IOC WESTPAC Project on diatom

*Pseudo-nitzschia:*

A Proposal

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OUTLINE

1. Background
2. Project objectives, activities and participations
3. Source of Project funding
Domoic acid poisoning

- **Biotoxin:** Domoic acid
  - Water soluble tricarboxylic amino acid
  - Glutamate receptor agonist

- ** Syndromes of Amnesic shellfish poisoning (ASP):**
  - Gastrointestinal symptoms (nausea, vomiting, abdominal cramps, and diarrhea)
  - Central nervous system disorder (loss of short-term memory, coma and death)
Domoic acid contamination

- Zooplankton: Krills, ciliate, copepod
- Shellfish: mussel, clams etc
- Crustacean: crab, lobster, octopus, squids
- Benthic fauna: worm, barnacles, sea anemones
- Fish: planktivorous fishes, flatfishes
- Marine bird: pelicans, cormorants, sea gulls
- Marine mammals: whale, sea otter, seals, sea lion etc
## Major Event of ASP Worldwide

<table>
<thead>
<tr>
<th>Event</th>
<th>Pseudo-nitzschia spp.</th>
<th>Location</th>
<th>Year</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination of blue mussels (Mytilus edulis)</td>
<td>P. multiseries</td>
<td>Prince Edward Island (PEI), Canada</td>
<td>1987</td>
<td>Bates et al., 1989</td>
</tr>
<tr>
<td>Fatality in pelicans and cormorants</td>
<td>P. australis</td>
<td>Monterey Bay (California)</td>
<td>1991</td>
<td>Work et al., 1993</td>
</tr>
<tr>
<td>Fatality of sea lions</td>
<td>P. australis</td>
<td>Central and northern California</td>
<td>1998</td>
<td>Lefebvre et al., 1999</td>
</tr>
<tr>
<td>Outburst of domoic acid in an artificial seawater reservoir</td>
<td>P. calliantha &amp; P. fraudulenta</td>
<td>Amurskii Bay, East/Japan Sea</td>
<td>2002</td>
<td>Stonik et al., 2008</td>
</tr>
</tbody>
</table>
Genus of *Pseudo-nitzschia*

- *P. americana* (Hasle) Fryxell
- *P. antarctica* Manguin
- *P. australis* Frenguelli
- *P. brasiliana* Lundholm, Hasle et Fryxell
- *P. caciantha* Lundholm, Moestrup et Hasle
- *P. calliantha* Lundholm, Moestrup et Hasle
- *P. cuspidata* (Hasle) Hasle
- *P. decipiens* Lundholm et Moestrup
- *P. delicatissima* (Cleve) Heiden
- *P. dolorosa* Lundholm et Moestrup
- *P. fraudulentula* (Cleve) Hasle
- *P. galaxiae* Lundholm et Moestrup
- *P. granii* (Hasle) Hasle
- *P. heimii* Manguin
- *P. inflatula* (Hasle) Hasle
- *P. linea* Lundholm, Hasle et Fryxell
- *P. mannii*
- *P. lineola* (Cleve) Hasle
- *P. micropora* Priisholm et Moestrup
- *P. multiseriata* (Hasle) Hasle
- *P. multisiriata* (Takano) Takano
- *P. obtusa* (Hasle) Hasle et Lundholm
- *P. prolongatoides* (Hasle) Hasle
- *P. pseudodelicatissima* (Hasle) Hasle
- *P. pungens* (Cleve) Hasle
- *P. pungiformis* (Hasle) Hasle
- *P. seriata* (Cleve) Peragallo *f. seriata*
- *P. sinica* Qi et Wang
- *P. subcurvata* (Hasle) Fryxell
- *P. subfraudulentula* (Hasle) Hasle
- *P. subpacifica* (Hasle) Hasle
- *P. turgidula* (Hustedt) Hasle
- *P. turgiduloides* (Hasle) Hasle
- *P. arenysensis* Quijano-Scheggia, Garces, Lundhorm
Table 1. Occurrence of *Pseudo-nitzschia* species in the Southeast Asia.

