

REPORT OF SECTION ON ECOLOGY OF HARMFUL ALGAL BLOOMS IN THE NORTH PACIFIC



The Section on *Ecology of harmful algal blooms in the North Pacific* (HAB-S) met on October 16, 2004. The meeting was attended by 18 participants representing all PICES member countries (*HAB-S Endnote 1*). The agenda for the meeting was approved as presented (*HAB-S Endnote 2*).

Meeting summary

The terms of reference for the HAB Section can be found in *HAB-S Endnote 3*. Because the scope of the Section is large, it was agreed that representatives from each PICES member country would be needed to provide expertise in the following areas: (1) current science projects in their countries, (2) state-of-the-art methods and new technologies, (3) future national plans for HAB research and monitoring, and (4) types of monitoring projects and data availability. Some suggestions for the expanded membership are provided under “Recommendations”.

Presentations on subjects of interest in HAB research were given by scientists from all PICES member countries (see *HAB-S Endnote 2*).

The Section Co-Chairman, Dr. Vera L. Trainer reported on the successful joint PICES/IOC workshop on “Developing a North Pacific HAB data resource – II”, held on October 15, 2004. The main goal of the workshop was to provide an interim “report card” on the use of the IOC/ICES HAE-DAT database by PICES member countries. The agenda included nine presentations and an extensive discussion on the usefulness and possible modifications to HAE-DAT for PICES member countries. The summary of the workshop can be found elsewhere in this Annual Report.

Proposals generated during the discussion of HAB Section future tasks are included under “Recommendations”.

Recommendations to Science Board

- Request additions to the existing HAB Section membership to fill gaps in expertise that have been recognized by this year’s members. Experts are needed in:
 - phytoplankton taxonomy (suggested additions: Yasuwo Fukuyo of Japan, and Rita Horner of U.S.A.);
 - phytoplankton mitigation strategies (suggested addition: expert on clay deposition from Korea);
 - plankton physiology of such species as *Pseudo-nitzschia*, *Heterosigma*, *Alexandrium*, *Chattonella* (suggested addition: Charles Trick of Canada);
 - marine pollution and molecular biomarkers (suggested addition: Olga Lukyanova of Russia);
- Encourage participation in HAB Section activities by researchers from Hong Kong and Mexico;
- Integrate efforts of the PICES HAB Section with NOWPAP and NEAR-GOOS and their relevant programs and groups;
- Partner formally PICES data efforts with IOC/ICES HAE-DAT database, and request NCDDC assistance with HAB data efforts;
- Link PICES HAB database contributions on the IOC website to PICES website;
- Encourage HAB managers (especially from China) to participate in PICES HAB data efforts;
- Convene a 1-day workshop at PICES XIV on “Review of selected harmful algae in the PICES region: I. *Pseudo-nitzschia* and *Alexandrium* spp.” preceded by a ½-day laboratory demonstration on algal toxins detection techniques (*HAB-S Endnote 4*);
- Convene a 1½-day HAB Section meeting at PICES XIV (including ½-day for a HAB data demonstration by Henrik Enevoldsen (IOC) and discussion of PICES HAB data efforts);

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- Provide travel funds for 3 specialists to speak/demonstrate at the proposed workshop on “Review of selected harmful algae in the PICES region: I. *Pseudo-nitzschia* and *Alexandrium* spp.” [possibly D. Anderson

(*Alexandrium*), S. Bates (*Pseudo-nitzschia*), and M. Quiliam (HPLC)], and 1 Chinese scientist to attend the HAB Section meeting at PICES XIV.

HAB-S Endnote 1

Participation List

Members

William Cochlan (U.S.A.)
Ichiro Imai (Japan)
Hak-Gyoon Kim (Korea, Co-Chairman)
Tatiana Yu. Orlova (Russia)
Angelica Peña (Canada)
Vera L. Trainer (U.S.A., Co-Chairman)
Yasunori Watanabe (Japan)
Mark L. Wells (U.S.A.)
Ming-Yuan Zhu (China)

Observers

Nicolaus G. Adams (U.S.A.)
Jeanne Allen (U.S.A.)
Brian D. Bill (U.S.A.)
Eun-Seob Cho (Korea)
Henrik Enevoldsen (IOC)
John E. Stein (U.S.A., MEQ Chairman)
Michelle Tomlinson (U.S.A.)
Dong-Beom Yang (Korea)
Ying-Lin Zou (China)

