An overview on the recent East Asian regional cooperation on HABs

Hak-Gyoon Kim, Pukyong National University
IOC–WESTPAC HAB Programme (HAB)

IOC–WESTPAC/HAB aims at:
- providing capacity building for Member States.
- produces reference materials, and documentation, channeled to interested parties through an active network in the region.

The future plan includes further courses,
- the participation in different forums to evaluate WESTPAC/HAB,
- the production and dissemination of reference materials and relevant documentation and networking.
## IOC/WESTPAC Activities-2003

<table>
<thead>
<tr>
<th>Title</th>
<th>Place &amp; Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>The First Southeast Asian Ocean Forecasting Models Inter-comparison Workshop</td>
<td>Kuala Lumpur, Malaysia 19-24 Feb</td>
</tr>
<tr>
<td>The Seventh IOC/WESTPAC Training Course on the Identification and Monitoring of Harmful Microalgae</td>
<td>Sabah, Malaysia 24-29 March</td>
</tr>
</tbody>
</table>
North Pacific Marine Science Organization,
Report 23 (August 2002) Harmful algal blooms
in the PICES region of the North Pacific

Harmful Algal Blooms Section, 2003 –
Acronym: HAB-S

Parent Committee: MEQ
Co-Chairman: Hak-Gyoon Kim <hgkim7952@yahoo.co.kr>
Co-Chairman: Vera Trainer <Vera.L.Trainer@noaa.gov>

Mailing List (HAB-S Members only)

- 12th 2003: HABs – Harmonization of data
- 13th 2004: Developing a North Pacific HAB data resource–II
- 14th 2005: Review of two selected harmful algae in the PICES
  - Pseudo-nitzschia & Alexandrium
- 15th 2006: Review of two selected harmful algae in the PICES
  - Dinophyis & Cochlodinium
Joint PICES–ICES HAE-DAT

- To make monitoring and research effective, predictive and mitigative
- Benefit from building common data resources among PICES nations
- Central tasks are:
  - ascertain the data base process
  - identify the difficulties in delivery
  - assess web-based window
  - further modification to encompass Pacific
NOWPAP activities on HABs since 1994

- NOWPAP – The Regional Seas Programme of UNEP
- 4th IGM agreed to establish four Regional Activities Centres (1999)
  - CEARAC, POMRAC, MERRAC, and DINRAC
- 7th IGM established WG3 and WG4 in CEARAC/Toyama, Japan
  - WG3 – Harmful algal blooms including red tides
  - WG4 – Remote sensing of marine and coastal environment
- 2003 WG3 established CCG
- 2005 WG3–4 Meeting: Reference metadata base
- 2006 WG3–4 Meeting:
  - Countermeasure against HABs: July, Toyama, Japan
EAST-HAB

- Establishment of EAST-HAB
  - East Asia Study Team for HAB include China, Japan, and Korea
  - The initiative workshop on Aug. 30, 2004, Inha Univ. Korea
    - Discuss collaborative works on HAB and agreed to have 2nd meeting in Jeju Island, December, 2004
  - The 1st Workshop on Dec. 10–12, 2004, Jeju, Korea
  - The 2nd Workshop on Nov. 25–27, 2005, Quindao, China

- The future projects
  - The 3rd workshop will be in November, 2006, Nagasaki, Japan
  - Discuss on the target species: *Coccolithus*, *Prorocentrum*
Briefs on MOMAF/NFRDI–NOAA Sponsored

- Workshop of Recent Progress on the Research and Management of Cochlodinium Blooms
  - Date: on 22-23 May 2006
  - Venue: Cheju National University, Republic of Korea
  - Organizers: Drs. Changkyu Lee (NFRDI) and Gregory Doucette (NOAA/NOS),
  - Participants: c.a. 50 experts from China, Japan, Korea, Philippines, and U.S.A
The goal of the joint workshop

- This workshop was developed as part of a collaboration between the NFRDI/MOMAF and the NOAA/NOS.
- To raise the issue of Cochlodinium blooms as an emerging global HAB problem;
- To provide a summary of recent progress on the research and management of Cochlodinium blooms;
- To identify important topics for future investigation.
The workshop comprised four sessions
- Taxonomy,
- Ecology/Oceanography/Modeling,
- Monitoring/Remote Sensing,
- Mitigation.

Each session concluded with an open discussion of issues relevant to the topic(s).

Following the workshop, NOAA/NOS scientists Dr. Doucette and Ms. Mikulski traveled to the NFRDI laboratory in Busan as part of an ongoing collaborative project to develop a molecular diagnostic test for detection of Cochlodinium polykrikoides in Korean waters.
Session I: Taxonomy
(Speakers – Prof. K. Matsuoka/Japan, Prof. J.-B. Lee/Korea)

- The two primary issues raised during this session were related to the
  - identification and phylogenetic analysis of the genus Cochlodinium,
  - as well as the question of cyst formation within the species C. polykrikoides.
Session II: Ecology/Oceanography/Modeling

(Speakers: Prof. K. Yin/Hong Kong, Prof. R. Azanza/Philippines, Dr. G.W. Na/Korea, Prof. D.-K. Lee/Korea, Prof. R. Kudela/USA, Prof. P.J.S. Franks/USA)

- This session highlighted many aspects of the ecology and oceanography of C. polykrikoides that may influence bloom dynamics,
- including temperature and nutrient requirements, autotrophic vs. mixotrophic modes of nutrition, and the relationship to physical features (e.g., wind-driven circulation patterns).
Session III: Monitoring/Remote Sensing

(Speakers: Dr. Y.-S. Suh/Korea, Dr. R.P. Stumpf/USA, Prof. G.H. Kim/Korea, Ms. C.M. Mikulski/USA, Prof. J.Y. Na/Korea)

- Applications of remote sensing as well as molecular-based tools for forecasting and detection of Cochlodinium blooms were emphasized during this session.
- Operational forecasts utilizing satellite data coupled with careful analysis of contextual data (e.g., sea surface temperature, meteorological forcings, ground truthing, etc.) are currently employed in the USA for blooms of the red tide dinoflagellate, Karenia brevis.
Session IV: Mitigation

(Speakers: Dr. M.R. Sengco/USA, Dr. C.K. Lee/Korea, Prof. I. Imai/Japan)

- Physical (i.e., clay, aeration) and biological control (i.e., bacteria, ciliate grazer) methods were focal points of this session.