<table>
<thead>
<tr>
<th>Species</th>
<th>Malaysia</th>
<th>Thailand</th>
<th>Indonesia</th>
<th>Vietnam</th>
<th>Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pseudo-nitzschia americana</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia brasiliana</em></td>
<td>+ b, d, h</td>
<td>+ e</td>
<td>+ e</td>
<td>+ b</td>
<td>+ c</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia caciantha</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ c</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia calliantha</em>*</td>
<td>+ b</td>
<td>+ f</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia cuspidata</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia delicatissima</em>*</td>
<td>+ b</td>
<td>+ f</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia dolorosa</em></td>
<td>+ d</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia fraudulent</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia cf. grani</em></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia heimii</em></td>
<td>-</td>
<td>+ f</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia inflatula</em></td>
<td>-</td>
<td>+ f</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia micropora</em></td>
<td>+ b</td>
<td>+ f</td>
<td>-</td>
<td>+ b</td>
<td>+ c</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia multistriata</em></td>
<td>+ b</td>
<td>-</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia pungens</em></td>
<td>+ d, h</td>
<td>-</td>
<td>+ g</td>
<td>+ b</td>
<td>+ a, c</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia pseudodelicatissima</em>*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+ c</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia cf. sinica</em></td>
<td>-</td>
<td>+ f</td>
<td>-</td>
<td>+ b</td>
<td>-</td>
</tr>
<tr>
<td><em>Pseudo-nitzschia subpacific</em></td>
<td>-</td>
<td>+ f</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Rationale/Justification

- Limited understanding on bloom dynamic of *Pseudo-nitzschia* and related shellfish poisoning in the regions
- Contamination domoic acid has been reported in Philippines (Bajarias et al., 2006) and Vietnam (Ha et al., 2009), with no records of human poisoning.
Rationale/Justification

- Lack of trained personnel in research and monitoring of this group of toxic diatom
- Lack of standardization in research and monitoring (phytoplankton & toxins)
IOC/WESTPAC Training course on taxonomy and ecology of the diatom *Pseudo-nitzschia* (Bacillariophyceae)

20-23 March 2011,

*Universiti Malaysia Sarawak*
Seminar on Harmful Algal Blooms

- Prof Dr Yasuwo Fukuyo
- Dr Nina Lundholm
- Dr Dao Viet Ha
Lectures on taxonomy of diatom

*Pseudo-nitzschia* by Dr. Nina Lundholm
Samples preparations and observation
Observation of *Pseudo-nitzschia* by TEM
TEM Micrographs observation & morphometric analysis
Demonstration of FISH method
Pseudo-nitzschia Project: a proposal

- A group discussion was held on the 23rd March.
- All participants agreed in consensus to the proposal to establish a new project.
- Discussion on several issues related to the project; strategies to support the proposal & financial support.
**Pseudo-nitzschia** Project:
A proposal

- China (JY Cen)
- Indonesia (A. Rachman)
- Japan
- Malaysia (PT Lim, AH Yong, S Salleh)
- Philippines (VM Borja, L Yap Dejeto, N. Gatdula)
- Thailand (P. Uttayammanee)
- Vietnam (Dao VH, Le TT, Nguyen PA)
Project’s objectives

- To standardize sampling methodology in research and monitoring of toxic *Pseudo-nitzschia* and shellfish
- To establish regional research networking and database on *Pseudo-nitzschia*
- To promote capacity building in research and monitoring
- To establish regional focal point/ training center
Potential source of financial support for this project

- Universiti Malaysia Sarawak (Support in venue for meeting and training, as well research facilities)
- IOC/WESTPAC
- Government of Malaysia (MOSTI-NOD)
- Japanese Fund in trust for UNESCO (JFIT-UNESCO)
- Other potential funding sources
Conclusion

- Establishment of a new IOC/WESTPAC project has a good start with the implementation of the TC on *Pseudo-nitzschia*.
- More challenging waiting ahead in materialize the proposal.
- Advice and comments from all are most welcome.
Acknowledgement

- Prof Fukuyo for his advice and encouragement on *Pseudo-nitzschia* TC and projects
- Financial support from IOC/WESTPAC HAB to attend this scientific symposium
- Universiti Malaysia Sarawak
Bloom dynamic of *Pseudo-nitzschia*

- Regulated by differences in environmental conditions, temperatures, salinity, tidal cycles, pH, macronutrients (Si, P, N, trace elements etc).
- Higher cell density was also observed during the dry season from December to May in Philippines (Yap-Dejeto et al. 2008) and Thailand (Udomratana et al. 2008).
Abundance of *Pseudo-nitzschia*

![Graph](image.png)

- **Santubong**
  - May-Aug
- **Samariang**
  - May-Aug

Date of sampling:
- 2007
- 2008
- 2009
- 2010

Average cell density L\(^{-1}\)

- Santubong
- Samariang

Abundance of *Pseudo-nitzschia*

Date of sampling:
- May
- May-Aug
- Sept
Monthly rainfall 2007-2010 in Kuching, Malaysia