Seasonal dynamics and spatial distribution of Ostreopsis spp. in the Peter the Great Bay, the Sea of Japan

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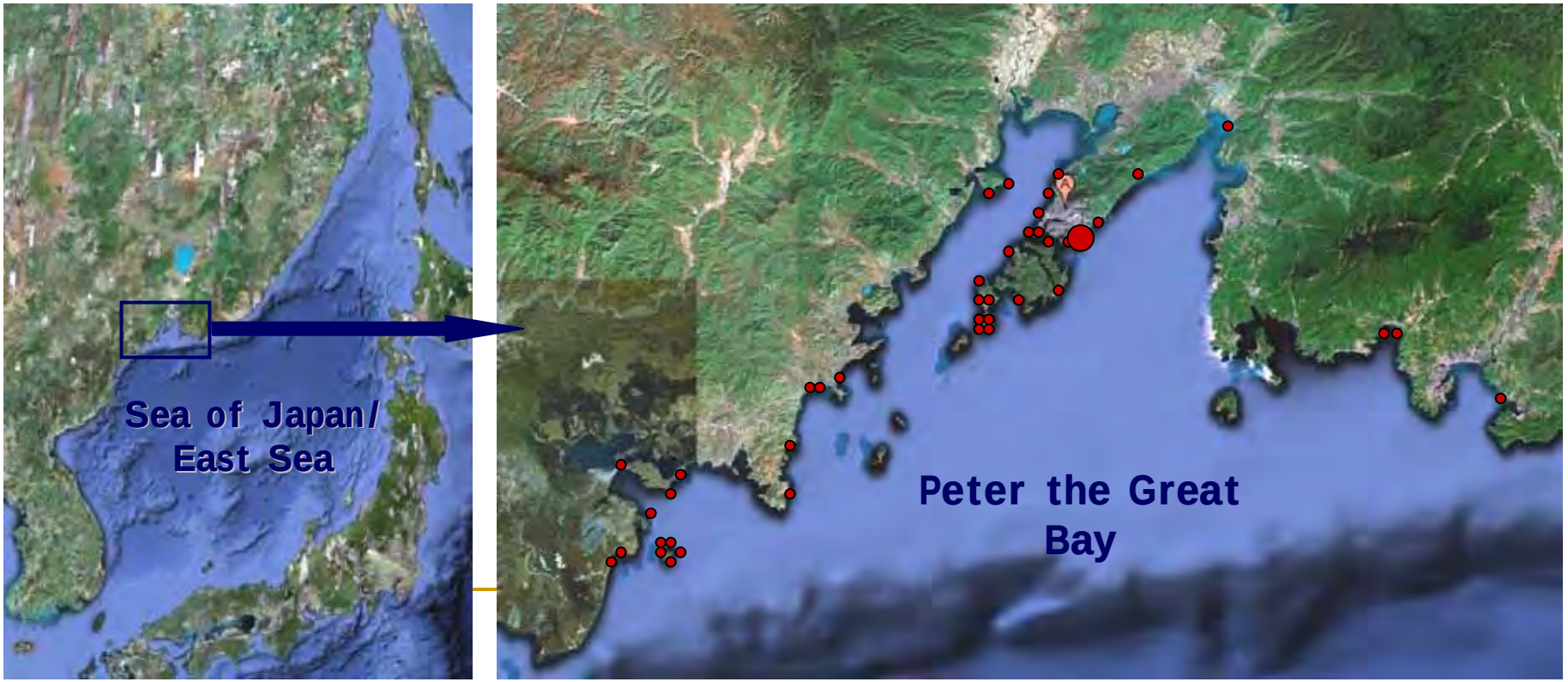
Introduction

- The studies of benthic dinoflagellates in the Peter the Great Bay, Sea of Japan, revealed 69 species, 39 of which were recorded in the seas of Russia for the first time.
- They include the potentially toxic species Ostreopsis siamensis and Ostreopsis ovata. These species are known as palytoxin producers. Humans get poisoned after consumption of fish contaminated with a palytoxin. Aerosols from O. ovata bloom can cause respiratory problems.
- Until recently, it was generally thought that the genus Ostreopsis is widely distributed in tropical and subtropical areas, where it is responsible for ciguatera. It was also believed that the geographical range of Ostreopsis is limited between the latitudes 28 ° N and 20 ° S (Faust et al. 1996), a little later - between 35 ° N and 35 ° S (Vila et al. 2001).
- During the last decade, an expansion of O. ovata and O. siamensis was observed in the temperate area of the northern and southern hemispheres. Our finding is the first record of this genus in regions with water temperatures below zero in winter.
- The present work represent a preliminary results of research of seasonal dynamics and spatial distribution of Ostreopsis spp. in Peter the Great Bay, Sea of Japan.

