Chairman. WG 8 was dissolved after developing plans for publication of a data report and peer-reviewed articles concerning the results of the Practical Workshop.

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.

The future

MEQ Endnote 4

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:

- Impacts of climate change on coastal ecosystems;
- Ecological and environmental impacts of mariculture;
- Impacts of trawling of benthic habitat;
- Emerging of chemical contaminants of concern;
- Biogeochemical processes regulating contaminant dynamics in sediment;
- Biological and physical transport of anthropogenic substances in the North Pacific;
- Diseases in marine species: population level effects and the role of human activities in their occurrence;
- Harmonization of existing methodologies used in PICES countries;
- Scientific criteria for protection of marine ecosystems from contaminant impacts.

MEQ will work in establishing links with international organizations/programs (e.g., SCOR, ICES, GIWA, TRAP) that will improve coordination of multidisciplinary research to better understand the structure, function, and health of North Pacific marine ecosystems under anthropogenic pressure. The MEQ will also pursue building relationships with other international organizations that will broaden interest in MEQ activities within PICES countries, and will bring scientists from disciplines not currently represented in MEQ to PICES meetings and workshops.

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

The results of the Vancouver Harbour Practical Workshop were presented at a special session at PICES IX (11 papers and 2 posters). Topic included sediment chemistry, chemistry in biota, and biological parameters, and data on biota ranged from community structure to effects on individuals. The quality of the results encouraged further planning for a peer-reviewed publication.

WG 8 Meeting agenda

1. Develop format of WG 8 Final Report on the Vancouver Harbour Practical Workshop.
2. Develop format of primary publication of Workshop's results.
3. Prepare recommendations to MEQ Committee.

Results

The WG 8 Final Report will be published in the PICES Scientific Report series. Ms. Carla M. Stehr and Dr. Toshihiro Horiguchi agreed to lead preparation of the report. The proposed format includes:

- a. Project description that will contain history of the Workshop preparation and general "scene setting" of Vancouver Harbour (e.g. circulation, use, fishery closures etc.);
- b. Work plan;
- c. Section containing extended abstracts of each paper presented at PICES IX and data sets not discussed at PICES IX (abstracts to be prepared by all authors and sent electronically to Ms. Stehr or Dr. Horiguchi by Dec. 1, 2000);
- d. Data tables in MS Excel format;
- e. Conclusions and recommendations. Technical conclusions will be based on extended abstracts. A set of recommendations on how to run a future workshop would be included. Information on the

problems and successes may also be presented.

WG 8 considered the need for further analyses, specifically sediment and liver dioxins (especially for site B50, where there were unexpected results).

Primary publication

The WG 8 Co-Chairman, Dr. John E. Stein, reported that he had received preliminary approval from the Editors of *Marine Environmental Research* (Elsevier) to publish the WG 8 results as a special issue. First drafts ready for refereeing to be with guest editor(s) (so far unidentified) by April 1, 2001. The proposed content of the special issue (which may change as authors begin to write the papers) is as follows:

- a. Preface/introduction (shorter than in PICES Report)
- b. Sediment chemistry – toxics, TOC, etc. (Stehr, Stein, Tkalin, Uno?)
- c. Biota chemistry – toxics and lipids (bivalves) (Stehr, Tkalin, Uno)
- d. CYP 1A (Bandiera, Addison) - (maybe combined with 'e' below)
- e. Bile, hepatic lesions and X-cells (Myers, Stehr) (may include Vtg data)
- f. Fish population data (Levings)
- g. Molluscan imposex and TBT data (Horiguchi, Li)
- h. HABs (Yan, Sutherland)
- i. Fish, bivalve and benthic communities (Belan, Levings, Je, Yoon)
- j. Synthesis (all participants, unattributed)

WG 8 requested that US\$5,000 be made available for computer support to NOAA, Seattle for manipulation of Excel files for the PICES Scientific Report.

MEQ Endnote 5

Report of Working Group 15 on Ecology of Harmful Algal Blooms (HABs) in the North Pacific

The Working Group 15 held its first formal meeting from 0900 to 1230 hours and from 1330 to 1600 on October 22, 2000. The meeting was attended by 15 members from Canada, China, Japan, Korea, Russia and U.S.A. (*WG 15 Annex 1*). The proposed agenda for the meeting (*WG 15 Annex 2*) was adopted.

