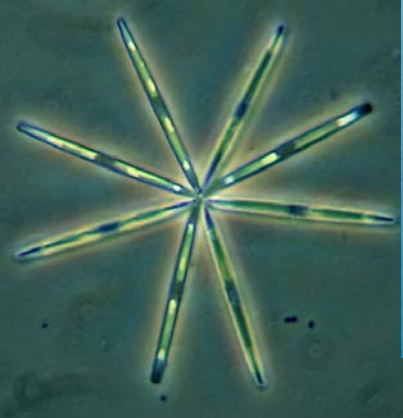


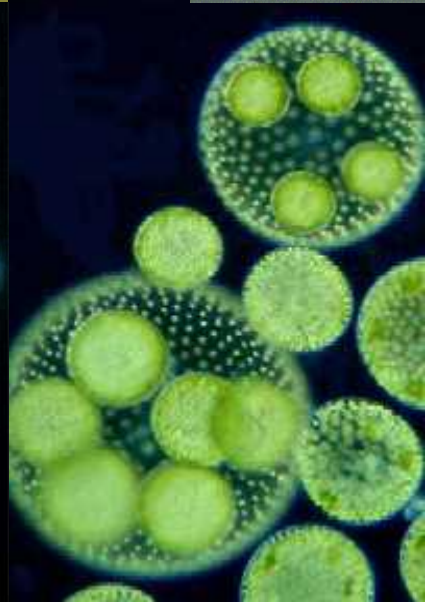
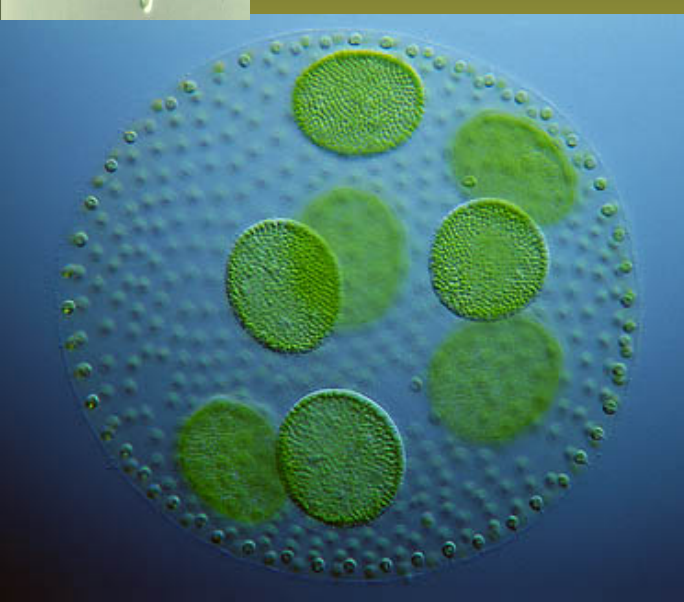
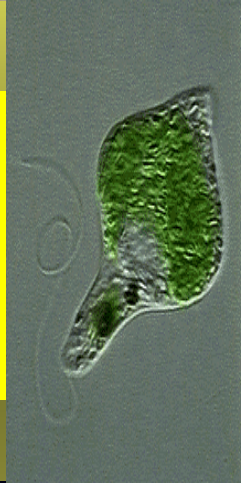
**LENTISKU HIDROEKOSISTĒMU
FITOPLANKTONA SABIEDRĪBU
IESPĒJAMĀS IZMAIŅAS**