Materials and methods

- Period of studies: September 2008 - November 2009 and June 2010- November 2010
- Surface water temperature : -1.5°C - 24°C ; salinity: 30 – 34 $^{o}/_{oo}$
- 6 macroalgae specimens were collected 1-3 time in month at water depths 0.5 - 1 m in 2008-2010
- 15 species of macroalgae from 40 station were sampled in Sept. 2010

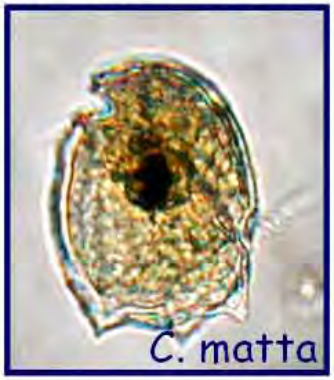


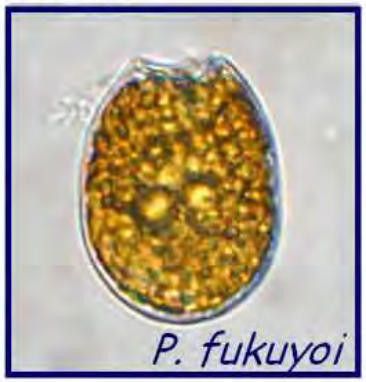
- A total of 16 macroalga species were analyzed with more attention paid to *N. larix*, *T. crinitus* (Rhodophyceae), and *C. fragile* (Chlorophyta).

- Morphology of the dinoflagellates was examined using LM and SEM.
- The number of dinoflagellate cells per gram of dry weight (cells/g DW) of host macrophytes was calculated.

Species composition of epiphytic dinoflagellates

- 13 species of epiphytic dinoflagellates were found on the macrophytes.
- *Cabra matta* Murray et Patterson, *Ostreopsis siamensis* Schmidt, *O. ovata* Fukuyo, and *Prorocentrum fukuyoi* Murray et Nagahama are recorded for the seas of Russia for the first time.


C. matta


P. fukuyoi


Ostreopsis spp.

- *Amphidinium carterae* Hulburt is the first record for the Far Eastern seas
- *Pseudothecadinium campbellii* Hoppenrath et Selina is the first record for the Sea of Japan.


A. carterae


P. campbellii


P. lima

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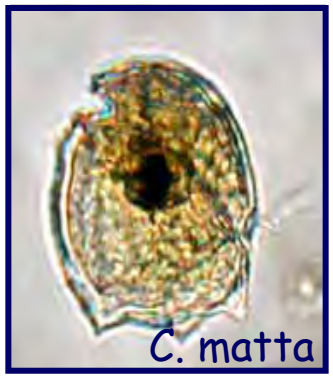
C. matta


