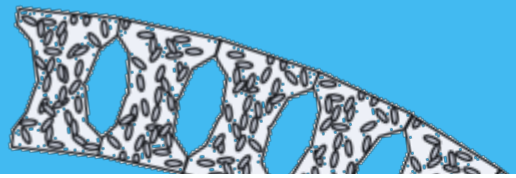
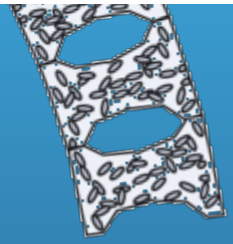


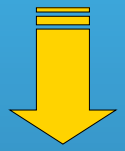
Long term (35 years) observations in dynamics of nutrients and phytoplankton including the harmful diatom *Eucampia zodiacus* in Harima-Nada, eastern Seto Inland Sea, Japan



Tetsuya Nishikawa[1], Yutaka Hori[1], Satoshi Nagai[2], Kazutaka Miyahara[3], Yukinobu Nakamura[4], Kazuhiro Harada[3], Minoru Tanda[3], Takehiko Manabe[3], Kuninao Tada[5] and **Ichiro Imai[6]** (Hokkaido University)

Objectives

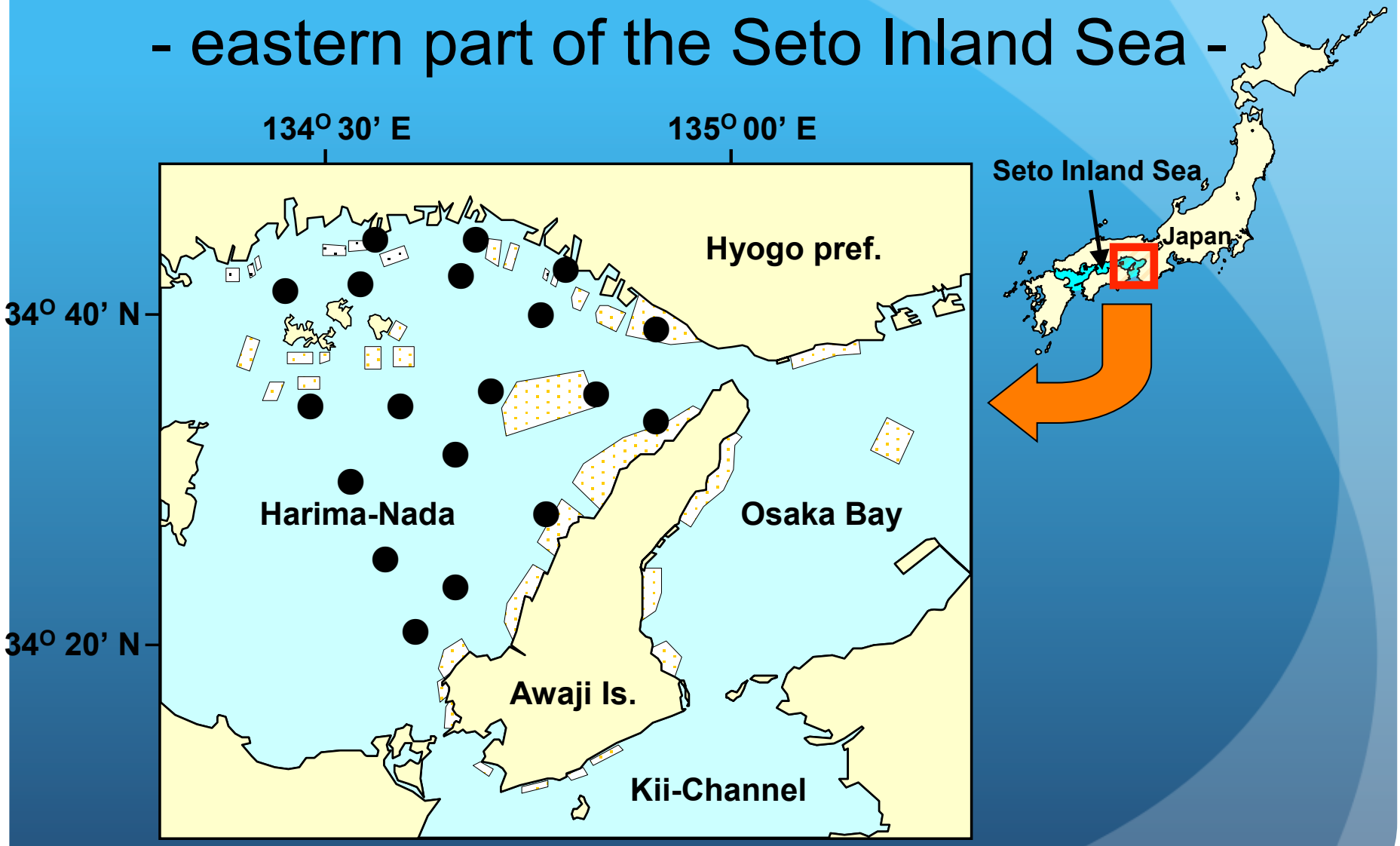
- Long term（1973～2007）observation of the Seto Inland sea