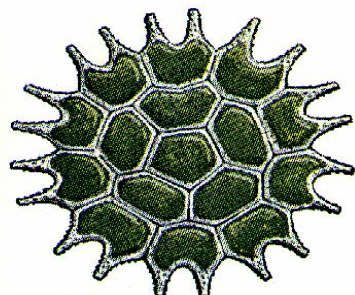
IVARS DRUVIETIS

**LU BIOLOĢIJAS FAKULTĀTE * HIDROBIOLOĢIJAS
KATEDRA**



EZERU FITOPLANKTONA IESPĒJAMĀS IZMAIŅAS TUVĀKĀ NĀKOTNĒ

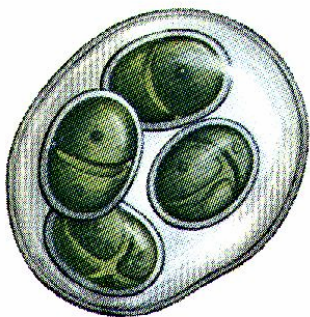




PEDIASTRUM



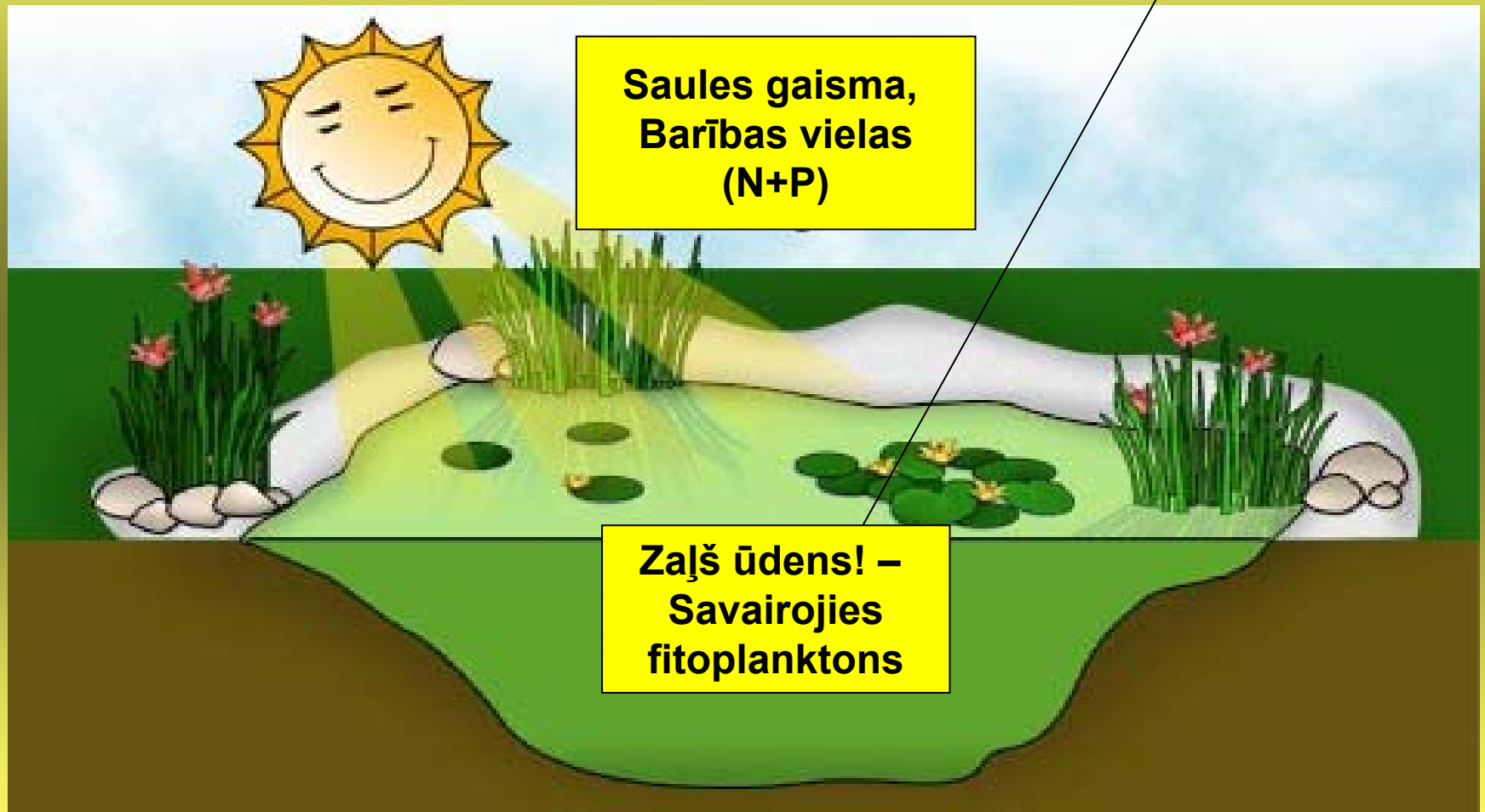
ACTINASTRUM



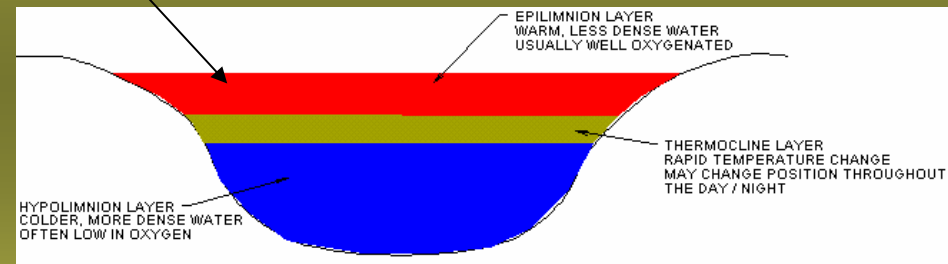
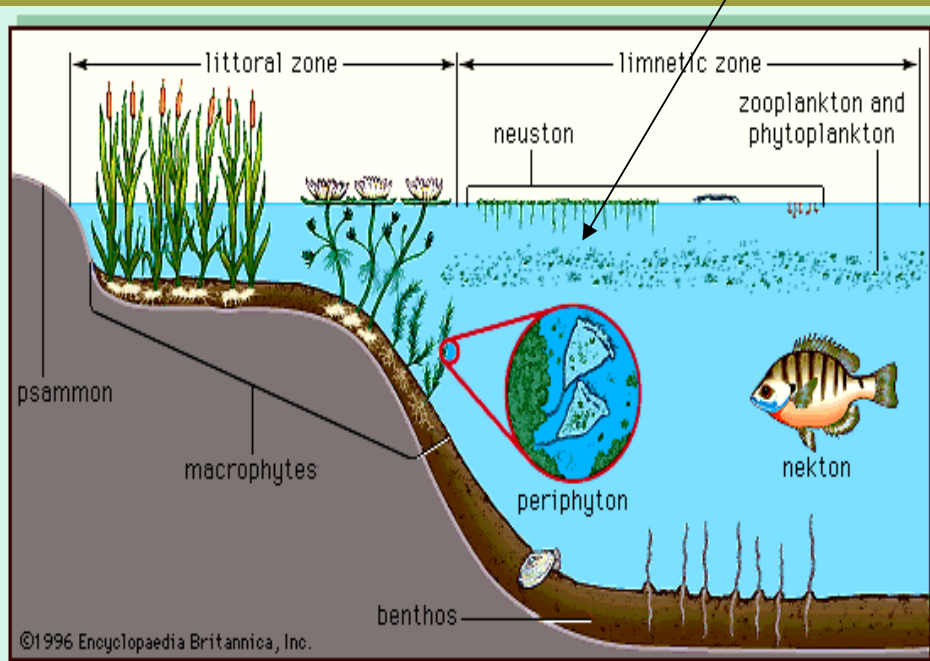
OOCYSTIS

- Fitoplanktons ir sīko augu valsts izcelsmes organismu kopums, kas atrodas ūdenī suspendētā stāvoklī un pasīvi pārvietojas ar ūdens masām.