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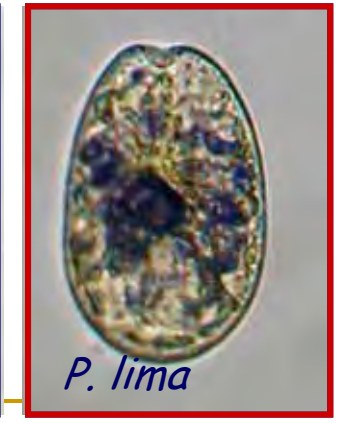
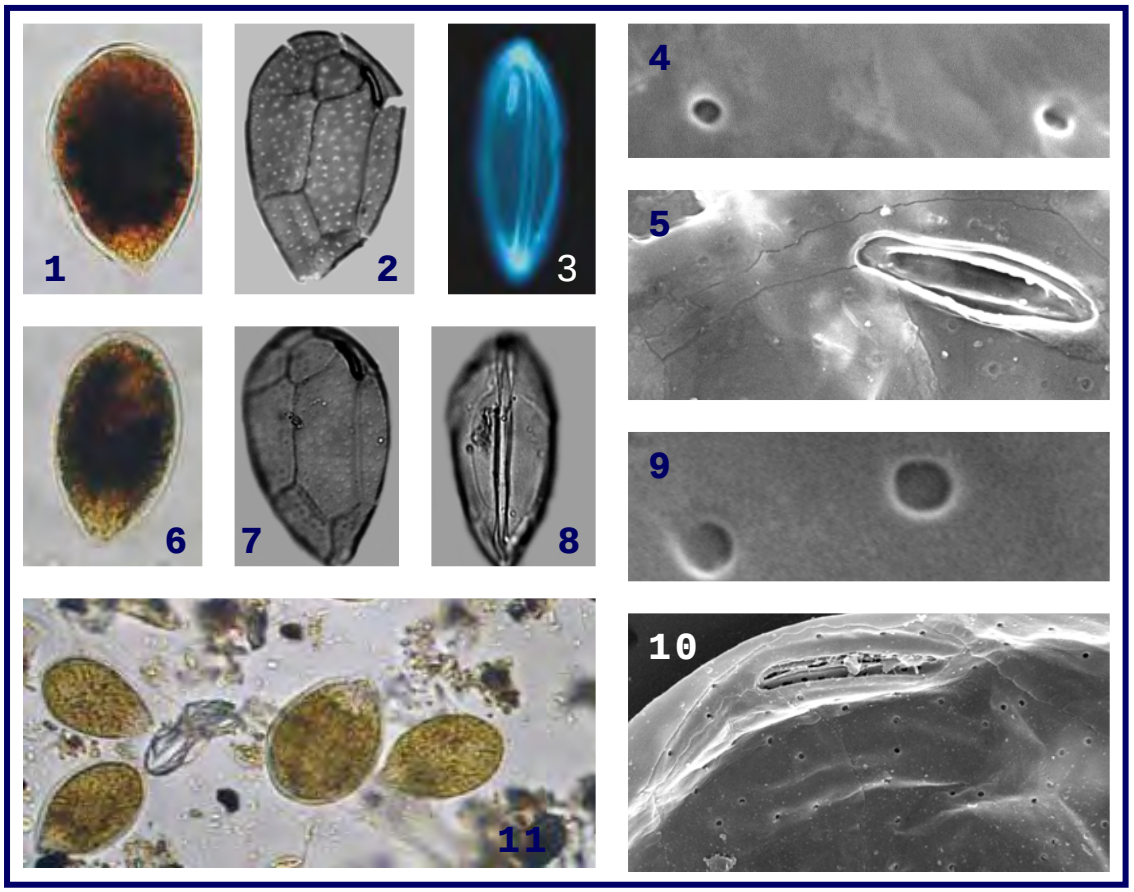
A. carterae


P. campbellii


P. lima

Among these species *A. carterae*, *O. ovata*, *O. siamensis*, and *Prorocentrum lima* are known as potentially toxic species.

