

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* (hereafter HAB-S) met from 09:00–18:00 hours on October 28, 2007. The HAB-S meeting was attended by members from all PICES member countries and 18 observers (*HAB-S Endnote 1*). The proposed agenda was approved (*HAB-S Endnote 2*).

Overview of WG 15 and review of HAB-S terms of reference (Agenda Item 3)

After presenting an overview of the terms of reference for Working Group (WG 15) on *Ecology of Harmful Algal Blooms in the North Pacific* and giving a brief history on the origin of this Working Group, Dr. Vera L. Trainer reviewed the terms of reference of HAB-S.

Events at PICES XVI (Agenda Item 4)

Summaries of the MEQ Topic Session (S6) on “*The relative contributions of off-shore and in-shore sources to harmful algal bloom development and persistence in the PICES region*” and the MEQ workshop and laboratory demonstration (W4) on “*Review of selected harmful algae in the PICES region: III. Heterosigma akashiwo and other harmful raphidophytes*” at PICES XVI can be found in the *Session Summaries* chapter of this Annual Report.

Plans for PICES XVII (Agenda Item 5)

The Section proposed the following events for PICES XVII:

- A 1-day MEQ workshop on the “*Review of selected harmful algae in the PICES region: IV. Karenia and Prorocentrum*”, co-convened by Drs. Trainer (U.S.A.) and Mingyuan Zhu (China). The workshop will be preceded by a ½-day laboratory demonstration on *Karenia* and *Prorocentrum* identification and detection methods, organized by Drs. Hao

Guo (China), Zhu, and Trainer (*HAB-S Endnote 3*). A product from the workshop will be a list of recommendations to help guide collaborative HAB research priorities in PICES countries over the next 5 years. Travel funds are requested for 2 invited speakers to attend the workshop.

- A ½-day MEQ Topic Session on “*Environmental regulation of species succession: The use of long-term data sets to understand HAB species dominance*” [This title was later changed to “*Species succession and long-term data set analysis pertaining to harmful algal blooms*”], co-convened by Drs. Hak-Gyoon Kim (Korea) and Mark Wells (U.S.A.) (*HAB-S Endnote 4*). Travel funds are requested for 1 invited speaker to attend the session.
- A 1-day HAB-S meeting, including national reports of HAB events in 2006–2007 and a discussion of HAE-DAT use. Countries are requested to input HAB event data directly online to HAE-DAT for 2004 and 2005.

National reports and Harmful Algal Event Database (HAE-DAT) use summary (Agenda Item 6)

Canada

Dr. Charles Trick stated that Canada has a weak monitoring program. The Canadian Food Inspection Agency tests seafood sold in stores, and is beginning to talk about accepting HAB data. There is a significant turnover of staff conducting the shellfish testing. Most problems in Canada are associated with fish killing species. The Harmful Algae Monitoring Program (HAMP) is motivated and funded by fish farmers (Nicky Haugh is the person currently working with the fish farmers on Vancouver Island). The database for this federal agency may eventually be made available for posting on HAE-DAT.

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China

Dr. Zhu reported that China is divided by seas: Bohai, Yellow, and East China – with the most frequent HAB area in the South China Sea. A total of 93 bloom events occurred in 2006, (20,000 km²) of which 41 were toxic (less than half yet covering 15,000 km²). The main toxic species were *Karenia mikimotoi*, *Phaeocystis globosa*, *Cochlodinium*, *Phaeocystis*. There are ongoing problems with dense blooms of *Microcystis* in the Three Gorges Dam region, resulting in no drinking water in some areas. The shellfish toxins ASP (amnesic shellfish poisoning), PSP, DSP are detected in Shanghai market seafood. ASP has not been detected yet in China (perhaps 1 report). DSP is a major problem. A first phase of the Chinese Ecology and Oceanography on Harmful Algal Blooms program (CEOHAB) was completed in 2006. A second phase will look at the increasing HAB trend, yearly jellyfish blooms and hypoxia. The National High Tech Project will develop a HAB monitoring system between 2007 and 2010.