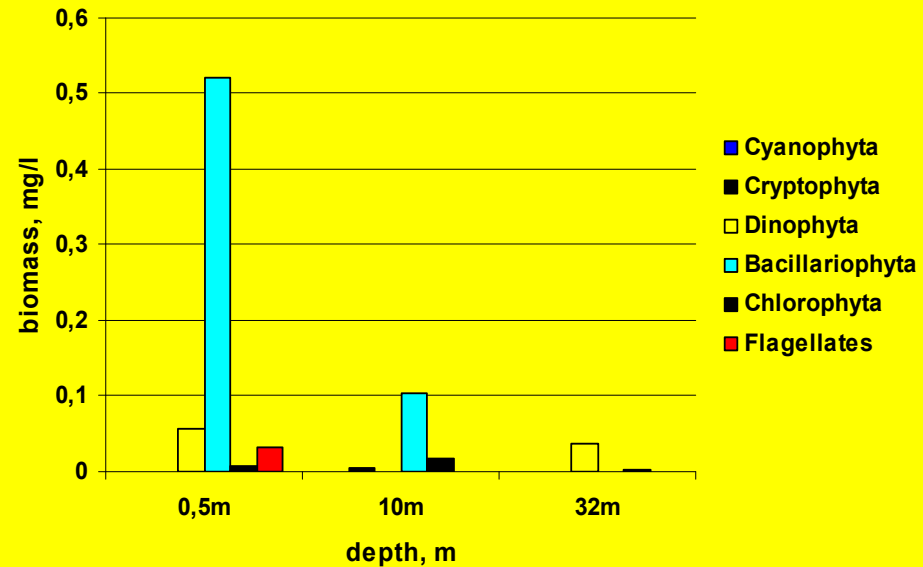
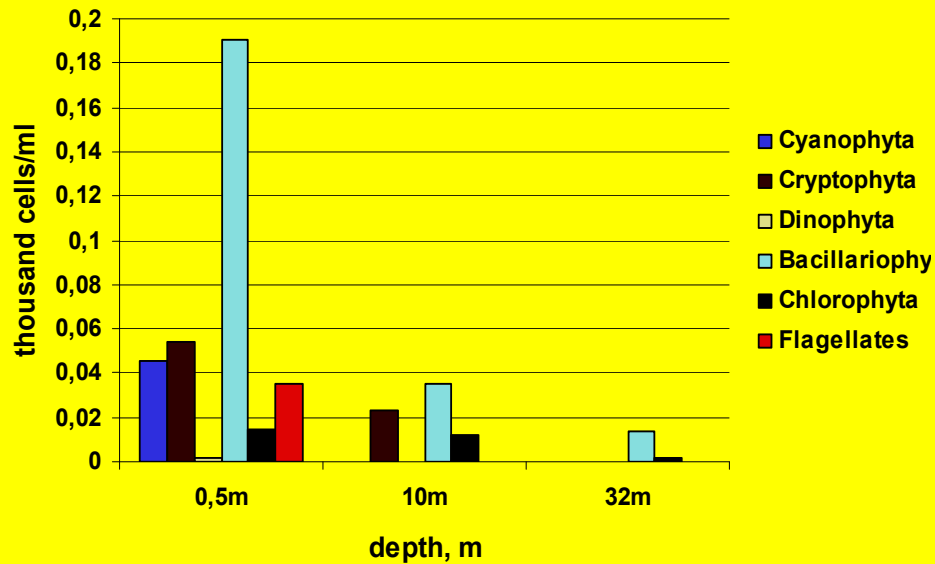
FITOPLANKTONS



FITOPLANKTONA ATTĪSTĪBA GALVENOKĀRT NOTIEK EPILIMNIONĀ (Eifotiskajā, Trofogenajā zonā)



Fitoplanktona šūnu skaits un biomasa Pļaviņu ūdenskrātuves ūdens kolonnā 2002. g. oktobrī



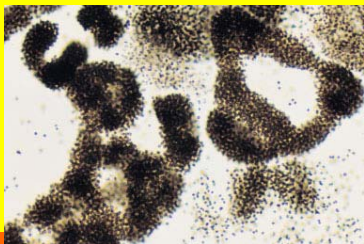
Galvenās problēmas no algologa viedokļa:

- **Cianobaktēriju (zilaļģu) masveida savairošanās – “zilaļģu ziedēšana” - vai ar turpmākām iespējamām klimata izmaiņām tā kļūs arvien lielāka?**
- **Kāpēc pēdējos desmit gados masveidā fitoplanktona paraugos dominē kriptofītaļģes?**
- **Kādas nepatikšanas var mums sagādāt *Prymnesium parvum* masveida savairošanās?**
- ***Gonyostomum semen* invāzija!!!
Vai klimata izmaiņas?
Vai kaut kas cits?**

Cianobaktēriju (zilaļģu) masveida savairošanās

–

“zilaļģu ziedēšana”- vai ar turpmākām
iespējamām
klimata izmaiņām tā kļūs
arvien intensīvāka?