Assessment of HAB problems in the coastal waters of PICES countries (Agenda Item 1)

The Working Group 15 was created to facilitate studies in harmful algal blooms (HABs) in the member countries of PICES. This need was recognized at the previous PICES Annual Meeting in Vladivostok, Russia in 1999. The WG 15's first task has been to evaluate current knowledge of the extent and severity of HABs in these countries and to that end representatives of each of the countries presented reports summarizing the nature and state of knowledge (species, location, intensity and consequences) of HABs in their regions. To put these reports in perspective, a few prefatory remarks have been made by Prof. F.J.R. (Max) Taylor.

In the past few decades the study of HABs has become a multidisciplinary field of its own, combining taxonomy, phytoplankton ecology (nearly all are caused by photosynthetic microplankton, with *Noctiluca* being a notable exception), limnology, toxicology, public health, epidemiology, economics and aquaculture. At the IX International Conference in Hobart, Tasmania, this year, there were 500 participants from 45 countries. The scope of phenomena and causative organisms has undergone a dramatic expansion, leading to a flood of reports that have caused considerable concern in most coastal countries. HABs can be broadly subdivided into two types: those that harm marine fauna and those that cause potentially fatal human health problems. HABs can be fundamentally subdivided into those harming marine organisms and those that are hazardous to humans.

Marine fauna mortalities

Harmful algae can kill fish, seabirds and marine mammals, either through oxygen depletion, the

release of toxins or through food chain transfer and accumulation. This is particularly an economic concern in aquaculture operations. For example, the pioneering, successful cultivation of yellowtail and red bream in the Seto Inland Sea of Japan was plagued by recurring blooms of raphidophyte algae, notably species of *Chattonella*. This also brought the role of eutrophication into focus since this has been known to produce an increase in HABs. In the PICES region this has been demonstrated not only in Japan but also in China and Korea. Fish killing dinoflagellates are also known from the PICES region. Major deaths of seabirds and sea lions have occurred in Monterey, California, in recent years, and elsewhere whales have died from toxins in their food, analogous to human health hazard.

Human health hazards

Humans can be affected by HABs primarily through eating contaminated seafood (shellfish or fish). Toxins produced by HAB species are accumulated by marine organisms feeding on them. The toxins are primarily neurotoxins although gastro-intestinal symptoms often precede them. The toxins act primarily on membrane permeability of sodium or calcium. For example, while saxitoxin blocks sodium channels and blocks nerve transmission ciguatera causes them to remain open, resulting in depolarization. The primary forms of HAB-related human intoxications in the North Pacific are:

- a. paralytic shellfish poisoning (PSP) caused by saxitoxins;
- b. diarrhetic shellfish poisoning (DSP) caused by okadaic acid, dinophysisyoxyin and pectenotoxins;
- c. amnesic shellfish poisoning (ASP) caused by domoic acid; and
- d. ciguatera fish poisoning (CFP) caused by ciguatoxin, ostreopsistoxin and possibly maitotoxin.

These are caused chiefly by dinoflagellates but ASP is linked to several species of the diatom genus *Pseudo-nitzschia*.

Summary of the National Reports (Agenda Item 2)

The National Reports on current knowledge of HABs problems have been presented by all PICES member countries. These reports serve as the baseline on which WG 15 is going to build other activities. The first conclusion to be drawn is that all countries have significant HAB problems and may be worsening in some. Japan experienced costly fish kills in fish farms in the Seto Inland Sea due to chloromonad flagellate blooms, which have also been problematic to salmon farmers in British Columbia. The losses have run into the millions of dollars. Korea is plagued by dinoflagellate-related fish kills as is Hong Kong. China has experienced severe losses from HABs in its extensive shrimp farming activities. Eutrophication has been implicated in the Inland Sea, Hong Kong and Korean localities and shrimp farms are inherently eutrophic.