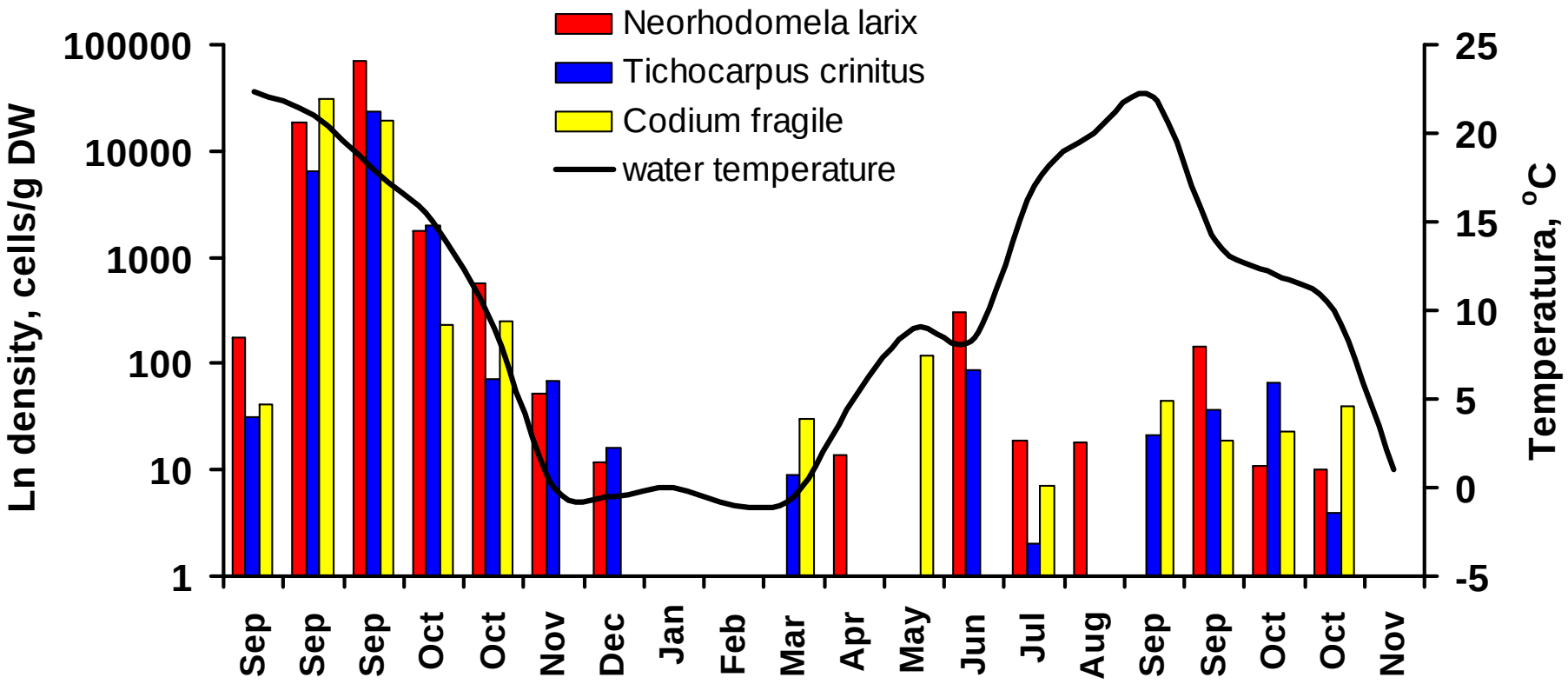


1-5 - *Ostreopsis siamensis*
6-10 - *Ostreopsis ovata*
11 – *Ostreopsis* spp.

The two species *Ostreopsis* differed from each other in cell form, size and the length of the Po plate.

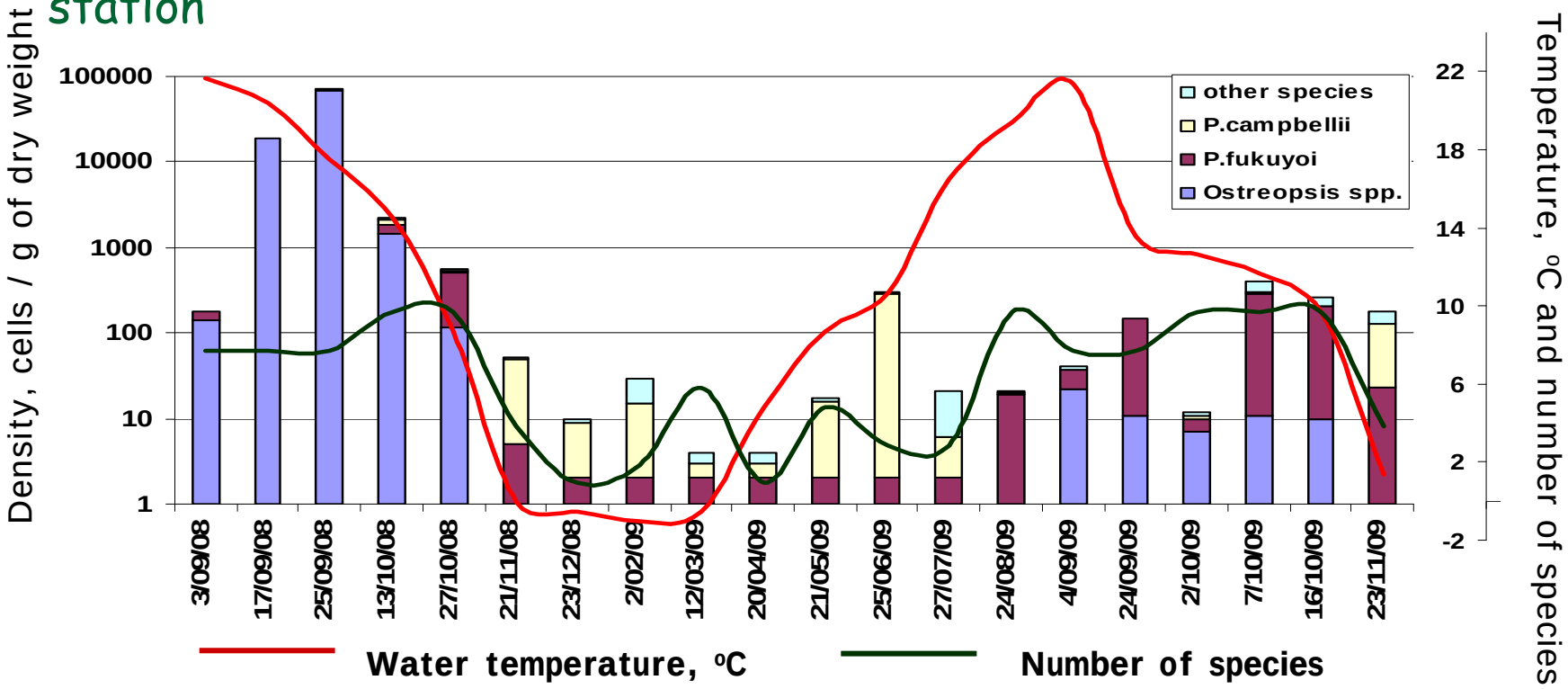
Further morphological examination of culture material and molecular analyses will be necessary in future to better circumscribe the taxonomic status of these two dinoflagellates.