Microcystis

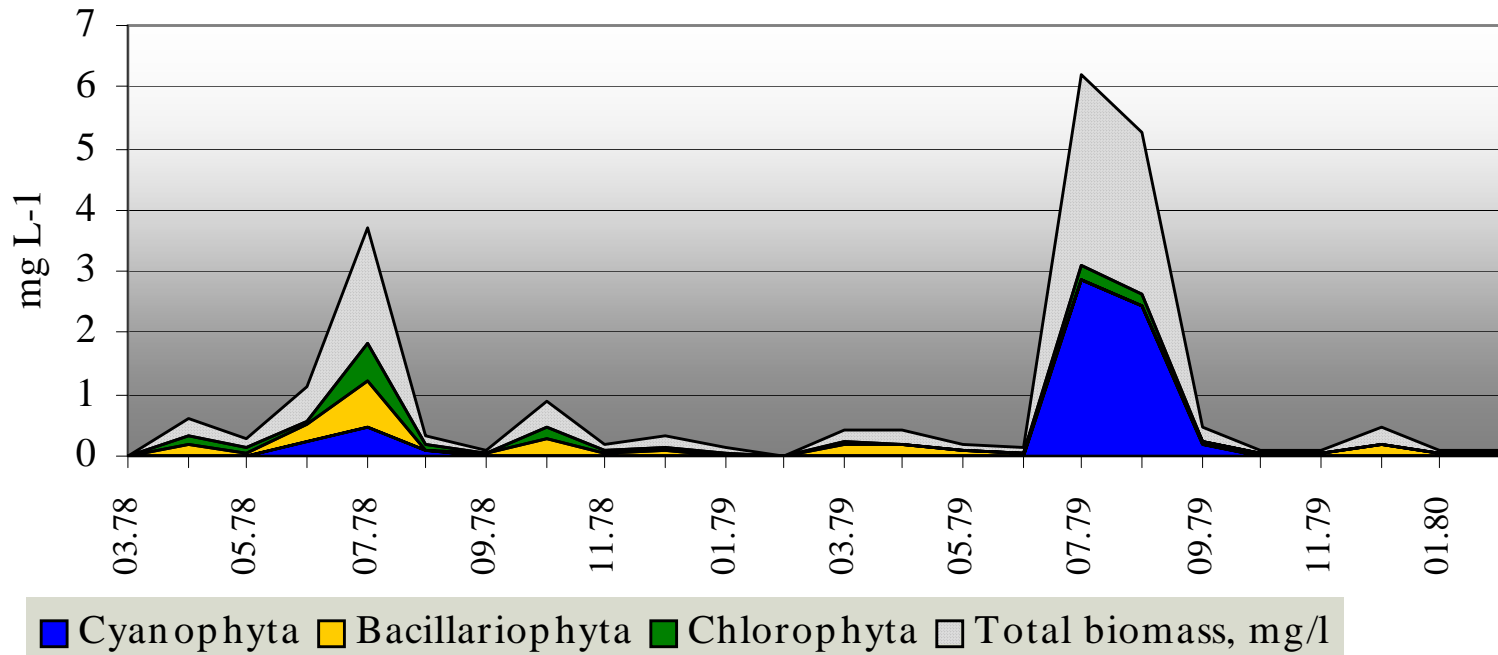


Rīgas kanāls

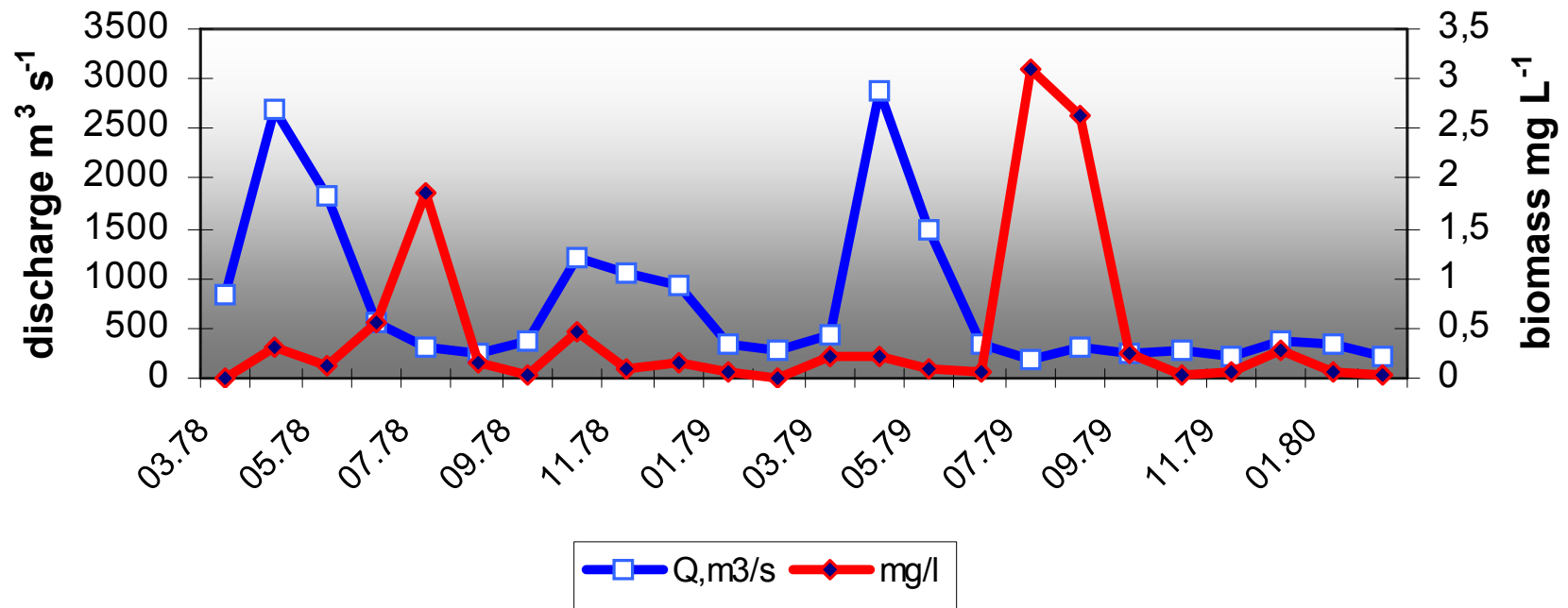


Brno ūdenskrātuve

Fitoplanktona attīstība Rīgas ūdenskrātuvē (1978-1980)

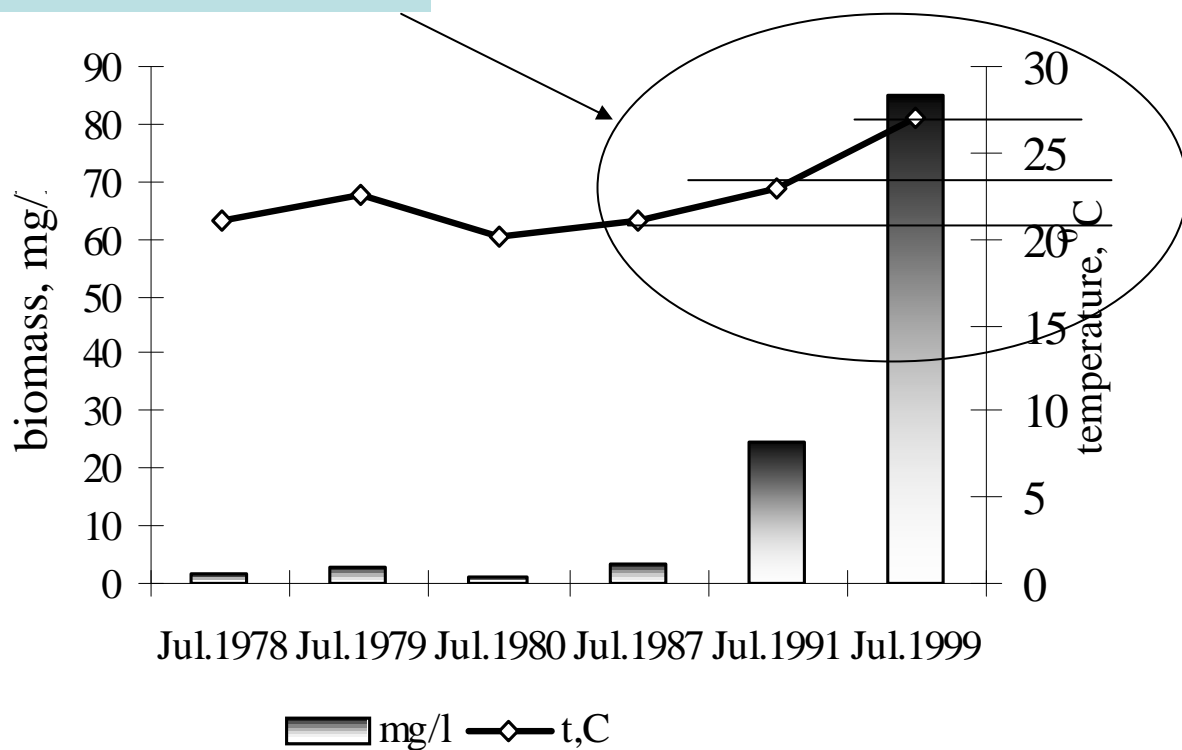


Fitoplanktona bimasas (mg l^{-1}) un ūdens caurplūduma Q m^3s^{-1} novērojumi Rīgas ūdenskrātuvē (1978-1980)