- A number of variables have been shown to influence the effectiveness of clay in cell removal, including the clay type, addition of flocculants, cell concentration, flow regime, etc.; however, effects on benthic organisms have thus far been reported as minimal.

- Use of aeration to reduce the impact of oxygen demand associated with respiration of dense Cochlodinium blooms was reported to be highly effective in enhancing the survival of commercially important abalone.
Publication of proceedings

- The proceedings concluded with an open discussion of a proposal to submit manuscripts based on workshop presentations for a Special Issue of the journal, Harmful Algae.
- Participants were informed that this proposal has the support of the journal’s two Editors-in-Chief, Drs. S. Shumway and T. Smayda.
2001-2002 HAE-DAT in Korea

Kim, H.G., C.K. Lee and S.G. Lee
Final area code naming of 3 areas
<table>
<thead>
<tr>
<th>Organization</th>
<th>Methods</th>
<th>Duration</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFRDI</td>
<td>Research Vessels</td>
<td>Monthly (Feb.-Nov.)</td>
<td>All coasts (77 st.)</td>
</tr>
<tr>
<td>Local MOMAF</td>
<td>On shore watch &amp; Vessels</td>
<td>Weekly (Apr.-Oct.)</td>
<td>39 local area (92st.)</td>
</tr>
<tr>
<td>NMPA</td>
<td>Helicopter</td>
<td>Daily (HABs time)</td>
<td>All coasts</td>
</tr>
</tbody>
</table>
HABs & environmental metadata

- Harmful algae identification
- Shellfish poisoning toxins
- Environmental and meteorological data
- Fish kill and economic value
### List of phytoplankton identified

**Identification sheet**

<table>
<thead>
<tr>
<th>세 집 장 소</th>
<th>접 수</th>
<th>총 집 장 장소</th>
<th>평균 수</th>
<th>총 집 장 장소</th>
<th>총 집 장 장소</th>
</tr>
</thead>
<tbody>
<tr>
<td>St.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>총 집 수</td>
<td>총 집 장</td>
<td></td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
</tr>
<tr>
<td>계수</td>
<td>Coulter Counter</td>
<td>총 집 장 장소</td>
<td>계수</td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
</tr>
<tr>
<td>방법</td>
<td>계수</td>
<td>총 집 장 장소</td>
<td>계수</td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
</tr>
<tr>
<td></td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
<td>총 집 장 장소</td>
</tr>
</tbody>
</table>

1. Sampling date, place, volume, and depth
2. Project title, name of research vessel
3. Methods of enumeration, counting plate,
4. concentration ratio, counting volume
Determination of Shellfish Toxins

- Paralytic shellfish poisoning (PSP)
  - Mouse bioassay
- Diarrhetic shellfish poisoning (DSP)
  - Mouse bioassay and HPLC
- Amnesic shellfish poisoning (ASP)
  - HPLC
# Monitor components for Korean marine environment

<table>
<thead>
<tr>
<th>Monitoring requirement</th>
<th>Required monitoring components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SEAWATER</strong> (21factors)</td>
<td>General items: SST, Salinity, pH, DO, COD, TN, TP, NO2 - N, NO3 - N, NH4 - N, PO4 - P, SS, Oil &amp; Grease, Clearness</td>
</tr>
<tr>
<td></td>
<td>Trace metal: Cu, Pb, Zn, Cd, Cr+6, total Hg, As, CN</td>
</tr>
<tr>
<td></td>
<td>Organic contaminants: PCBs, TBT</td>
</tr>
<tr>
<td><strong>SEDIMENT</strong> (12factors)</td>
<td>General items: Particle size, IL, AVS, COD</td>
</tr>
<tr>
<td></td>
<td>Trace metal: Cu, Pb, Zn, Cd, Cr+6, total Hg, As, CN</td>
</tr>
<tr>
<td></td>
<td>Organic contaminants: PCBs, TBT, Pesticides, PAHs, PCDDs/DFs</td>
</tr>
<tr>
<td><strong>ORGANISM</strong> (15factors)</td>
<td>General items: Chl a</td>
</tr>
<tr>
<td></td>
<td>Trace metal: Cu, Pb, Zn, Cd, Cr+6, total Hg, As, CN</td>
</tr>
<tr>
<td></td>
<td>Organic contaminants: PCBs, TBT, Pesticides, PAHs, PCDDs/DFs</td>
</tr>
</tbody>
</table>
Isothermal contour of remotely sensed water temperature
Fig. Home page of Korea Oceanographic Data Center (KODC)
Some constraints

- Two programs: RT & PSP
- The manager has no interests on HAE-DAT
The benefits of HAE-DAT

- on the viewpoint of science
  - can share the HABs data and information
- on the viewpoint of economy
  - secure the safety of marine products
  - trust trade of marine products
Thank you for your attention.