Process and conditions of formation of *Karenia mikimotoi* bloom in Bohai Sea, China

Ruixiang Li\(^1\), Mingyuan Zhu\(^1\) and Jianqiang Yang\(^2\)

1 First Institute of Oceanography, SOA
2 Environment Monitoring Centre of North China Sea, SOA

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Contents

► General status of *Karenia mikimotoi* bloom in China Seas
► Process and conditions of formation of *Karenia mikimotoi* bloom in Bohai Sea, 2004
Karenia mikimotoi is a eurytopic species. It forms Harmful Algal Blooms in many coastal countries in the world and causes great concern in these countries.

In China the bloom of Karenia mikimotoi occurs mainly in Estuary of Pearl River in South China Sea, Estuary of Yangtze River in East China Sea as well as coastal water of Tianjin City. However, there is no record of Karenia mikimotoi bloom in Yellow Sea so far, but there was one record in shrimp pond in Rongcheng county, Shangdong Province.
The occurring frequency of *Karenia mikimotoi* bloom in China Sea

2003 years ago, bloom events of *karenia mikimotoi* was less, but since 2004 occurring frequency tend to increase observably, especially 2005 and 2006.
Distribution of bloom of *Karenia mikimotoi*

- *Karenia mikimotoi* and *Gymnodinium* sp.
- *Akashiwo sanguineum*
- *Cochlodinium polykrikoides*
The bloom events of *Karenia* in East China Sea occupied 81% of total blooms of *Karenia* in China Sea.
Process and conditions of formation of *Karenia mikimotoi* bloom in Bohai Sea, 2004
# Several HAB in Bohai Bay in 2004

<table>
<thead>
<tr>
<th>HAB species</th>
<th>Time/date</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ditylum brightwellii</em></td>
<td>16/05/2004</td>
</tr>
<tr>
<td><em>Skeletonema costatus</em></td>
<td>31/05/2004</td>
</tr>
<tr>
<td><em>Karenia mikimotoi</em></td>
<td>03/06/2004~18/06/2004</td>
</tr>
<tr>
<td><em>Mesodinium rublum</em></td>
<td>21/06/2004</td>
</tr>
<tr>
<td><em>Odontella sinensis</em> and <em>Dinophysis acuminata</em></td>
<td>01/07/2004</td>
</tr>
<tr>
<td><em>Chattonella mirina</em></td>
<td>05/07/2004~08/07/2004</td>
</tr>
</tbody>
</table>
Pheocystis globosa
Karenia mikimotoi
Pheocystis globosa
This HAB was mainly Thalassiosira and *karenia mikimotoi*
The change of nutrients and *Karenia mikimotoi* abundance in process of bloom

The change of nitrate, ammonium and abundance of *k. mikimotoi*

The change of nitrite and phosphate
The variation of atom ratio of N/P during *Karenia mikimotoi* bloom

At the beginning of *Karenia mikimotoi* bloom, the ratio of N and P was about 153. As the boom was developing, the ratio decreased to less than 30. When the bloom of *karenia* disappeared, N/P increased to more than 300.
meteorological condition during bloom of *K. mikimotoi*

<table>
<thead>
<tr>
<th>parameter</th>
<th>02June</th>
<th>09June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature (°C)</td>
<td>24.4</td>
<td>29.8</td>
</tr>
<tr>
<td>Water temperature</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Wind speed (m/s)</td>
<td>2-3(mean)</td>
<td></td>
</tr>
<tr>
<td>Air pressure (hpa)</td>
<td>10170(mean)</td>
<td></td>
</tr>
</tbody>
</table>
The distribution and variation of abundance of *k.mikimotoi*

Unit: x10^6 cells/L
Summary

◆ *Karenia mikimotoi* bloom occurred in Tianjin coast waters on 3 June, 2004. The area is about 300 km². This bloom lasted for half a month, causing losses of mariculture of shrimp.

◆ Favourable weather conditions, especially continuous sunshine, is one of the causes to this bloom. *Karenia mikimotoi* were blooming with fast-increasing water temperature and extinction with nutrient depletion.

◆ During the extinction process of *Karenia mikimotoi* bloom, ammonium rapidly increased. This would provide again the abundant material foundation for the next bloom. For example, *Mesodinium rubrum* bloom (June 21) and *Chattonella mirina* bloom (July 5-8) occurring follow the *Karenia mikimotoi* bloom.
Thanks for your attention!