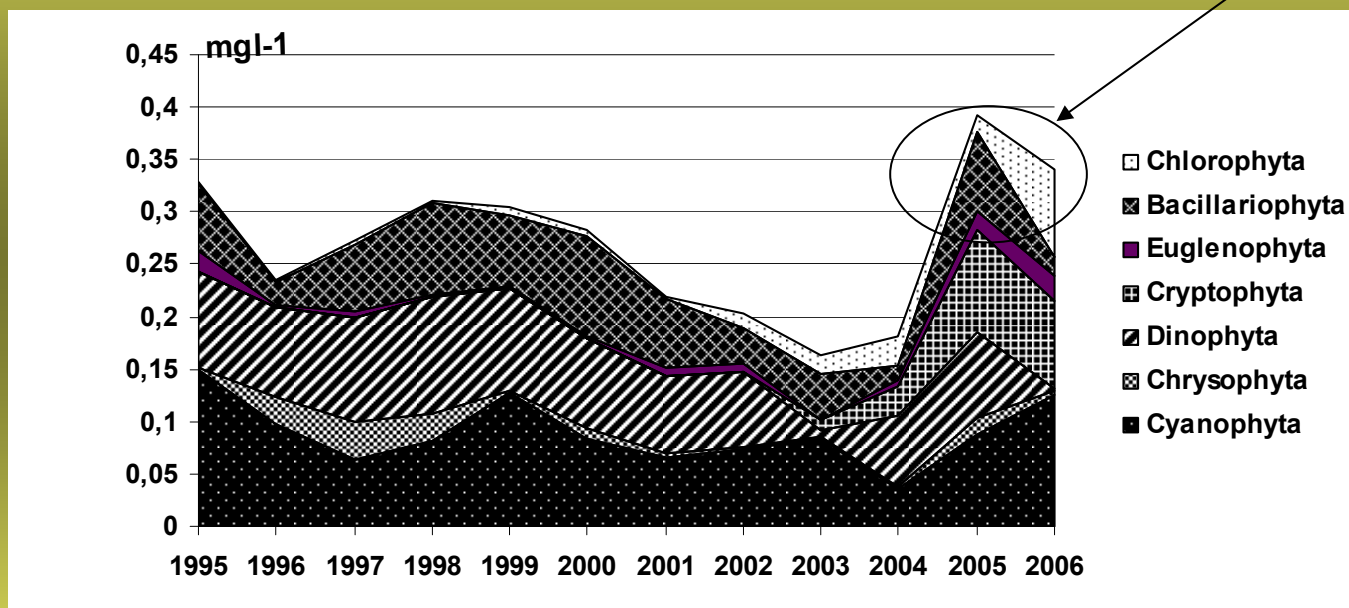
Jūlija fitoplanktona kopējās biomasas (mg l^{-1}) un ūdens temperatūras novērojumi Rīgas ūdenskrātuvē (0,5m horizontā).

Pie augstākas ūdens t° novērota lielāka biomasa



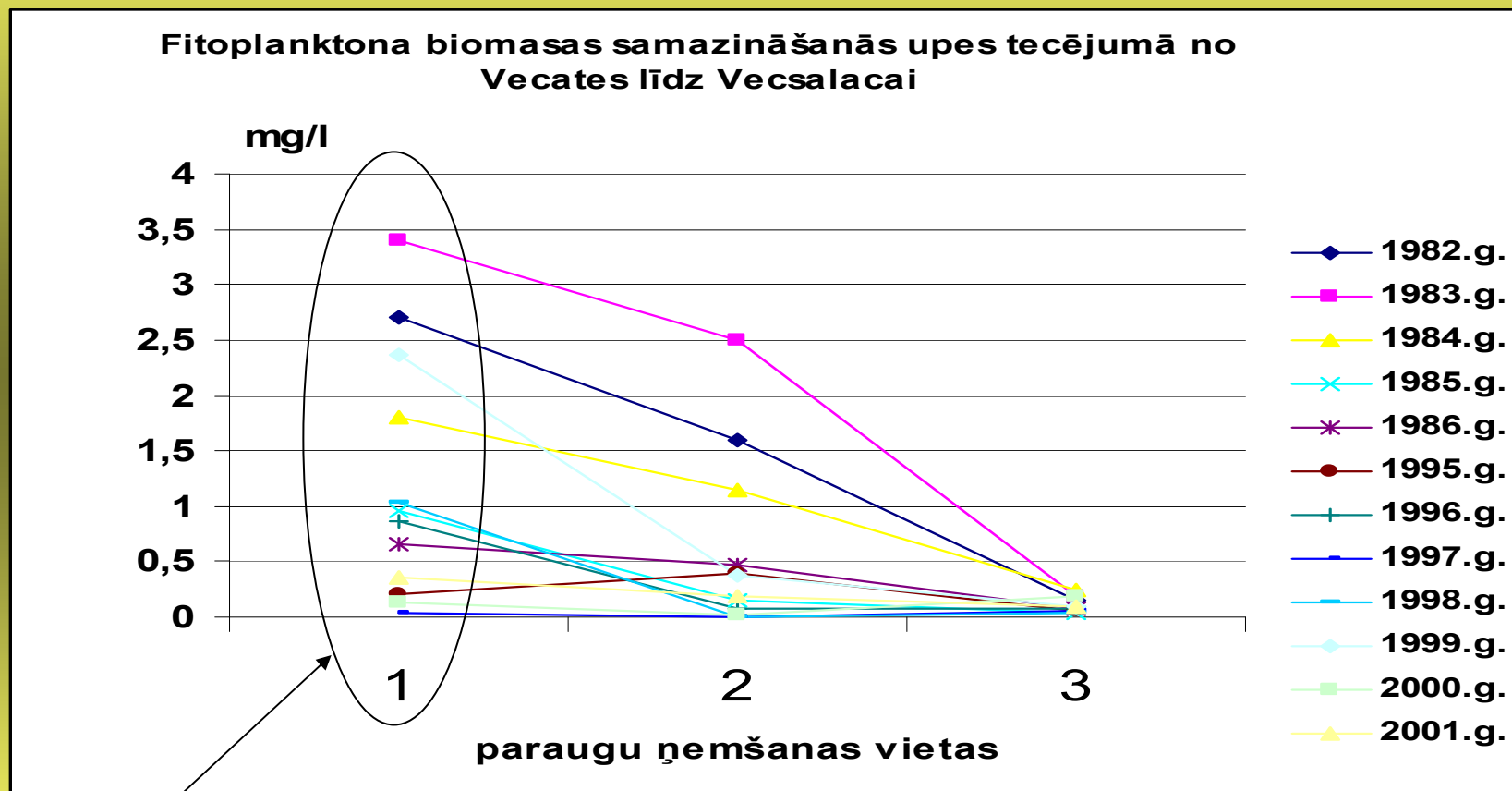
Engures ezera fitoplanktona novērojumi

Ūdens temperatūra paraugu ņemšanas laikā ap 22-26 C°



Engures ezera fitoplanktona vasaras biomasu monitorings
(~ 1.- 4. jūlijs – katru vasaru)

Burtnieku ezera ietekme uz Salacas fitoplanktona izmaiņām upes tecējumā (1982-2001 jūlija pēd. ned.)