HAB-S Endnote 2

HAB Meeting Agenda

1. Welcome and introductions
2. Country reports
 - Ming-Yuan Zhu et al. (China): The occurrences of HAB in Chinese coastal waters in last three years
 - Ichiro Imai et al. (Japan): Monitoring of the shellfish-killing dinoflagellate *Heterocapsa circularisquama* in Japanese coastal sea by indirect fluorescent antibody technique
 - Angelica Peña (Canada): Preliminary proposal of a Canadian Program on the Ecology and Oceanography of Harmful Algal Blooms
 - Tatiana Yu. Orlova (Russia): Harmful algal bloom data for the Russian east coast
 - Hak-Gyoon Kim et al. (Korea): Recent approaches for the prediction and

- mitigation of *Cochlodinium polykrikoides* blooms in Korean waters
- Vera L. Trainer et al. (U.S.A.): Ecological linkages between physical and oceanographic conditions and the seasonal growth and distribution of *Pseudo-nitzschia* blooms on the U.S. west coast
- Michelle C. Tomlinson et al. (U.S.A.): The use of remote sensing and meteorological data for monitoring HABs through ecological associations
- Ying-Lin Zou et al. (China): Monitoring toxic HAB in the Chinese waters during the last three years
3. Summary of the PICES XIII workshop on “Developing a North Pacific HAB Data Resource – II”.
4. Discussion of HAB Section future tasks

HAB-S Endnote 3

Terms of Reference for the Section on *Ecology of harmful algal blooms in the North Pacific*

1. To develop and implement annual bloom reporting procedures that can be consistent with ICES procedures and therefore

incorporated into HAE-DAT and used to update the North Pacific Ecosystem Status Report. This will be important in assessing

- impacts of HAB events and as a research tool to understand patterns that will eventually lead to an increased prediction capability.
2. To exchange national reports of HAB incidents and development in order to inform PICES of new toxins, new developments, and new approaches. Both toxin producing and nontoxic (but harmful) algal species should be included.
 3. To focus on specific needs for scientific advice among PICES member countries by identifying topics of interest, and providing syntheses of the available scientific information on those selected topics. Example topics for discussion and synthesis might include:
 - a. Mitigation practices to reduce the impact of HABs;
 - b. Numerical model development of harmful algal bloom initiation and transport for predictions and forecasts;
 - c. Relationship between oceanographic processes and HAB formation (*e.g.*, how the physics of nutrients, trace metals tie into bloom formation);
 - d. Organism identification using molecular biological techniques;
 - e. Discussion of possible changes to certain monitoring techniques (for example, cell numbers *vs.* toxin levels);
 - f. Species introductions including issues of anthropogenic sources (*e.g.*, ballast water) or natural systems (*e.g.*, species range extension).
 4. Together with TCODE, to develop a meta-database that describes HAB monitoring and research efforts in each PICES member country.
 5. Support the harmonization of methods for identifying HAB species. This could include intercalibration workshops co-sponsored by PICES and ICES.
 6. Development of early warning systems for the detection of HABs. This could include discussion of ocean observing systems and techniques.
 7. To educate the community (managers, students) about biology and ecology of HAB organisms. For example, an in-depth study and documentation of selected HAB species (“top ten”) could include information about physiology, taxonomy, etc., of each of the species.

HAB-S Endnote 4

Proposal for a workshop at PICES XIV on “Review of selected harmful algae in the PICES region: *I. Pseudo-nitzschia* and *Alexandrium* spp.”

This workshop is the beginning of an annual series in which harmful algal bloom (HAB) species that impact all or most countries in the North Pacific are discussed in detail. In 2005, we will focus on two genera, *Pseudo-nitzschia* and *Alexandrium*. Topics will include detection methods, ecosystem comparison, and new advancements in physiology and ecology from each of the PICES member countries. In particular, we would like to stress those factors which need additional study in order to develop a predictive capacity for these HAB species. Specific subjects will include: a comprehensive listing of both macro- and micro-nutrient requirements, toxin production, light and temperature requirements, environmental

conditions, species and strain variability, cyst formation, shellfish species impacted, modeling and genetics. We will document our knowledge on the ecophysiology of these HAB species as a result of this workshop. During future workshops we anticipate discussing additional species, such as *Cochlodinium*, *Heterosigma akashiwo*, *Dinophysis*, *Heterocapsa*, *Chattonella*, *Gymnodinium catenatum* and *Karenia mikimotoi*. This 1-day workshop will be preceded by a ½-day laboratory demonstration on detection techniques for algal toxins at the TINRO-Center.

Recommended co-convenors: Tatiana Orlova (Russia) and Mark Wells (U.S.A.).