- Long term（1973～2007）observation of *Eucampia zodiacus*

- Mechanisms of the dominance of *Eucampia zodiacus* in the Seto Inland Sea

Location of Harima-Nada
- eastern part of the Seto Inland Sea -

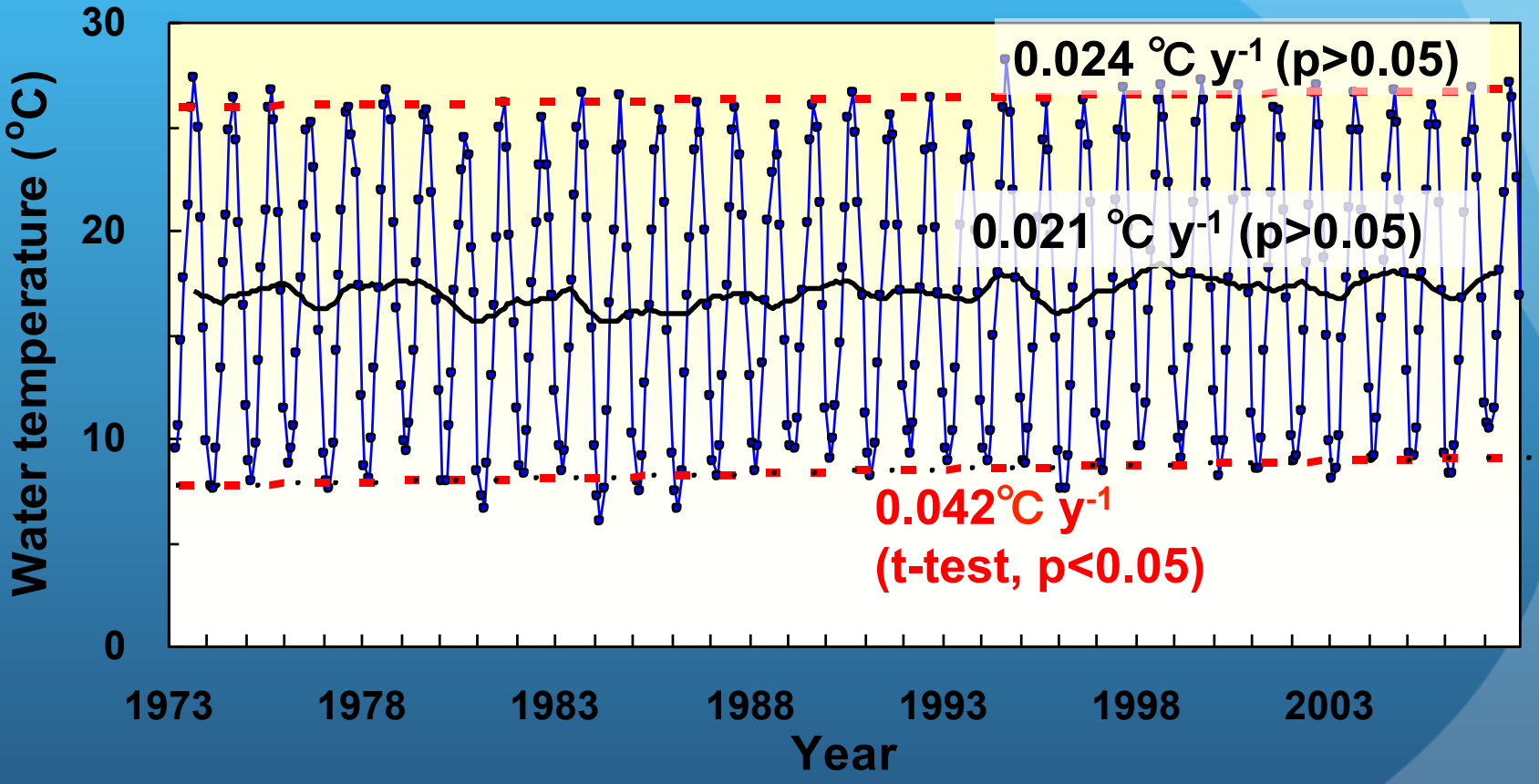


Ocaenographic data set of Harima-Nada

- Sampling site：19 Stns in Harima-Nada
- Period：April 1973～2007
- Frequency：once per month
- Sampling layer：3 depth（0m, 5 or 10m, B-1m)
- Observations：
  1) WT, Sal, Water color, Transparency, etc
  2) Nutrients（DIN, PO_4-P, SiO_2-Si）, DO, etc
  3) Phytoplankton abundance（Surface）

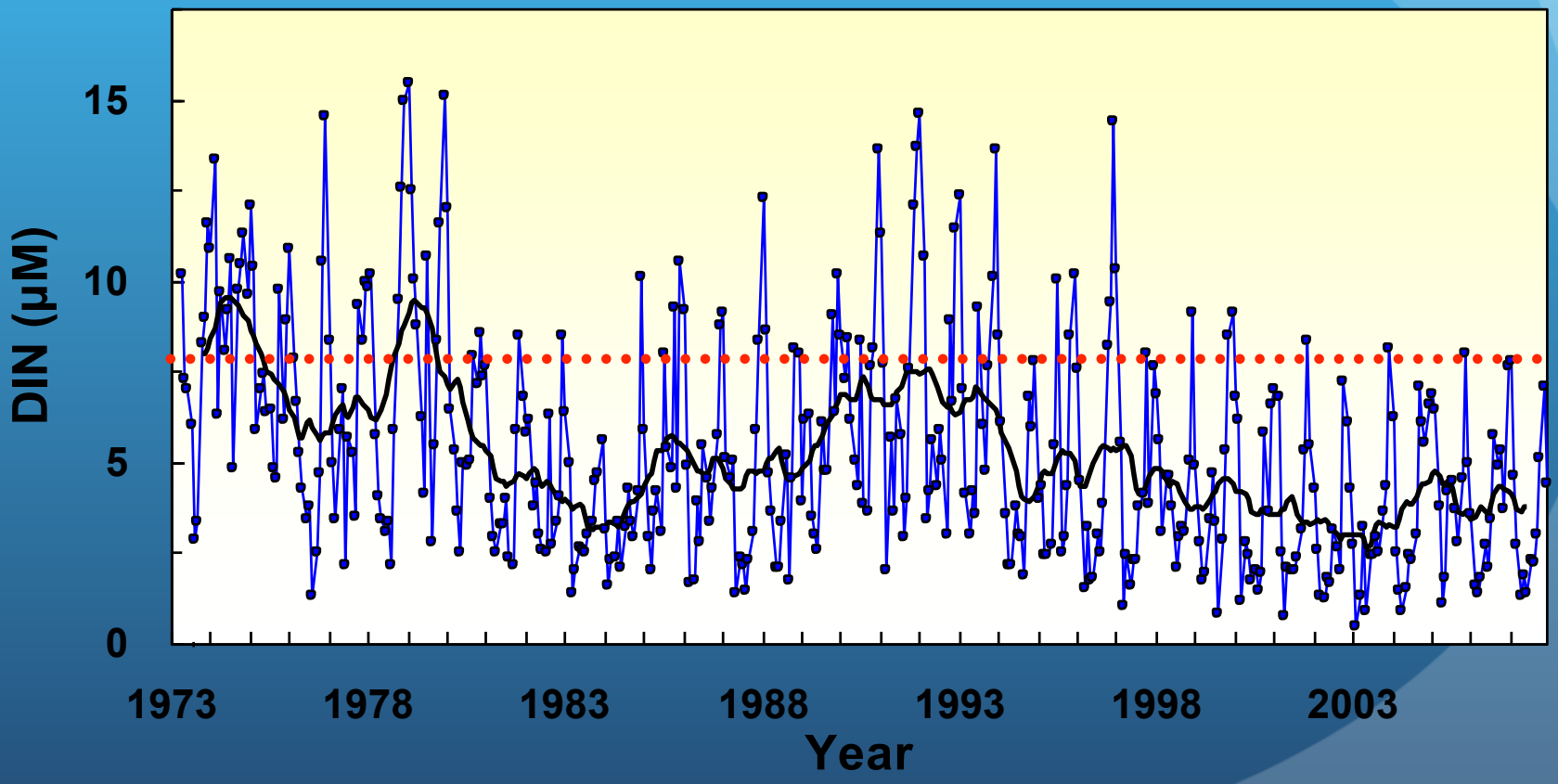
Long term fluctuation of water temperature

(April 1973-Dec 2007, mean of 3 depth at 19 sampling stations)