Burtnieku ezera ietekme

1 – izteka; 2 – Mērnietki; 3 – Monitoringa stacija Salaca

Kāpēc pēdējos desmit gados masveidā paraugos dominē Cryptomonas?

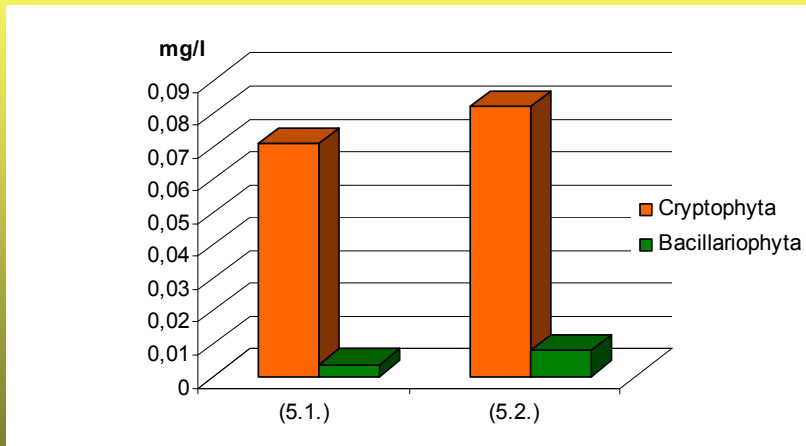


www.nies.go.jp

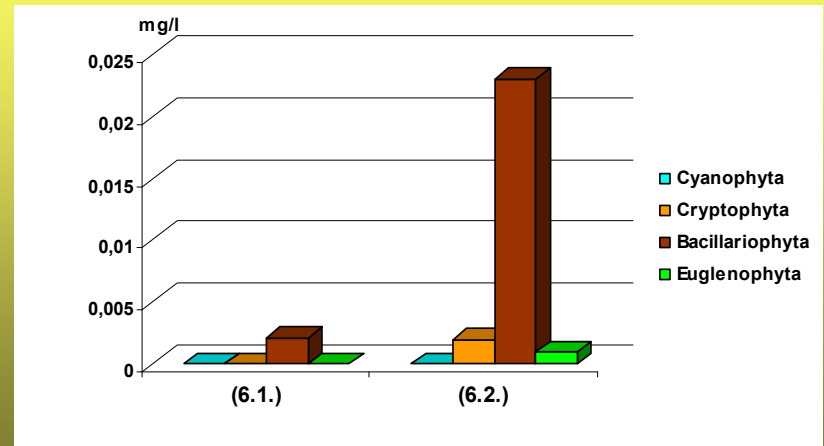


?

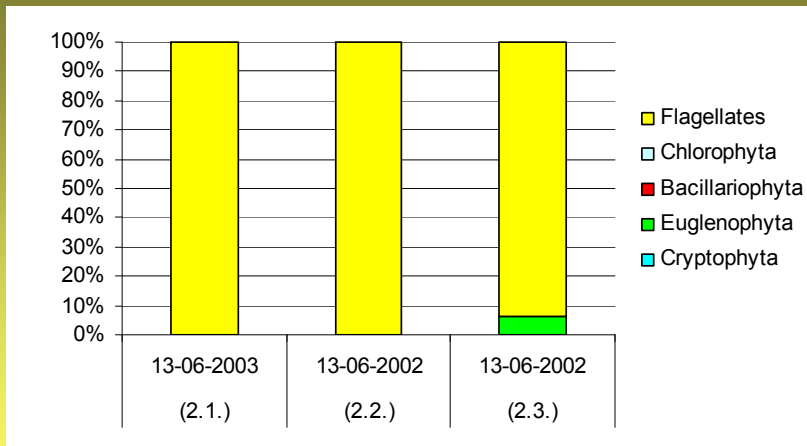
Teiču Dabas Rezervāta ezeri (2002-2003)



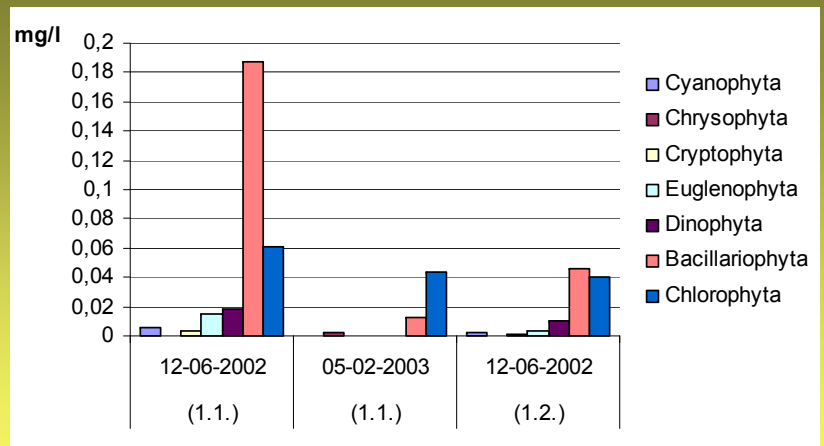
Veigantu ezera fitoplanktona biomasas monitoringa novērojumu posteņos 5.1. un 5.2.



Pieslaista ezera fitoplanktona biomasas monitoringa posteņos 6.1., 6.2.



Fitoplanktona procentuālais sastāvs Islienas ezerā



Fitoplanktona biomasu veidojošo aļģu nodalījumu sadalījums monitoringa posteņos MazajaPlencīti

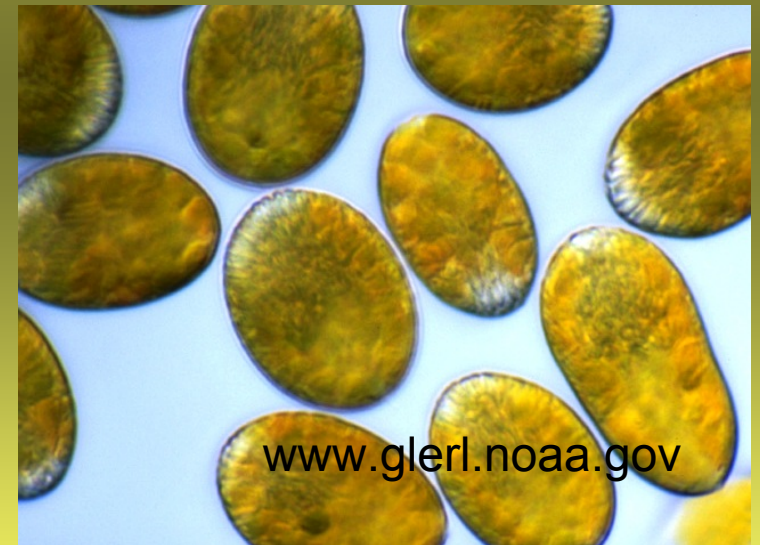
Vai *Gonyostomum* semen

invāzija!!!