Temporal dynamics of epiphytic dinoflagellates in September 2008 - November 2009 at the monitoring station



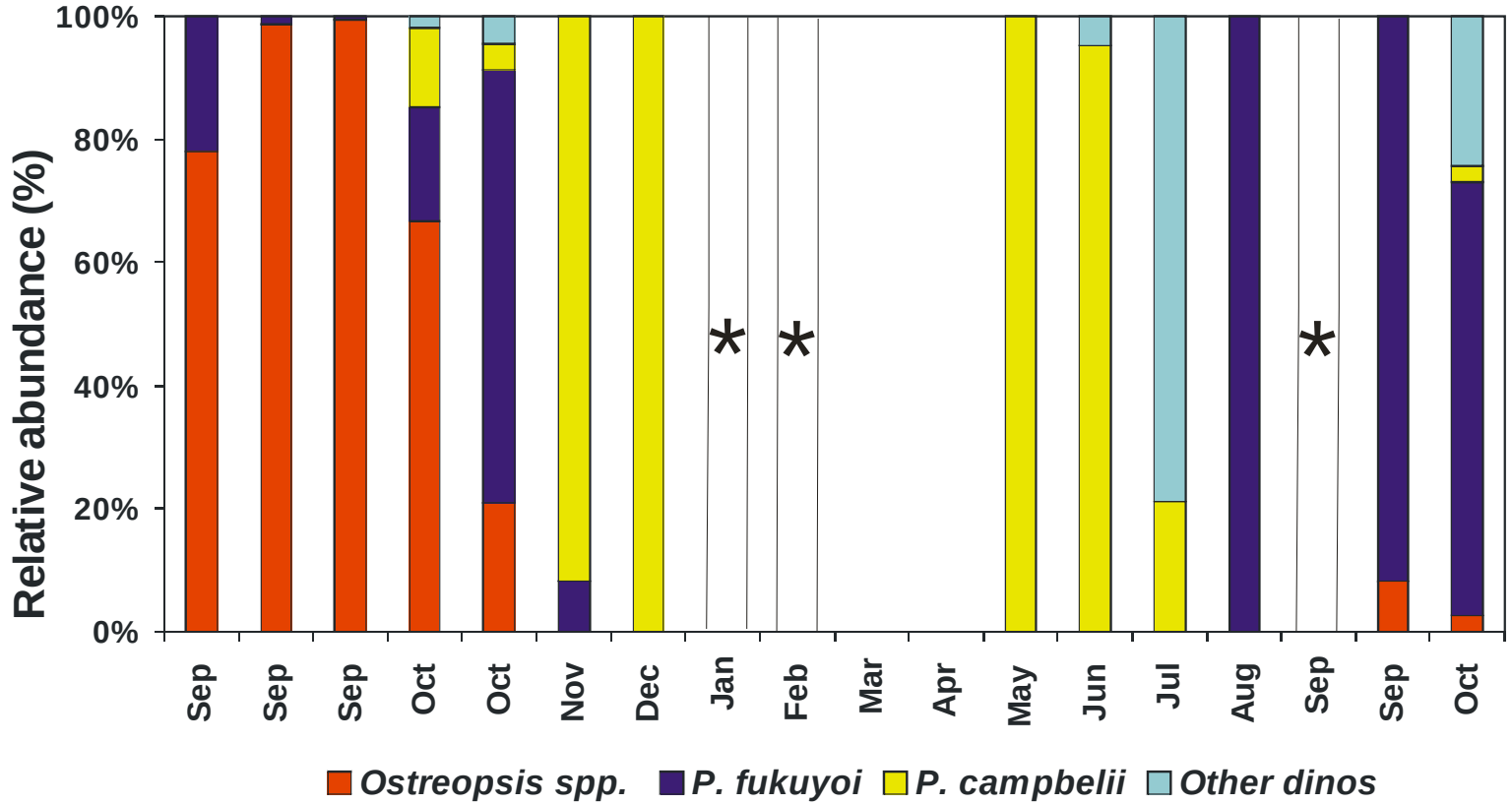
* The dinoflagellates density followed the same seasonal pattern on the 3 selected macroalgae