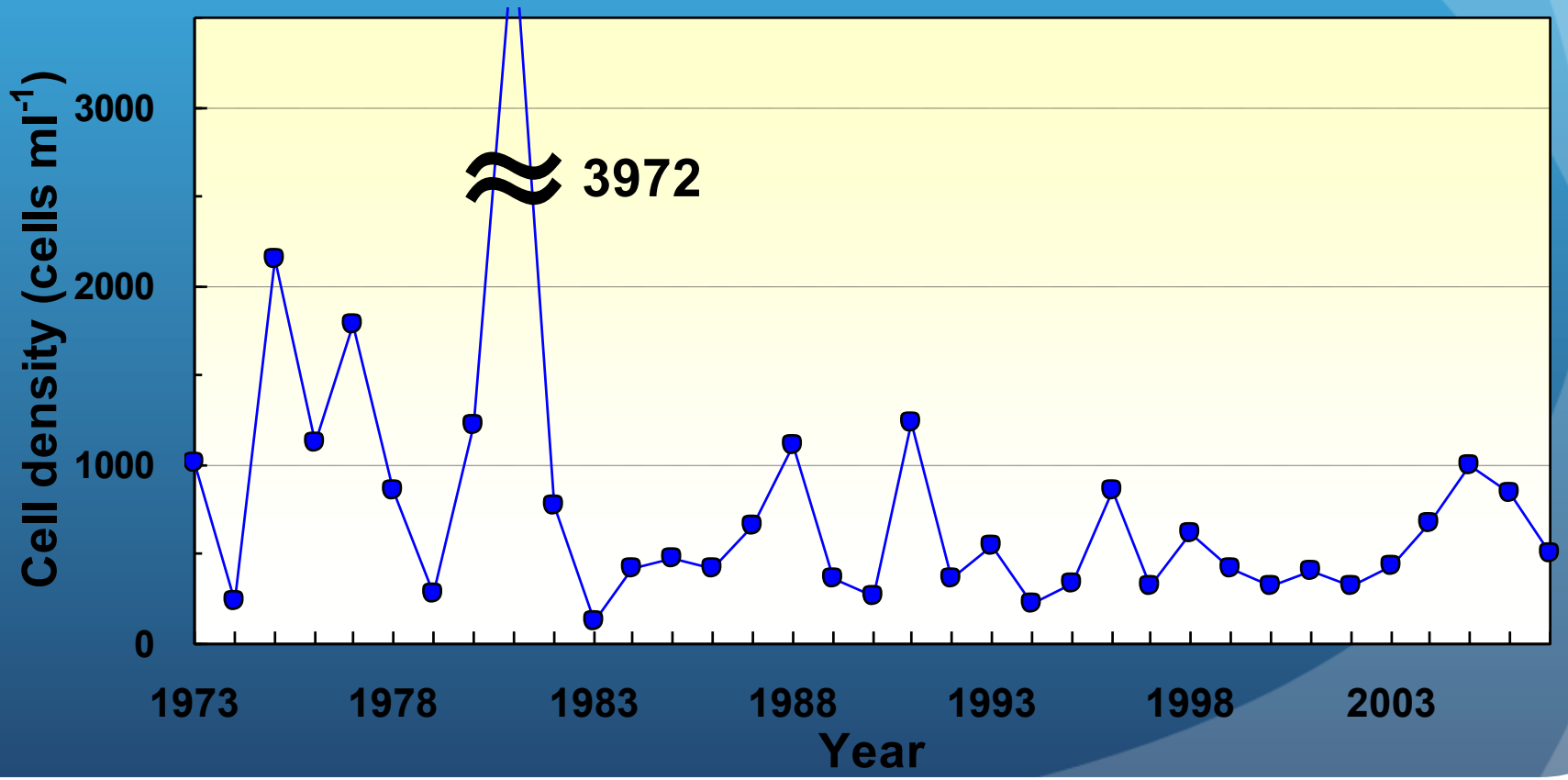
Long term fluctuation of DIN

(April 1973-Dec 2007, mean of 3 depth at 19 sampling stations)



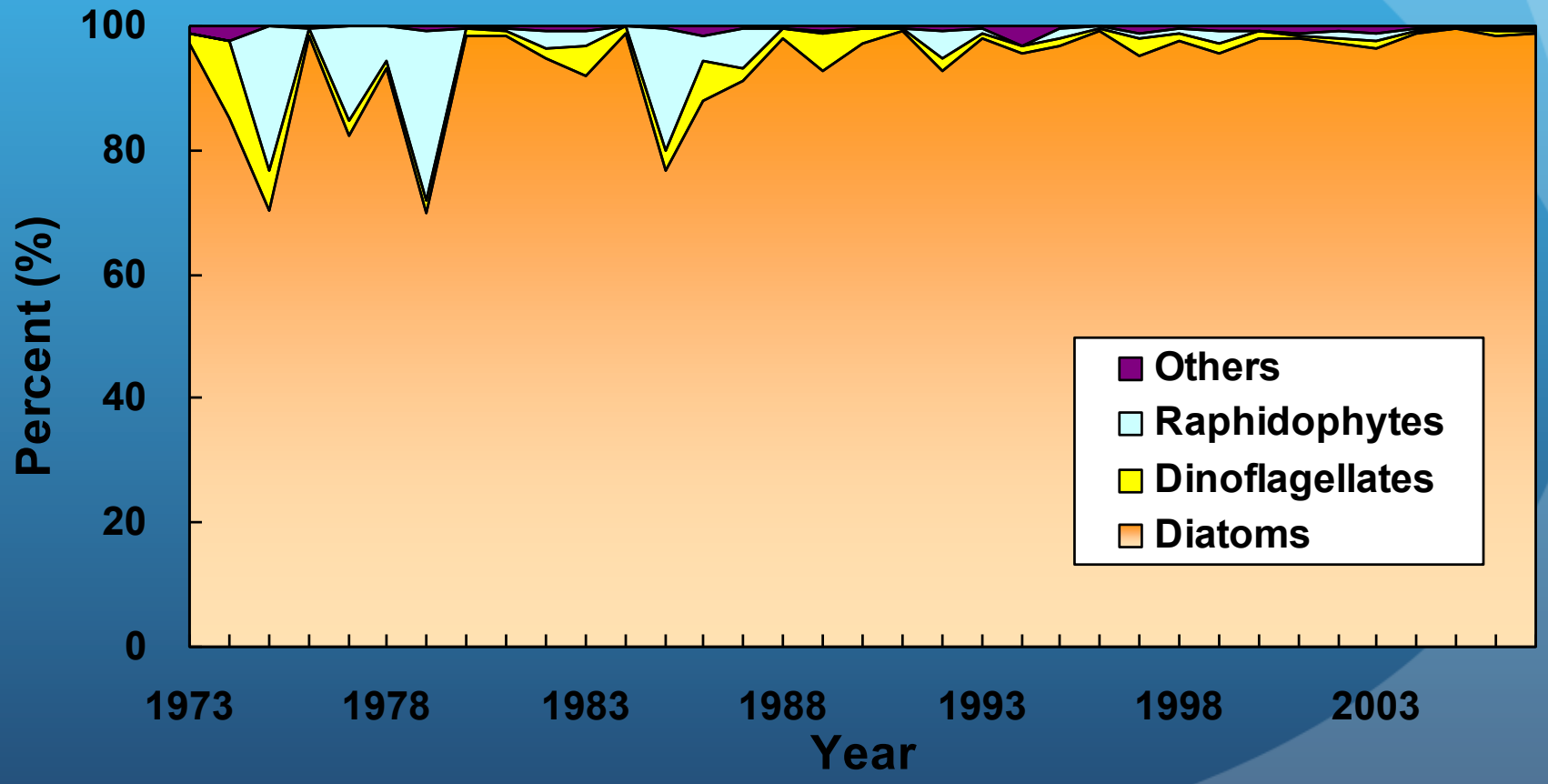
Long term fluctuation of men abundance of phytoplankton

(April 1973-Dec 2007, mean of surface at 19 sampling stations)



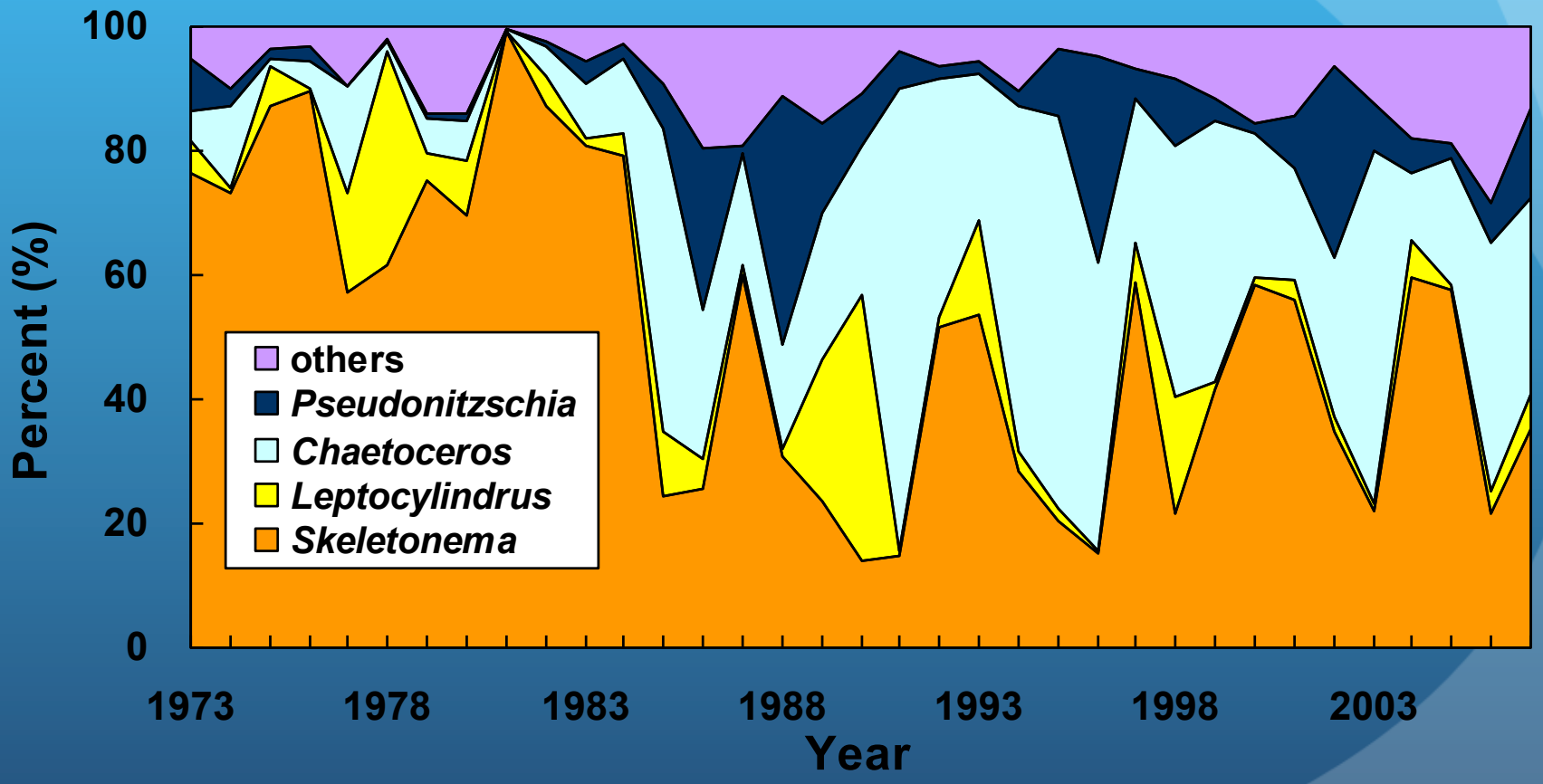
Long term fluctuation of composition of phytoplankton