Vai klimata izmaiņas?
Varbūt... kaut kas cits?



www.glerl.noaa.gov



www.glerl.noaa.gov

- **Alerģisku reakciju izsaucošās aļģes ir diseitrofu vai purvu ezeru iemītniecības. Igaunijā *G. semen* atrastas 80 ezeros un lielākās *G. semen* masveida savairošanās konstatētas 1991. gadā, kur atzīmēta loti augsta fitoplanktona biomasa - 100 g/m³**
- **Pēdējos gadu desmitos konstatēta šīs sugas strauja ekspansija Ziemeļeiropas un Austrumeiropas ūdenstilpēs – Polija, Vācija.**
- **Zviedru pētnieki (Cronberg et al., 1988) uzskata, ka, iespējams, šīs sugas ekspansija saistīta ar ezeru paskābināšanos.**
- **Iespējams, ka šī *G. semen* ekspansija saistīta ar klimata izmaiņām Ziemeļeiropā un Austrumeiropā.**



Bez cianobaktērijām Zviedrijā uzmanība jau tika pievērsta *Gonyostomum semen*!!!

TABLE 27.

CURRENT CONDITIONS: spring-developing diatoms (mm^3/l)

Class	Description	Biomass
1	Very small biomass	≤ 0.05
2	Small biomass	0.05 – 0.5
3	Moderate biomass	0.5 – 2.0
4	Large biomass	2.0 – 4.0
5	Very large biomass	> 4.0

TABLE 28.

CURRENT CONDITIONS: water-blooming cyanobacteria (mm^3/l)

Class	Description	Biomass
1	Very small biomass	≤ 0.5
2	Small biomass	0.5 – 1.0
3	Moderate biomass	1.0 – 2.5
4	Large biomass	2.5 – 5.0
5	Very large biomass	> 5.0

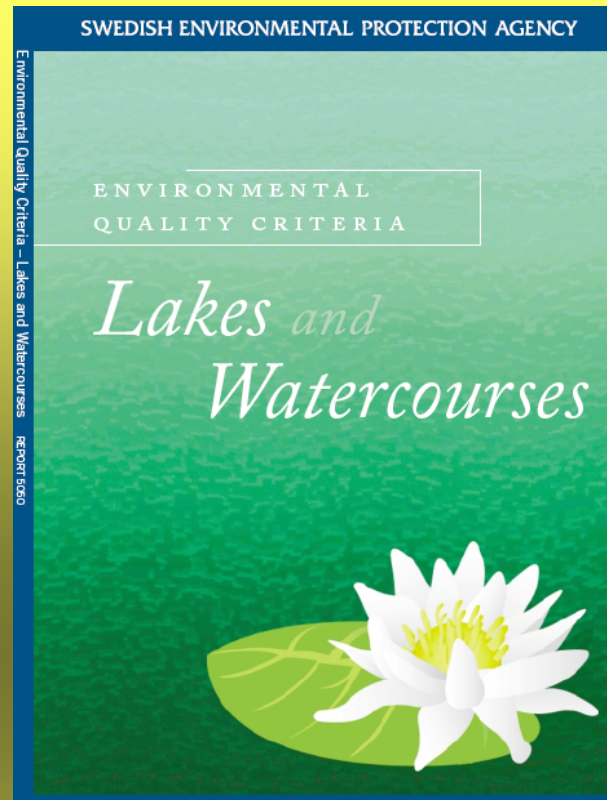
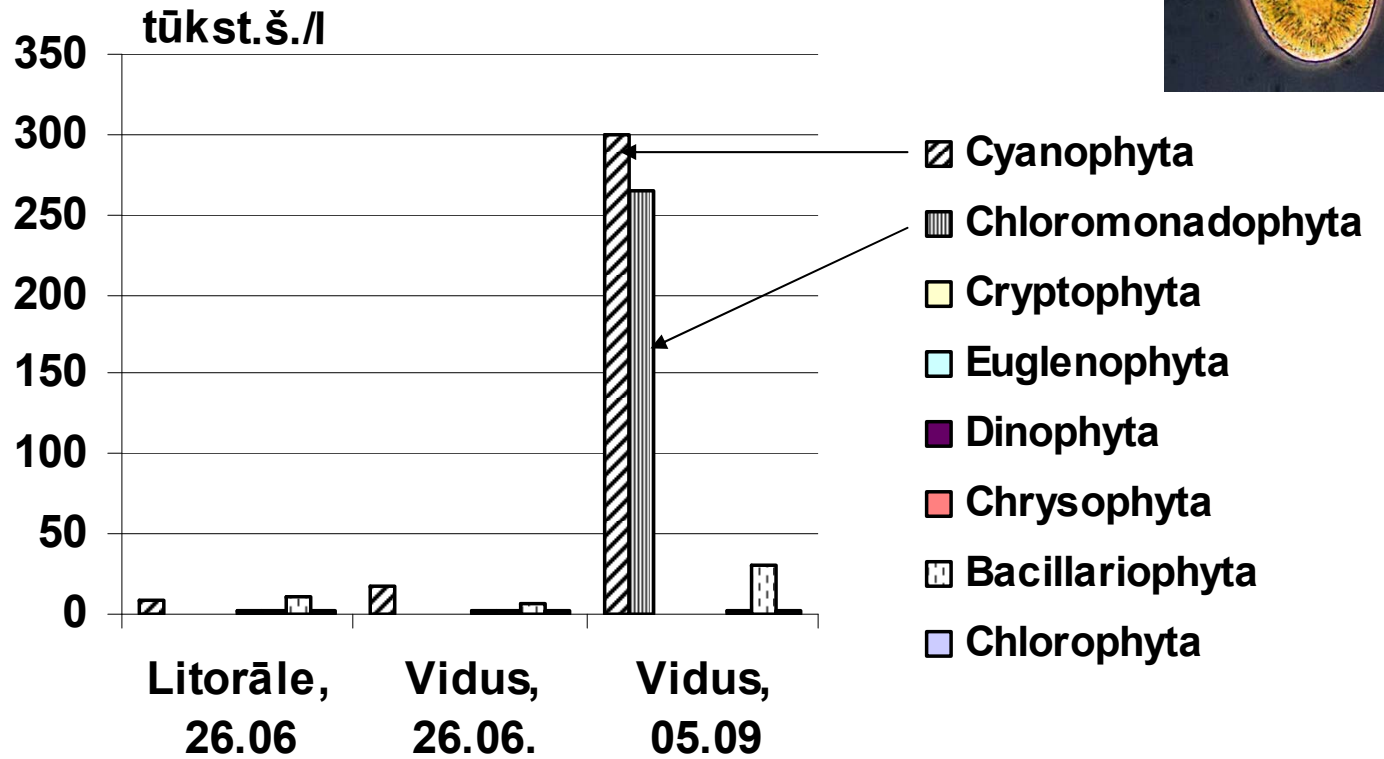