Japan

Dr. Yasunori Watanabe informed that there are 39 local governments with coastlines in Japan, but 7 area codes. Each area code includes many prefectures. The Bureau of Consumption and Safety has no phytoplankton species information. Paralytic shellfish poisoning (PSP) and diarrhetic shellfish poisoning (DSP) data are reported by area code. Dr. Watanabe presented a table of annual occurrences of PSP (from 18 in 2000 to 37 in 2006) and DSP (from 4 in 1999 to 4 in 2005). Deficiencies in data reporting are made up by the FEIS/Fisheries Research Agency. ALOS (Advanced Land Observing System), the Japanese earth observing satellite program, can be used to detect *Chattonella* and *Cochlodinium* blooms using an advanced visible and near infrared radiometry. Aerial photography is also used to monitor for blooms.

Korea

Dr. Kim reported that Korea's HAB database will be housed at the National Fisheries Research and Development Institute (NFRDI).

The Korean Oceanographic Data Center will provide most of the data to HAE-DAT. *Cochlodinium* blooms are the main fish killers. The third largest bloom occurred in 2007 during which 28,000 metric tons of clay were dispersed. Three toxins are monitored as follows: 55 stations for PSP (mainly from March–May on the south coast), 15 stations for DSP, with sporadic sampling, and 40 stations for ASP, but again, only sporadically. Current research activities are looking for *Pfisteria*-like species in Korea and studying the effects of clay use on the benthic ecosystems.

Russia

Dr. Olga Lukyanova informed that shellfish sampling for toxins was done in Peter the Great Bay (Japan/East Sea), near Vladivostok. Testing of several mollusk species for ASP (using HPLC) and PSP (ELISA) showed that these toxins were not over the permitted level. Species monitored are *Mytilus trossulus*, *Crenomytilus grayanus*, and *Modiolus difficilis*.

U.S.A

Dr. Trainer related that various West Coast agencies in Alaska, Washington, Oregon and California report PSP and toxins. However, there are no reports of phytoplankton. Each coastal State has a representative who submits annual HAE-DAT reports to the National HAB office in Woods Hole, Massachusetts. The 5-year ECOHAB Pacific North West program studying the ecology and oceanography of *Pseudo-nitzschia* species is coming to a close in 2007. A new program, SoundToxins, is a phytoplankton monitoring program in Puget Sound, Washington, intended to give fish and shellfish farmers an early warning of HAB events.

Joint ICES–PICES Database: HAE-DAT (Agenda Item 7)

Dr. Monica Lion gave the HAE-DAT summary and an online demonstration of the database hosted by the IODE (International Oceanographic Data Exchange) Project Office in Oostende, Belgium (<http://www.iode.org/haedat>). The

testing period was completed last year by PICES HAB-S together with ICES-WGHABD, IOC-ANCA, and IOC-FANSA. A summary section will be added to the web database to provide information on the following:

- What is a HAE?
- information on HAE-areas;
- short descriptions of the national monitoring programs on which the records of HAE-DAT are based;
- addition of legends on the maps;
- adjustment of the map minimum zoom to the whole country (the ability to zoom in and out on the maps like Google maps).

There will be only one user name and password per country. The national focal point persons (see recommendations to MEQ) will be responsible for submitting data to HAE-DAT. The next steps are to develop an integrated Harmful Algae Information System (HAIS), building on existing data products by IOC and its partners.

Several people were suggested as new primary contacts for data entry into HAE-DAT. This was necessary due to changes in key people responsible for HAB data in their countries. The new contacts are: Yang Soon Kang (Korea) to replace Hak-Gyoon Kim, Hao Guo (China) to replace Mingyuan Zhu, and Tatiana Morozova (Russia) to replace Tatiana Orlova. It was requested that the respective member countries consider appointing these scientists to become HAB Section members (or at least adding them to the HAB-S e-mail list).

Publications (Agenda Item 8)

The invited speakers of the HAB-S workshops on *Cochlodinium* and *Dinophysis*, *Alexandrium* and *Pseudo-nitzscha*, *Heterosigma*, *Karenia*, and *Prorocentrum* will be contacted to determine their interest in writing 3- to 5-page summaries and extensive bibliographies based on their presentations. The goal is to combine these summaries into a *Review of selected harmful algae in the PICES region* and publish this review as a PICES Scientific Report by 2010.