(April 1973-Dec 2007, mean of surface at 19 sampling stations)

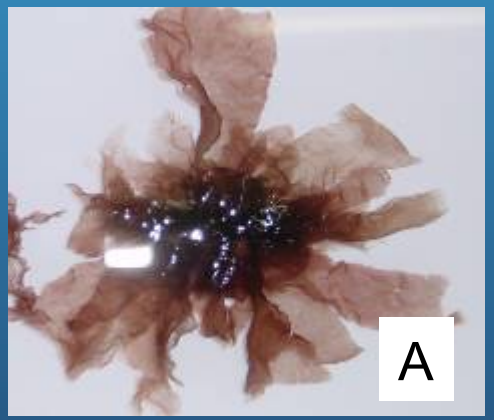


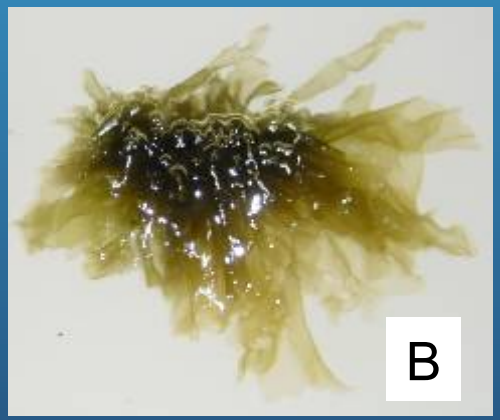
Long term fluctuation of diatom composition

(April 1973-Dec 2007, mean of surface at 19 sampling stations)



Bleaching of Nori (*Porphyra*) by N-depletion





A : Normal

B : Bleaching

Causative ditoms for Nori bleaching in Harima-Nada, the Seto Inland Sea

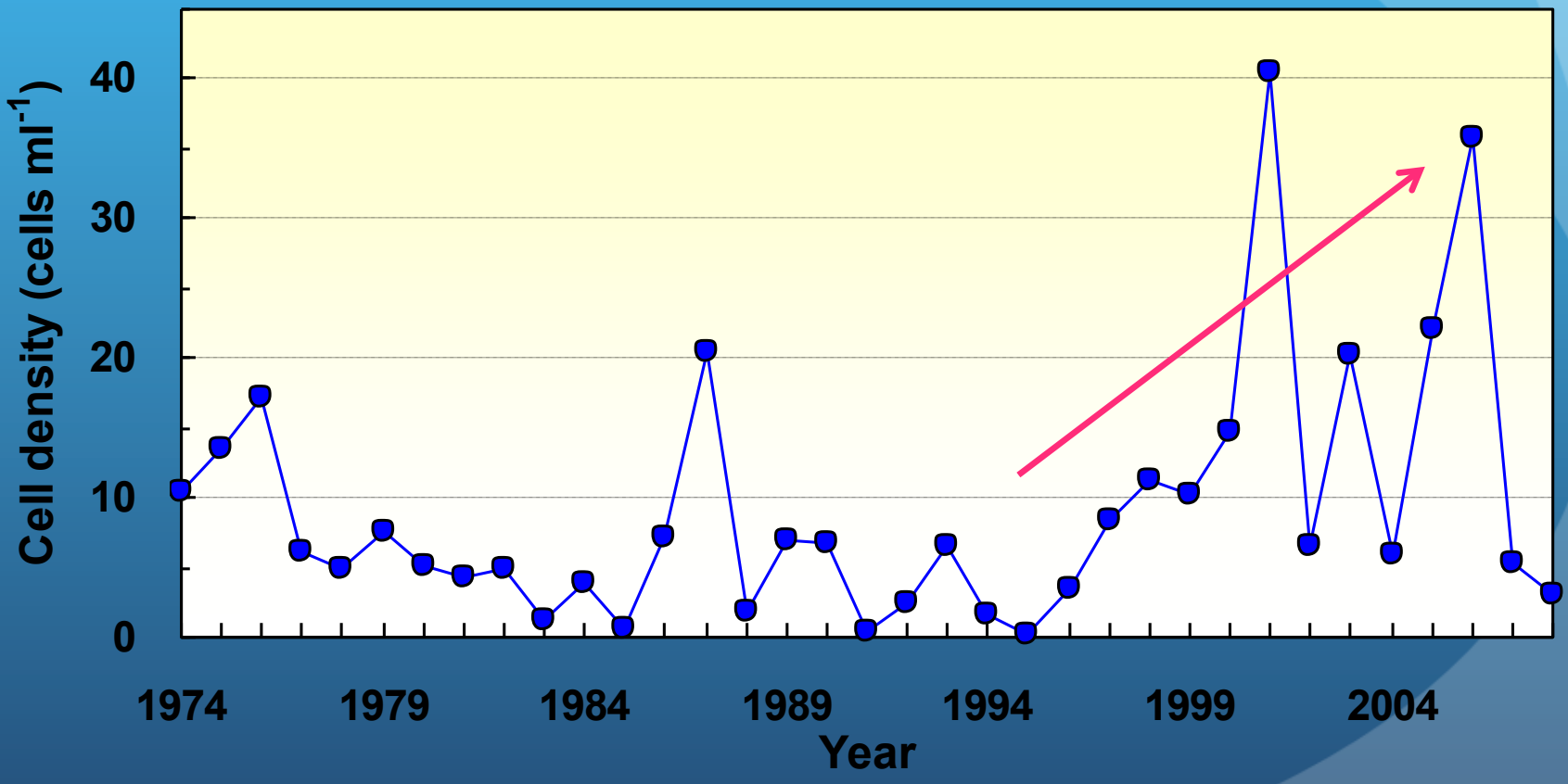
Coscinodiscus wailesii
(1980s～)

Eucampia zodiacus
(1990s～～)

(Scale bar =100μm)