PSP is present in all PICES countries and particularly severe in western Canada, Alaska (extending as far south as California) and probably Russia. In Japan, PSP appears to have spread since the 1970s from the north down both the east and west coasts. In Korea toxicity has been known from the south coast since the 1970s. DSP has been recorded in Japan but there are few records elsewhere. Since the symptoms of the latter are difficult to distinguish from bacterial contamination it is only the presence of okadaic acid in shellfish that confirms DSP. In most PICES countries this is not tested for. ASP is well established on the west coast of the United States where it has mainly affected seabirds and marine mammals. Ciguatera fish poisoning, found in tropical and subtropical reef systems is a significant problem in Hawaii, is recorded from imported fish in Hong Kong and can be expected in offshore South China Sea locations.

Some coastlines, such as the eastern Bering Sea, are evidently understudied and field monitoring and research in HABs is usually not coordinated between adjacent countries even

though the phenomena do not respect national boundaries.

Recommendations for 2001 activities (Agenda Items 3 and 5)

During the next year, WG 15 is planning to produce a series of maps showing the location of HABs in the PICES region. The initial maps will indicate historic knowledge of all HAB events in each PICES country. Since ICES is also producing such maps for its region (including the west coast of North America) it seems logical to follow the same format so that they can be additive, eventually contributing to a global picture.

In mid-2000, a questionnaire, based on the ICES equivalent, was sent to each country to serve as the start of a PICES HABs database. The suggested historical maps should be part of the database, which can then be updated by annual event reports.

These should be part of the database, which can then be added to by annual event reports, as is the case in the ICES region. In addition a questionnaire was sent to each country to serve as the start of a PICES database.

The Working Group proposed holding (jointly with POC and BIO) a session at PICES X on "Physical, chemical and biological interactions during harmful algal blooms". Drs. F.J.R. (Max) Taylor (Canada), and Vera L. Trainer (U.S.A.) were suggested as potential convenors, and one more convenor from Asia could be determined later, if the session approved by MEQ.

The Working Group also recommended (subject to approval by MEQ and Science Board) convening a 2-day Practical Workshop on "Taxonomy and identification of harmful algal bloom species" for experienced analysts from each country to ensure that all identifications of harmful species will be based on the same criteria. Many of the species are common to most of the participating countries. It is planned

that the workshop will be held at the University of British Columbia in Vancouver, just prior to PICES X.

WG 15 reviewed the list of organizations and programs for collaboration and identified SCOR GEOHAB, IOS/WESTPAC HAB, and

ECOhab as the highest priority programs for interaction.

Steps toward the co-ordination of research, particularly fieldwork, in adjacent waters should be encouraged and facilitated.

WG 15 Annex 2

Participation List

Canada

Paul J. Harrison
Maurice Levasseur
F.J.R. (Max) Taylor (Co-Chairman)

Japan

Yasuwo Fukuyo
Ichiro Imai

People's Republic of China

Tian Yan

Republic of Korea

Chang-Hoon Kim

Russian Federation

Dmitry L. Aminin
Tatiana Yu. Orlova (Co-Chairman)

U.S.A.

Donald M. Anderson
William Cochlan
David Garrison
Vera L. Trainer
Mark L. Wells

Observer

Young-Shil Kang

WG 15 Annex 1

Agenda

1. An introduction. (F.J.R. (Max) Taylor)
2. National reports on HAB events in PICES countries:
Canada (Paul J. Harrison and F.J.R. (Max) Taylor)
China (Tian Yan)
Japan (Yasuwo Fukuyo)
Korea (Young-Shil Kang)
Russia (Tatiana. Yu. Orlova)
U.S.A. (Vera L. Trainer)
3. Discussion to plan joint activities.
4. Forum on new results:
Tian Yan, Mingjiang Zhou, Meng Fu, Yunfeng Wang, Rencheng Yu, and Jun Li "Inhibition of egg hatching success and Larvae survival of the scallop, *Chlamys ferrerii*, associated with exposure to cells and cell fragments of

- the dinoflagellate, *Alexandrium tamarense*"
Chang-Hoon Kim "Bloom dynamics, physiology and PSP toxin production of *Alexandrium* species and *Gymnodinium catenatum* in the Korean coastal waters"
Vera L. Trainer "US West Coast Monitoring project"
Maria T. Maldonado, Eden L. Rue, and Mark L. Wells "The Role of trace elements in domoic acid production by *Pseudo-nitzschia* spp."
Donald M. Anderson "Biogeography of the Toxic Dinoflagellate Genus *Alexandrium*"
5. General discussion and recommendations to PICES.
 6. Closing remarks.