HAB-S Endnote 1

Participation list

Members

Ichiro Imai (Japan)
 Hak-Gyoon Kim (Korea, Co-Chairman)
 Olga Lukyanova (Russia)
 Vera L. Trainer (U.S.A., Co-Chairman)
 Charles Trick (Canada)
 Yasunori Watanabe (Japan)
 Mingyuan Zhu (China)

Observers

Robin Brown (Canada)
 Luzviminda Dimaano (Philippines)
 Henrik Enevoldsen (IOC)

Hao Guo (China)
 Julian Herndon (U.S.A.)
 Yoichiro Ishibashi (Japan)
 Takashi Kamiyama (Japan)
 Kunio Kohata (Japan)
 Yoon Lee (Korea)
 Ruixiang Li (China)
 Monica Lion (IOC)
 Jinhui Wang (China)
 Lijun Wang (China)
 Quan Weimin (China)
 Chen Yagu (China)
 Shi Li Yan (China)
 Wenxi Zhu (China)
 Zhaohui Zhang (China)

HAB Endnote 2

HAB-S meeting agenda

1. Welcome and introductions
2. Approval of agenda
3. Overview of terms of reference and history of WG 15, and review of terms of reference of HAB-S
4. Events at PICES XVI
5. Plans for PICES XVII
6. National reports and HAE-DAT use summary
7. Joint ICES-PICES HAE-DAT database
8. Publications

HAB-S Endnote 3

Proposal for a 1-day workshop and a ½-day laboratory demonstration at PICES XVII on “Review of selected harmful algae in the PICES region: IV. Karenia and Prorocentrum”

This workshop is the fourth 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 2008, we will focus on two fish-killing species *Karenia* and *Prorocentrum*. *Karenia mikimotoi* is known to kill both wild and cultured fish in China, Korea and Japan. Although this species is absent, to date, in the eastern Pacific, other species from the genus *Karenia* are known to kill fish in the southeastern U.S. *Prorocentrum* is a “red tide” species that forms dense, colored blooms in China, Korea and Japan, resulting in economic loss to fisheries due to reduced consumer confidence. *Prorocentrum* blooms are relatively rare in the eastern Pacific, but have been documented occasionally in areas of the U.S. and Canada. The integration of information from each country will advance our understanding of these organisms. Topics will include modes of toxicity, distribution, impact (differences between toxic and nontoxic strains), as well as physiology and ecology in each of the

member countries. In particular, we would like to identify additional studies needed specifically to understand the difference in occurrence and toxicity of these organisms in the eastern and western Pacific. The workshop will produce a list of recommendations to help guide collaborative HAB research priorities in PICES member countries over the next five years. The workshop will be preceded by a half-day laboratory demonstration on *Karenia* and *Prorocentrum* identification and detection methods.

Recommended convenors: Vera L. Trainer (U.S.A.) and Mingyuan Zhu (China).

Potential invited speakers: Daniel Baden (U.S.A.), Lu Dou Ding (China), Steven Morton (U.S.A.), Jacob Larsen (Denmark), Song Hui Lu (China), Karen Steidinger (U.S.A.) and Dr. Yamaguchi (Japan). The co-convenors will make the final decision regarding which expert speakers to invite.

HAB-S Endnote 4**Proposal for a ½-day MEQ Topic Session at PICES XVII on**

“Environmental regulation of species succession: The use of long-term data sets to understand HAB species dominance” [later renamed to *“Species succession and long-term data set analysis pertaining to harmful algal blooms”*]

Increasing numbers of harmful algal bloom (HAB) events in many coastal locations are a result of significant changes in the dominant species compared to earlier periods. These changes may stem from introductions of new species or from range extensions, but they seem more likely to have arisen from changes in the environmental conditions that promote the dominance of a particular HAB species. Often, it has been concluded that anthropogenic influences on hydrology, land-use, nutrient inputs, *etc.* are the root cause of these changes, but there are examples of HAB incursions into regions that lack these pressures. An ecosystem approach focusing on decadal-scale changes in

environmental conditions and planktonic species composition may provide some clarity on the causes of intensified HAB events. Talks on physical-scale to nutrient-scale factors that may affect species succession towards HAB species dominance are especially welcome.

Recommended convenors: Hak-Gyoon Kim (Korea) and Mark Wells (U.S.A.).

Potential invited speakers: Theodor Smayda (U.S.A.) and an Asian scientist (TBD). The co-convenors will make the final decision regarding which expert speakers to invite.