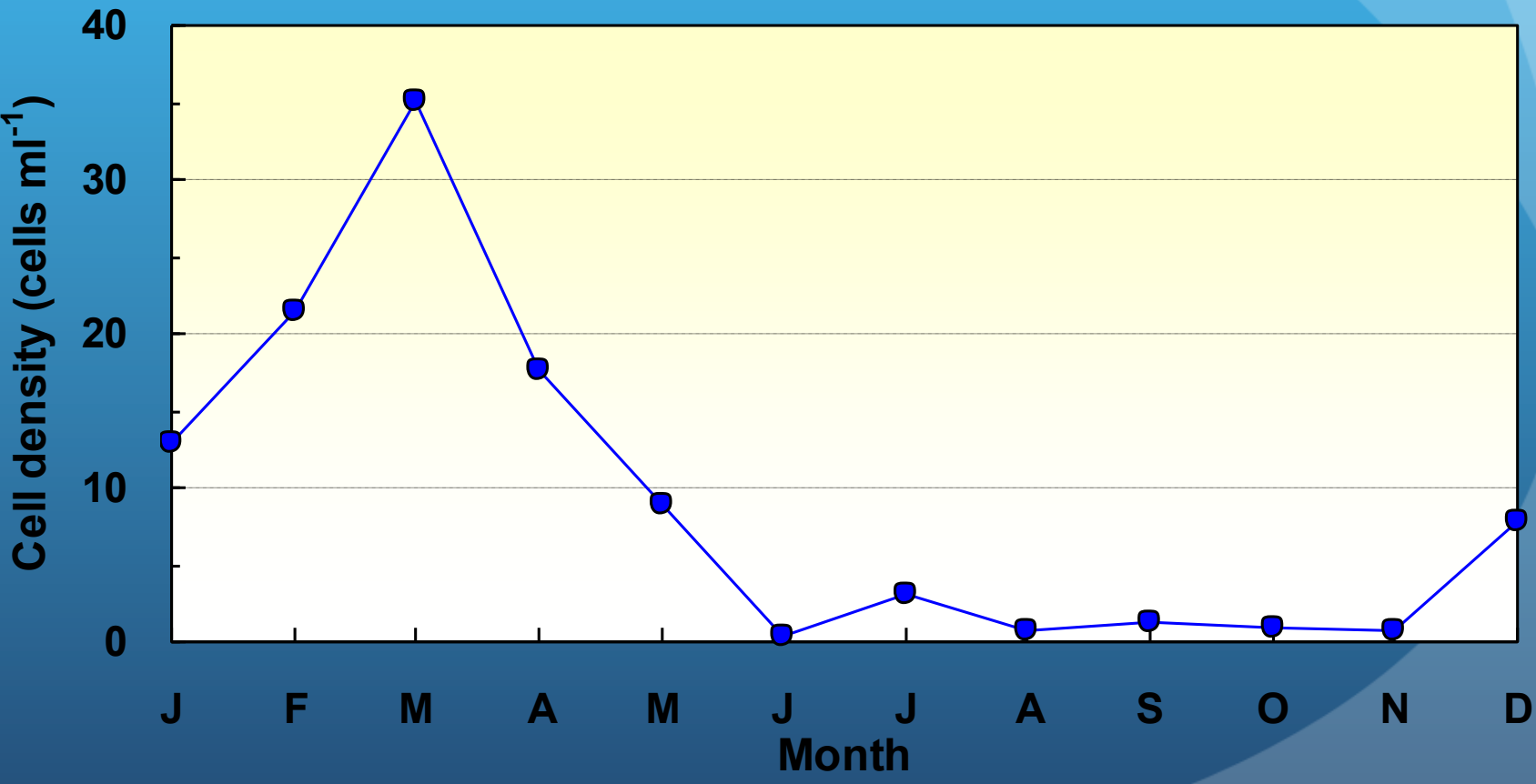
Trend of mean abundance of *Eucampia zodiacus* in Harima-Nada

(April 1974-Dec 2008, mean of surface at 19 sampling stations)



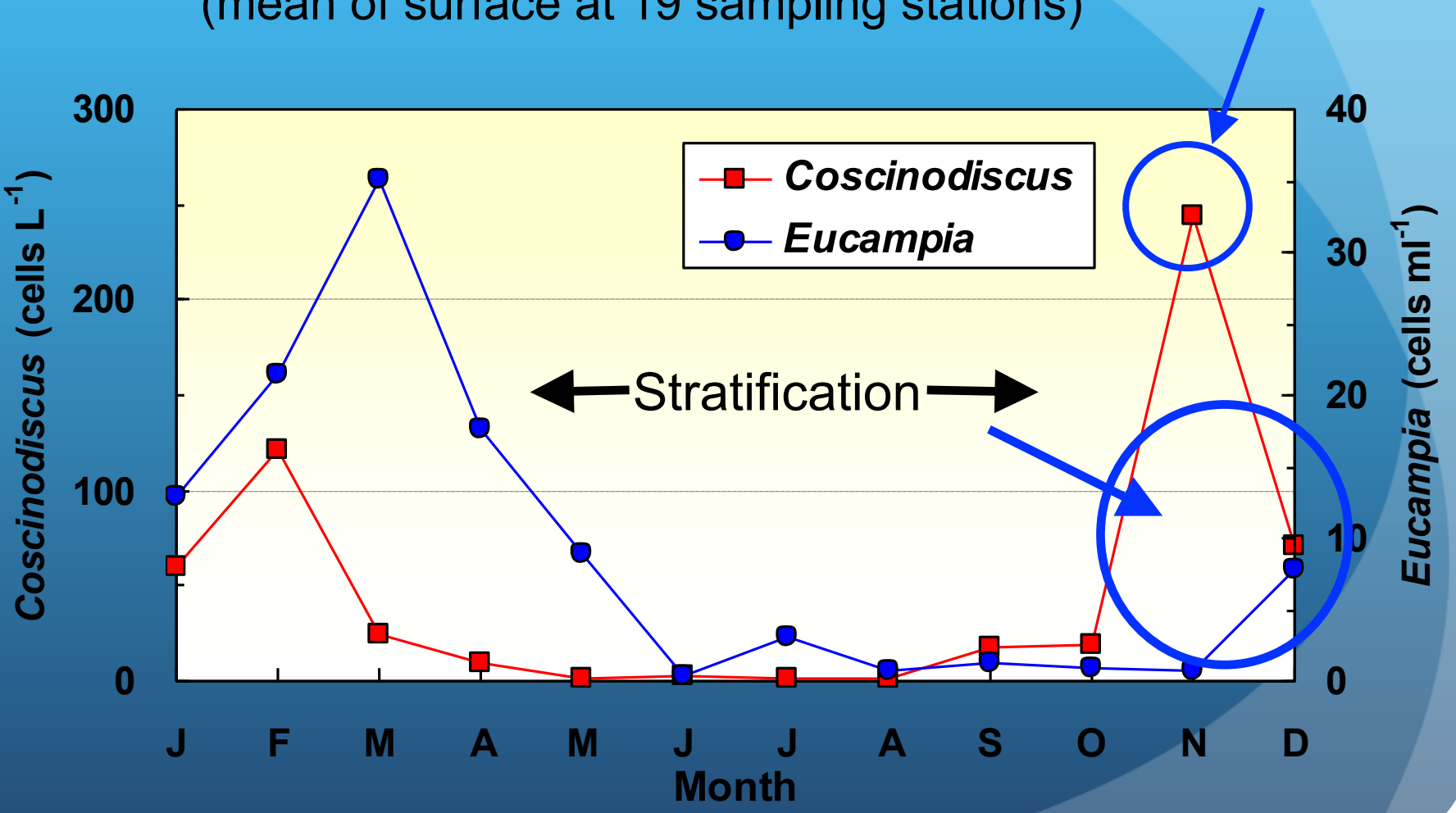
Monthly change of *Eucampia zodiacus* abundance

(April 1974-Dec 2008, mean of surface at 19 sampling stations)