Temporal dynamics of the epiphytic dinoflagellates in September 2008- November 2009 on *Neorhodomela larix* at the monitoring station



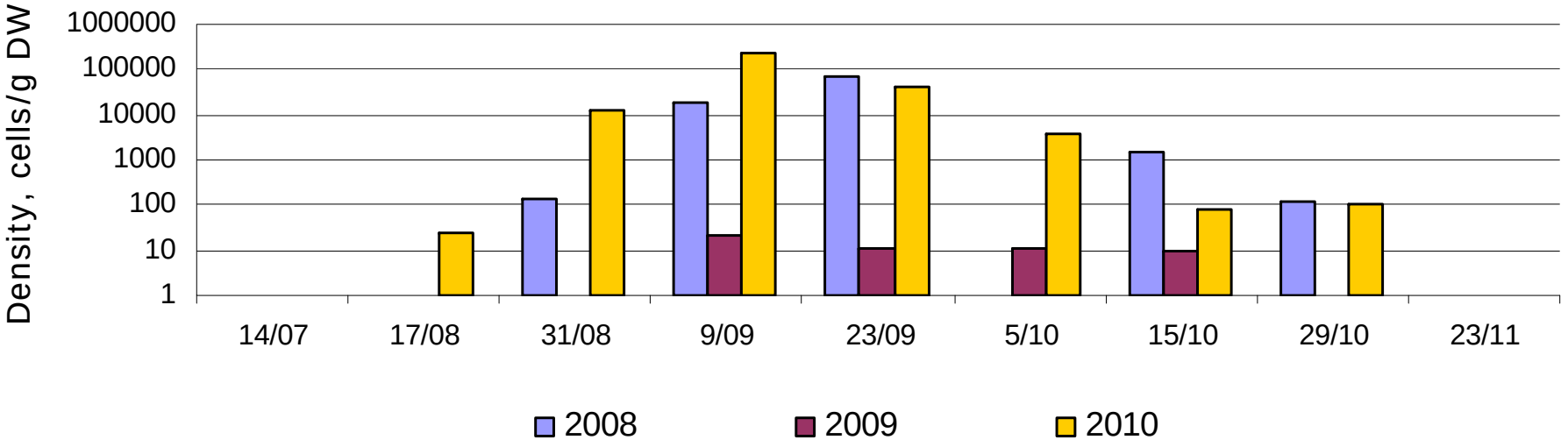
- **The abundance of the epiphytic dinoflagellates varied from 59 to 70 000 cells per gram of DW of macrophytes.**
- **Density of the *Ostreopsis* spp. reached 69 573 cells/g DW in September 2008 (99% of total dinoflagellates abundance)**

Seasonal changes in relative abundance of epiphytic dinoflagellates on *N. arix* in September 2008 - October 2009 at the monitoring station

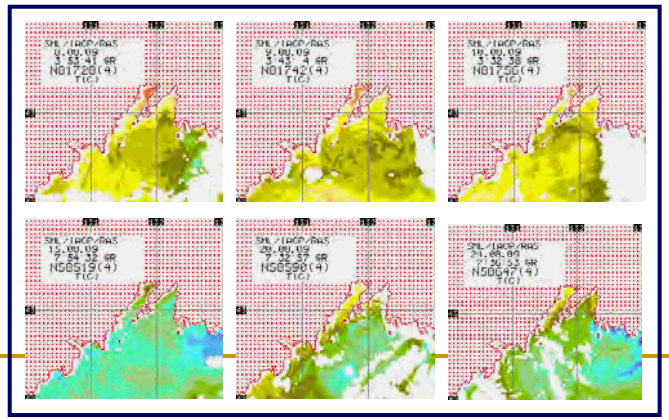


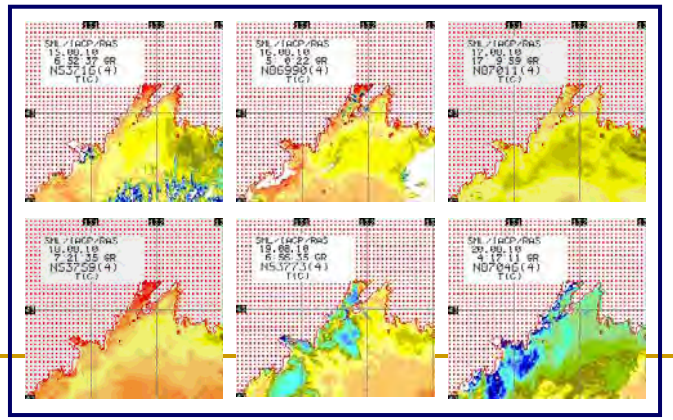
Asterisks indicate the months in which the macroalgae were not collected.

