Harmful Algae Blooms in Coastal Waters of China in 2011

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There were 1244 of HABs before 2012.
The frequency and Area of HAB in China Sea in 2011

- Total affected area of 6076 km²
Season of occurrence of HABs in 2011
There were 21 species of HAB in 2011

13 records: *Prorocentrum donghaiense* bloom only in East China Sea
11 records: *Noctiluca scintillans*
7 records: *Skeletonema costatum*
3 records: *Akashiwo sanguinea*
2 records: *Phaeocystis globosa, Heterosigma akashiwo, Gyrodinium spirale, *
1 record: *Cochlodinium polykrikoidis, Prorocentrum minimun, Karenia breve, Chattonella, sp., Chattonella antiqua, Gymnodinium sp. (may be Karlodinium), Pseudonitzschia pungens, Eucampia zoodiacus, Leptocylindrus danicus, Rhizosolenia delicatula, et.al., Aureococcus anophagefferen* (Belong to PELAGOPHYCEAE)
HABs in coastal waters of China from 2007 to 2011
Compared with HAB in recent 5 years, HABs in 2011 were lowest both in frequency and area affected.
The season with frequent HAB was from May to September.
The HAB caused by dinoflagellates and other flagellates were increased.
HABs in coastal waters in China in 2011

Noctiluca scintillans bloom
Fengao Lin et.al divided HABs causative species in coastal waters of China into three categories based on their average annual number and total area of occurrence from 2006 to 2010:

high, frequent and common bloom-forming species

- **4 high occurrence HAB species**: *Prorocentrum donghaiense*, *Skeleonema costatum*, *Noctiluca scintillans* and *Karenia mikimotoi*;
- **4 frequent occurrence HAB species**: *Phaeocystis globosa*, *Chaetoceros sp.*, *Heterosigma akashiwo* and *Rhodomonas sp.*;
- **8 common bloom-forming species**: *Thalassiosira sp.*, *Mesodinium rubrum*, *Scrippsiella trochoidea*, *Ceratium sp.*, *Gonyaulax spinifera*, *Akashiwo sanguinea*, *Chattonella marina* and *Gymnodinium sp.*
Bloom of *Phaeocystis globosa* in Beihai coast of Guangxi Province in 2011
Brown tide in coast waters of Qinghuangdao, Hebei Province—a small new HAB species

(From Kong Fanzhou, et al., 2012)
The specimen picture from field samples in July/2010
The specimen picture from field samples in June/2011

Similar with *Aureococcus anophagefferens*
PHYTO-PAM datum

Channels

470nm 520nm 645nm 665nm
Ft: 373 245 229 344
F: 368 245 189 268
Fm: 412 262 315 469
dF: 52 17 135 201
Yield: 0.13 0.06 0.43 0.43

Mean

298

263

364

101

0.28

05JUL2010

09:17:31

AL Time

Gain 8

New Record

Mode

● MEASURE

○ VIEW

Exit

Clock

SAT-Pulse

On 20
Schematic of partial N transport and assimilation network present in *Aureococcus anophagefferens*. (Gry Mine Berg et al., 2008)

From (http://psort.nibb.ac.jp)
### Macroalgae bloom in Yellow Sea

<table>
<thead>
<tr>
<th>year</th>
<th>The largest distribution area (km²)</th>
<th>Covered area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>58 000</td>
<td>2 100</td>
</tr>
<tr>
<td>2010</td>
<td>29 800</td>
<td>530</td>
</tr>
<tr>
<td>2011</td>
<td>26 400</td>
<td>560</td>
</tr>
</tbody>
</table>
The distribution image of *Ulva prolifera* by aviation in 13/July/2011 of Qingdao beach
Image of remote sensing in 2011-06-22
(form Beihai Branch, SOA)
Green algae bloom may be correlated with culture of Porphyra ?
Summary

- The frequency and area of HABs was decreased than before, and was the lowest compared with recent 5 years.
- New HAB species appear continuously, for example, *Aureococcus anophagefferens*.
- But Macroalgae bloom (*Ulva prolifera*) still continue and develop in west coast in Yellow Sea every year.
Thank you for your attention