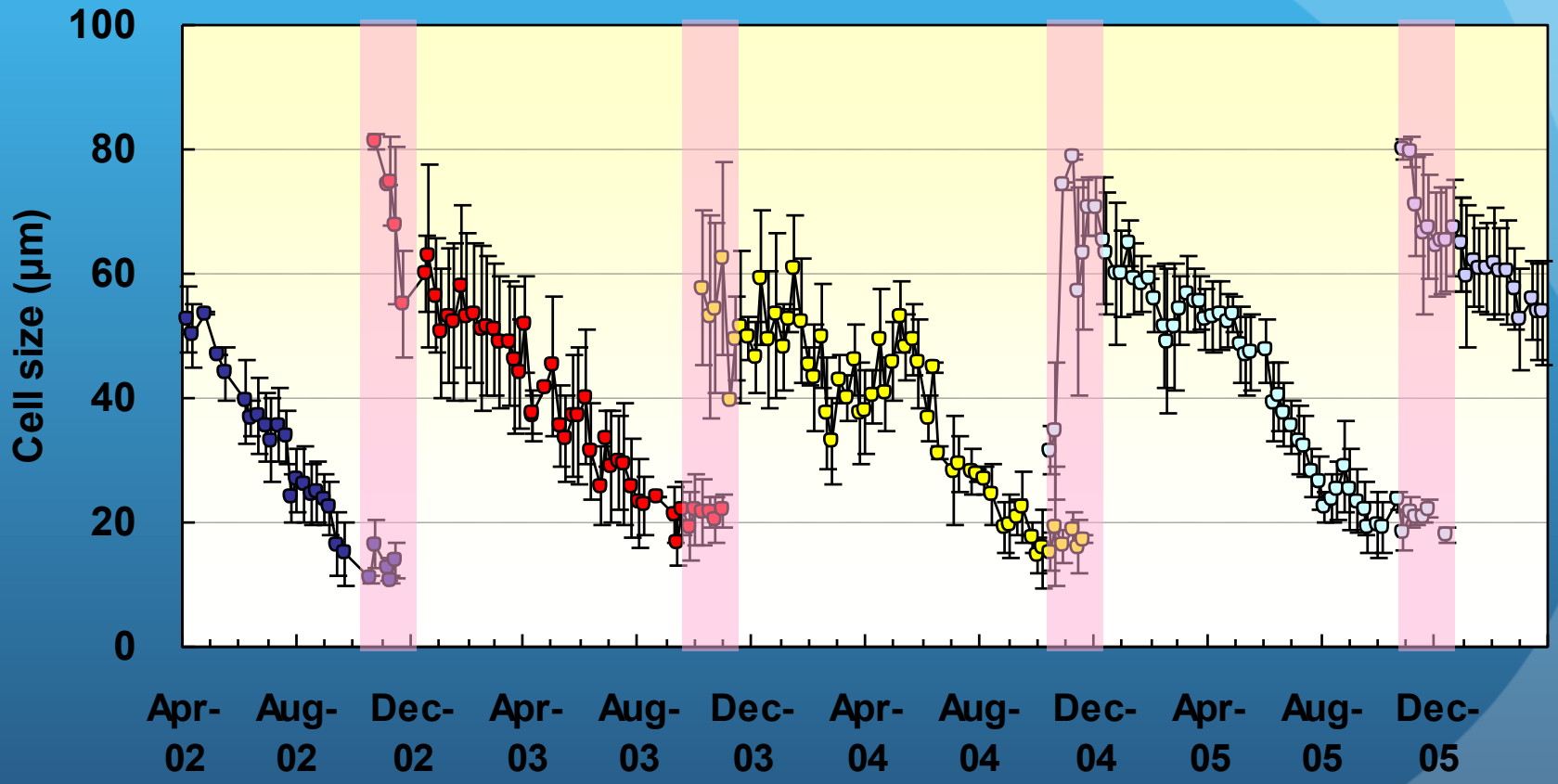
Monthly mean abundance of two harmful diatoms

(mean of surface at 19 sampling stations)