Seasonal abundance of *Ostreopsis* spp. during 2008-2010 on N. larix at the monitoring station



Water temperature dynamics in Peter the Great Bay

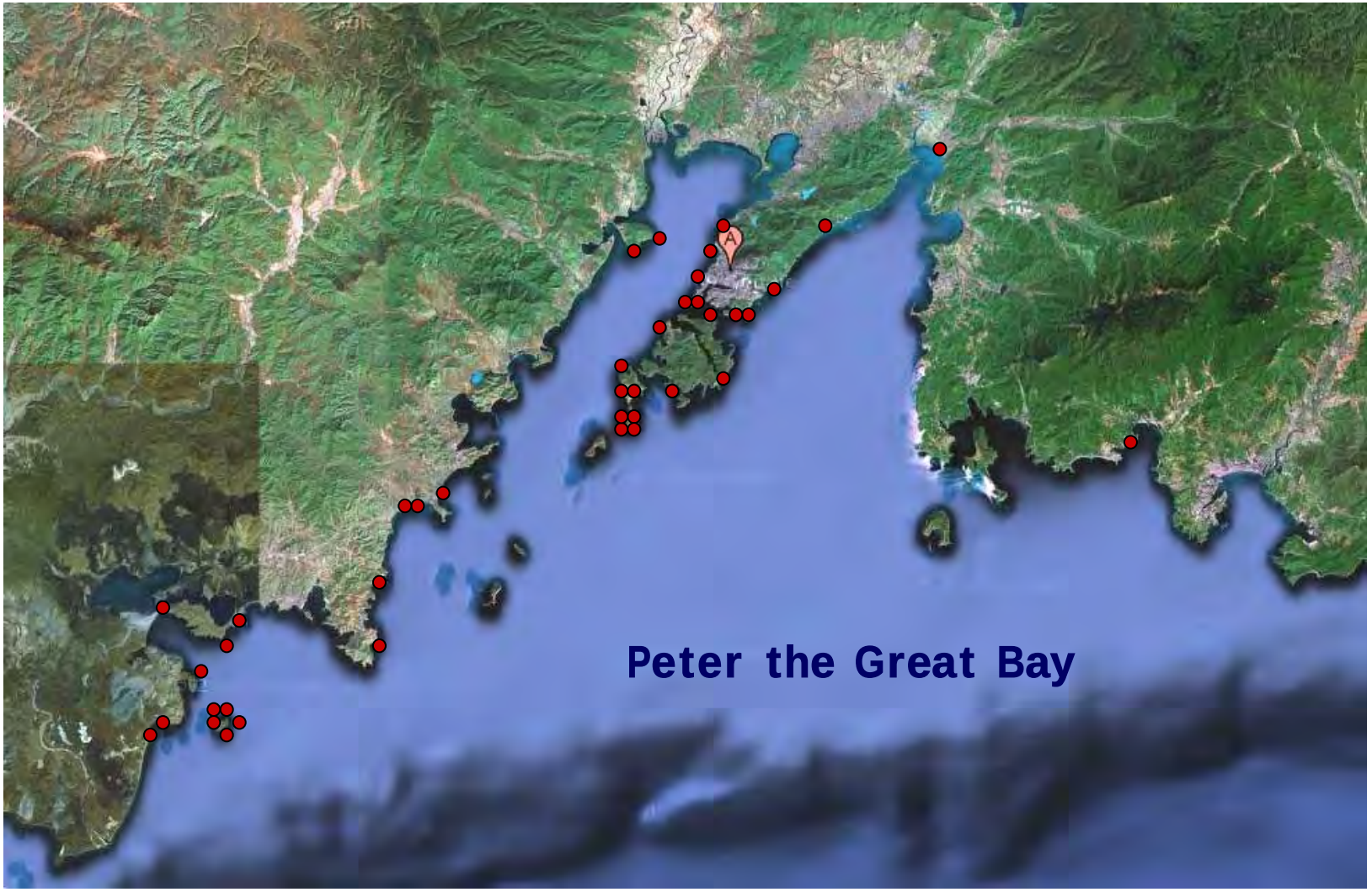




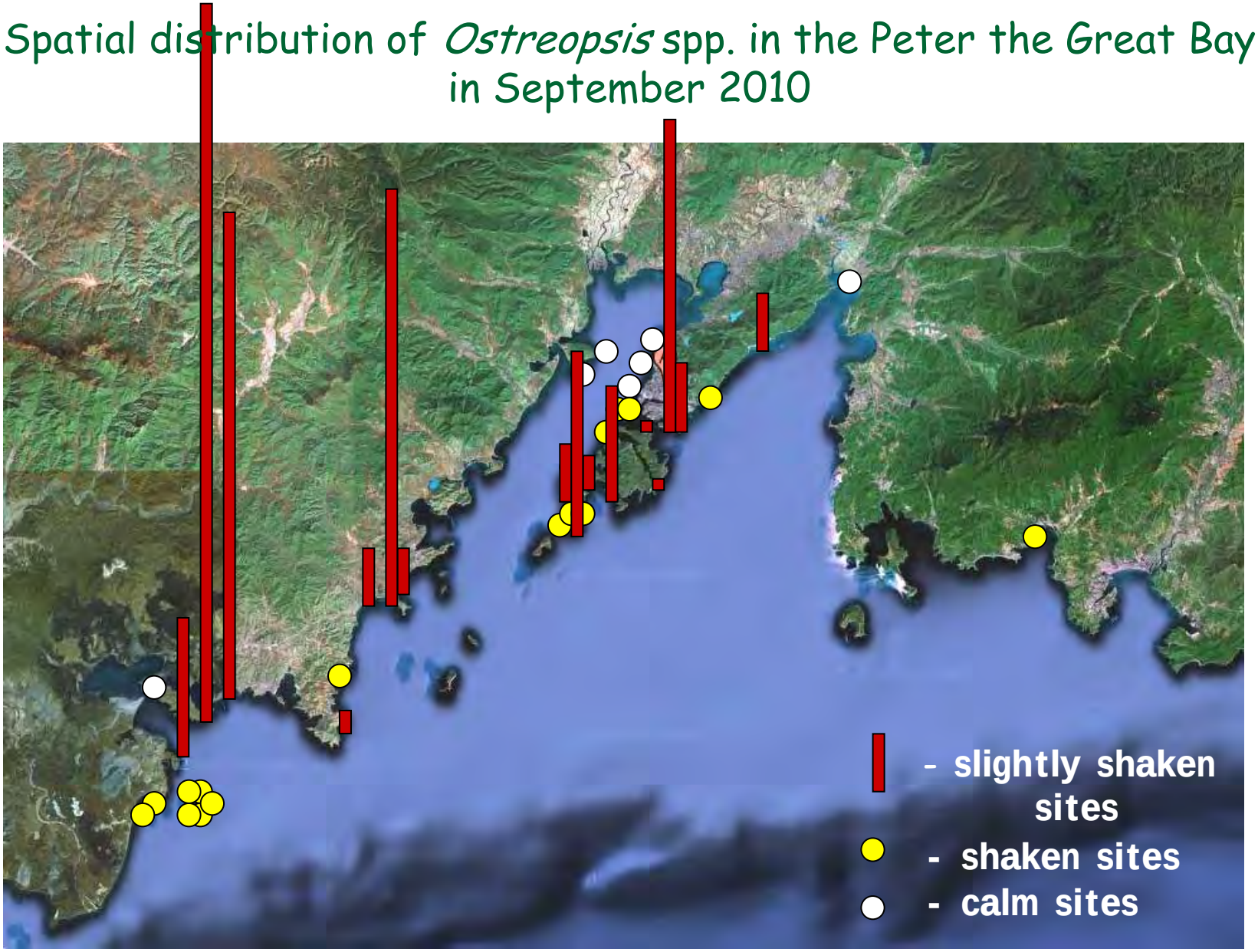
August 2009

August 2010

Spatial distribution of *Ostreopsis* spp. in the Peter the Great Bay in September 2010 and relation with hydrodynamic conditions



Spatial distribution of *Ostreopsis* spp. in the Peter the Great Bay in September 2010



Density of *Ostreopsis* spp. in slightly shaken sites – 500-306000 cells/g DW;

Density of *Ostreopsis* spp. in shaken and calm sites – 0-2400 cells/g DW

Conclusion

- Due to the lack of monitoring of epiphytic dinoflagellates in Peter the Great Bay we cannot say for sure if *Ostreopsis* species inhabited the studied area before or they have been introduced with ballast waters or currents within the last decade.
- However it is clear now that species of this genus are permanent and predominant component of epiphytic assamblages in slightly shaken sites in Peter the Great Bay. *Ostreopsis* is the only genus of potentially toxic dinoflagellates, which is regularly reported to bloom in waters of Peter the Great Bay
- Due to the constant presence and high abundance of new potentially toxic dinoflagellates in summer–autumn period, monitoring of epiphytic assemblage is a necessity in Peter the Great Bay.