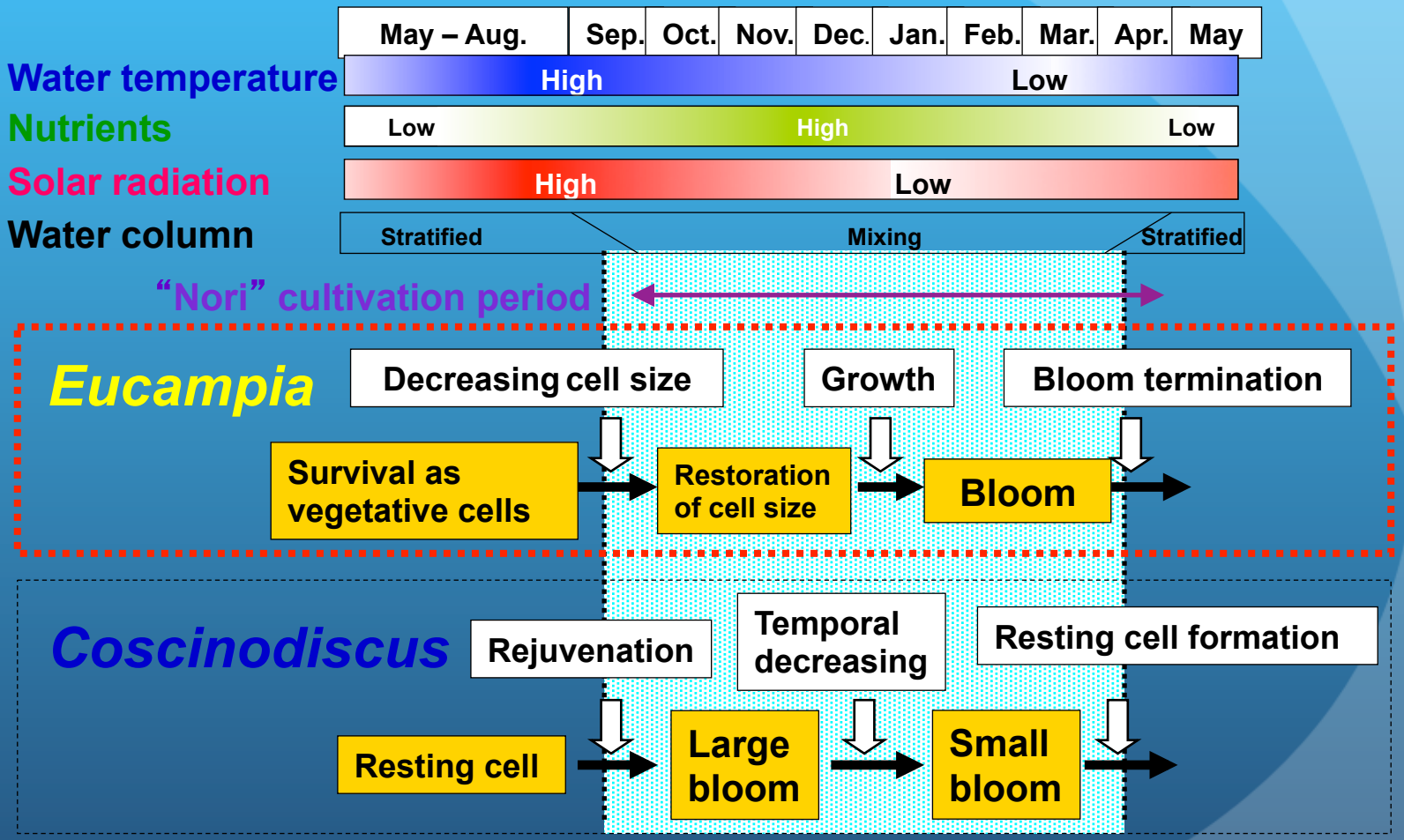


Seasonal changes in cell size of *Eucampia zodiacus*

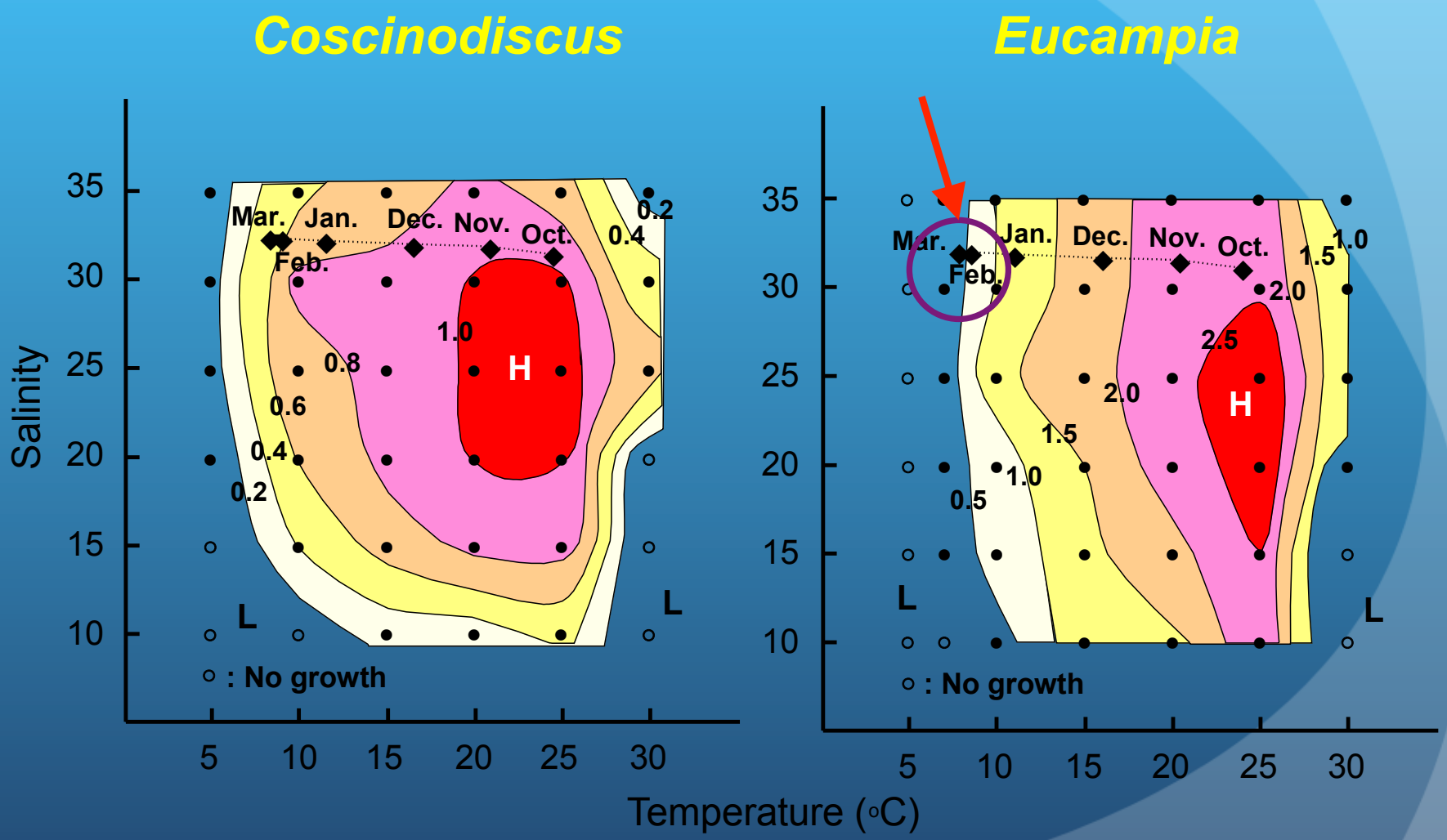
(April 2002-May 2006, at Futami station)



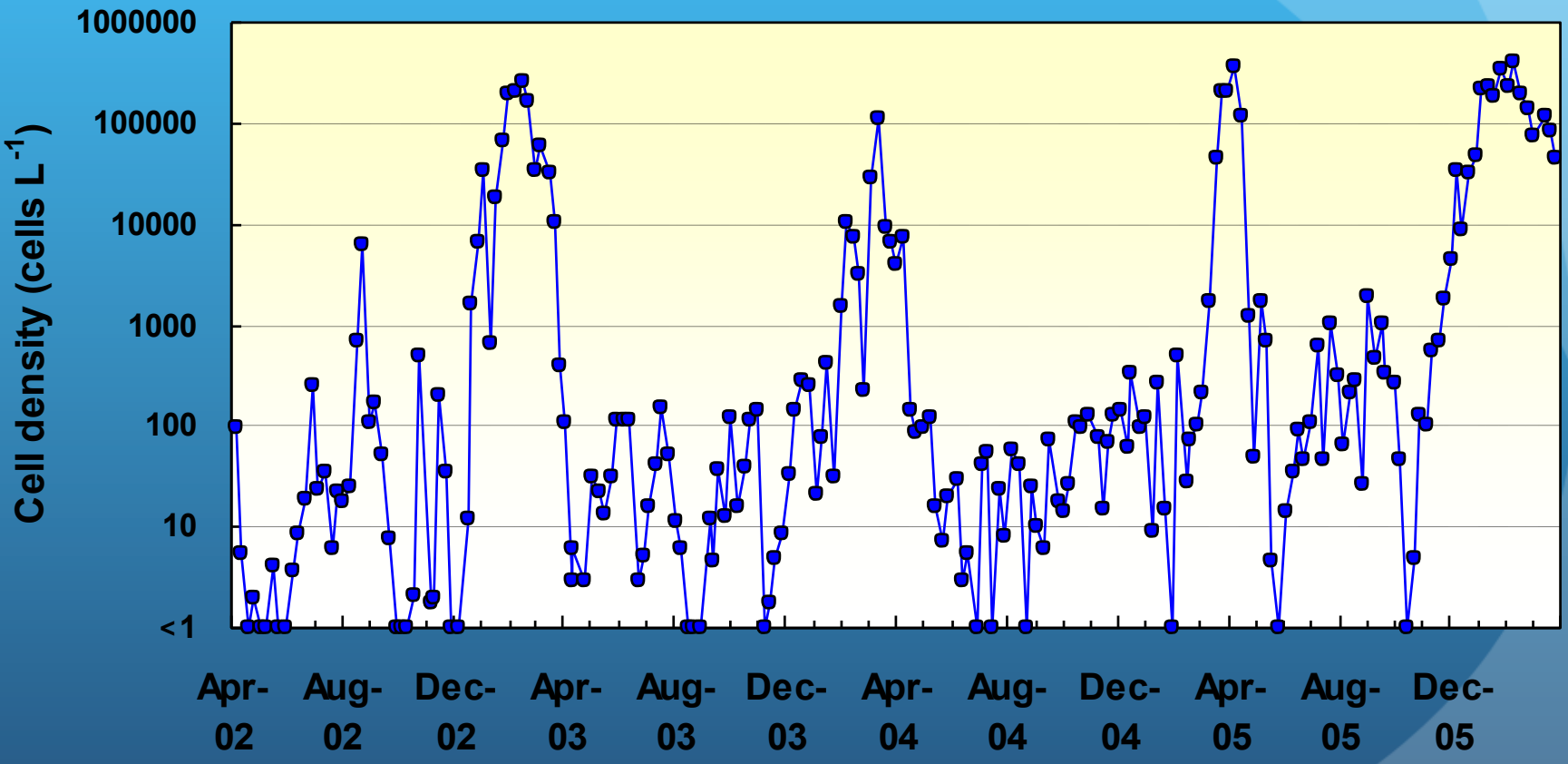
Differences of life cycle in 2 diatoms (Ez vs Cw)



Growth responses of 2 diatoms for temperature and salinity

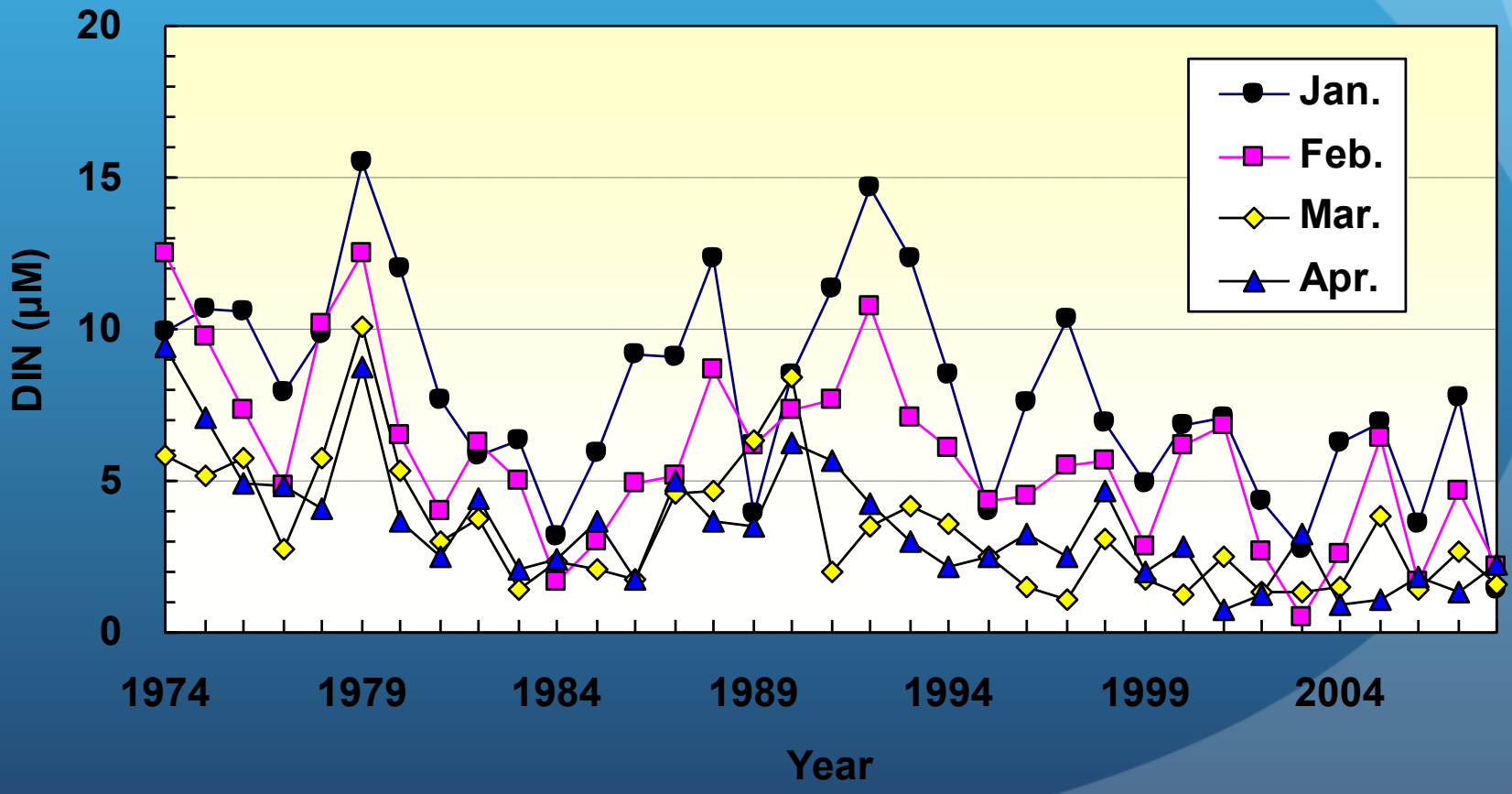


Changes in abundance of *Eucampia zodiacus* (April 2002-May 2006, at Futami station)



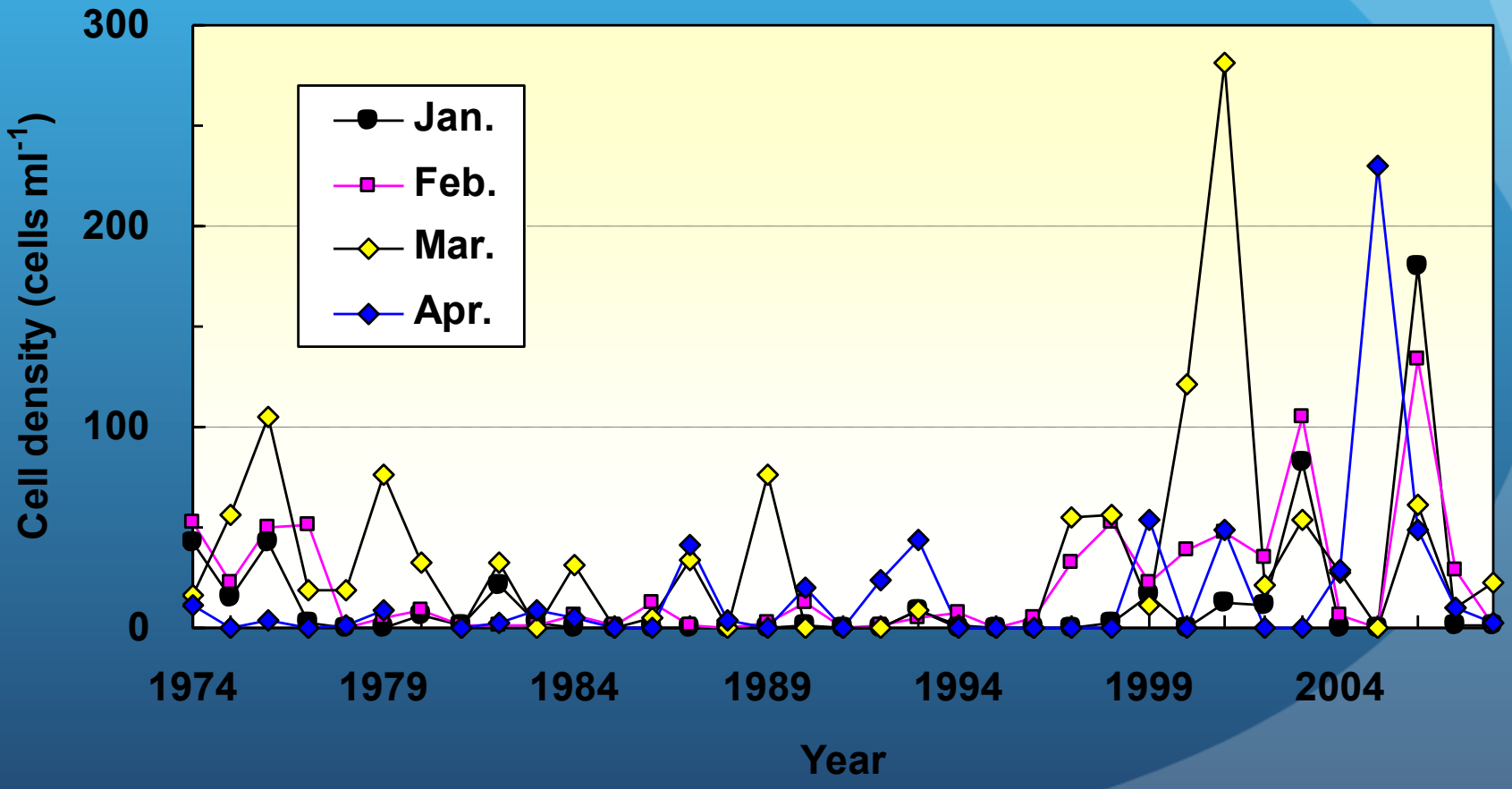
Long term fluctuation of DIN between January and April of every year

(1973-2007, mean of 3 depth at 19 sampling stations)

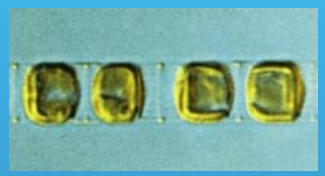


Long term fluctuation of *Eucampia* between January and April of every year

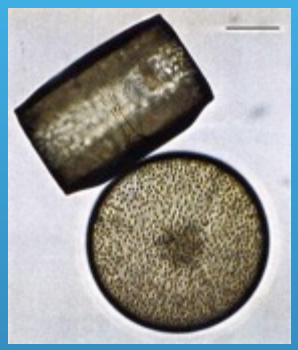
(1974-2008, mean of surface at 19 sampling stations)



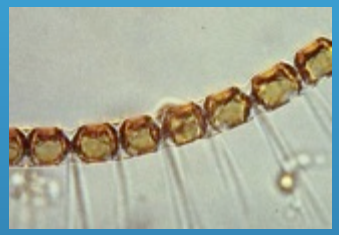
Responses of main diatoms under low DIN conditions



Skeletonema



Coscinodiscus



Chaetoceros

Eucampia

Rhizosolenia

Survival as vegetative cells?

Formation of resting stage cells

Dominance by *Eucampia*

Growth rate; High
N-uptake rate; High
Minimum cell quota; Low