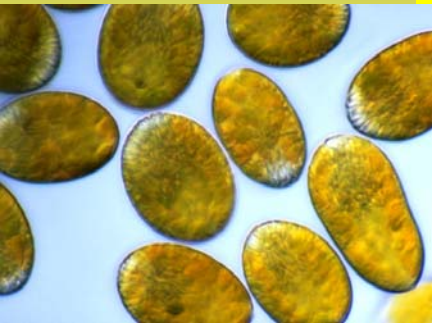
TABLE 30.

CURRENT CONDITIONS: *Gonyostomum semen* (mm^3/l)

Class	Description	Biomass
1	Very small biomass	≤ 0.1
2	Small biomass	0.1 – 1.0
3	Moderate biomass	1.0 – 2.5
4	Large biomass	2.5 – 5.0
5	Very large biomass	> 5.0



Fitoplanktona šūnu skaits (šūnas/l) Lieluikas ezerā.



Kādas nepatikšanas var mums sagādāt iespējama *Prymnesium parvum* masveida savairošanās?



Tiina Nõges

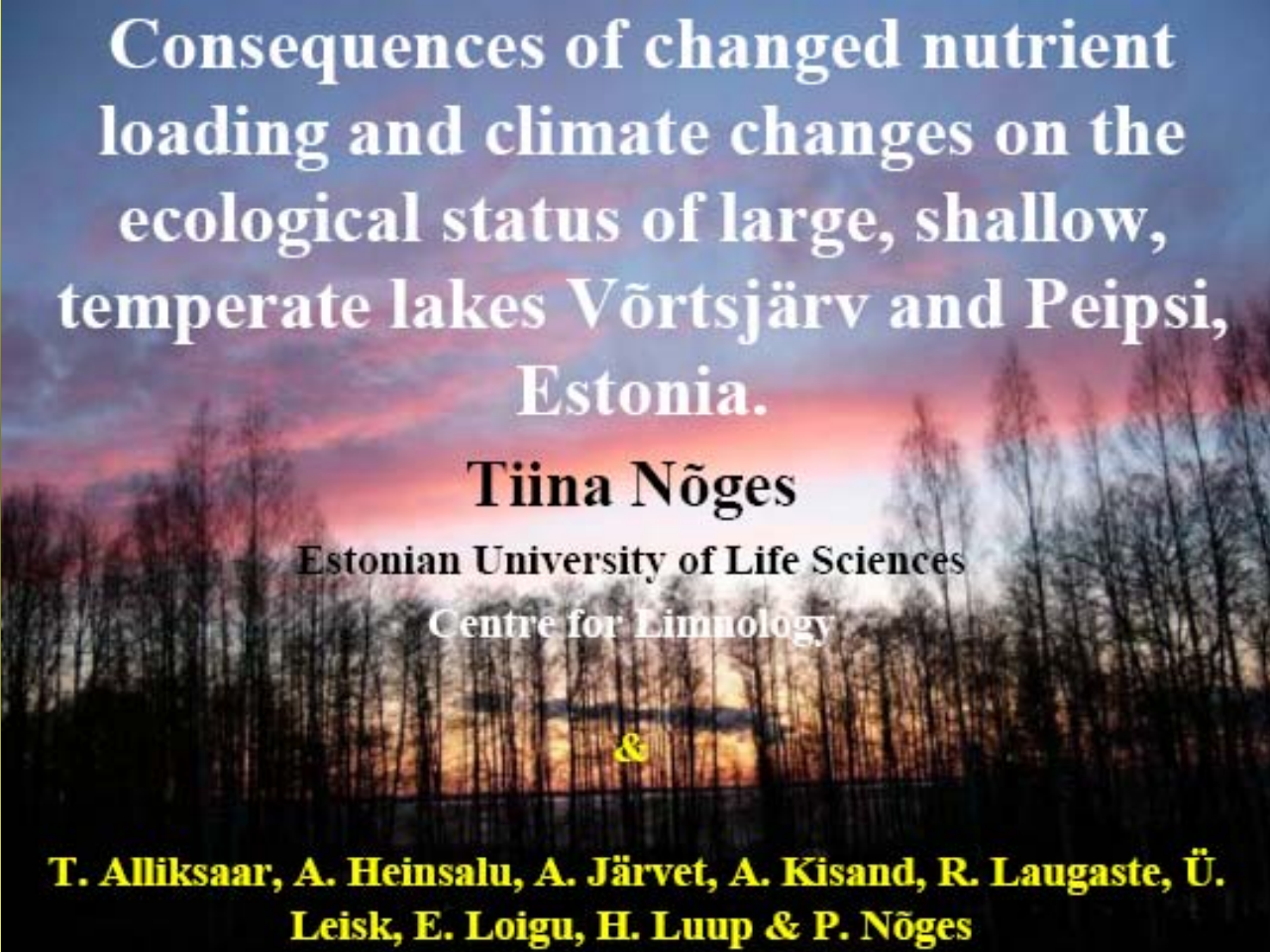
**Water level
affects
cyanophyte
species**

- Igaunu Zinātnieki

**Tiina un Peter
Nõges**

**konstatējuši, ka
Igaunijā Ūdens
līmenis ietekmē
zilaļģu sugas....un
to attīstību.....**

- **Vai Latvijā
tāpat?**



**Consequences of changed nutrient
loading and climate changes on the
ecological status of large, shallow,
temperate lakes Võrtsjärv and Peipsi,
Estonia.**

Tiina Nõges

Estonian University of Life Sciences

Centre for Limnology

&

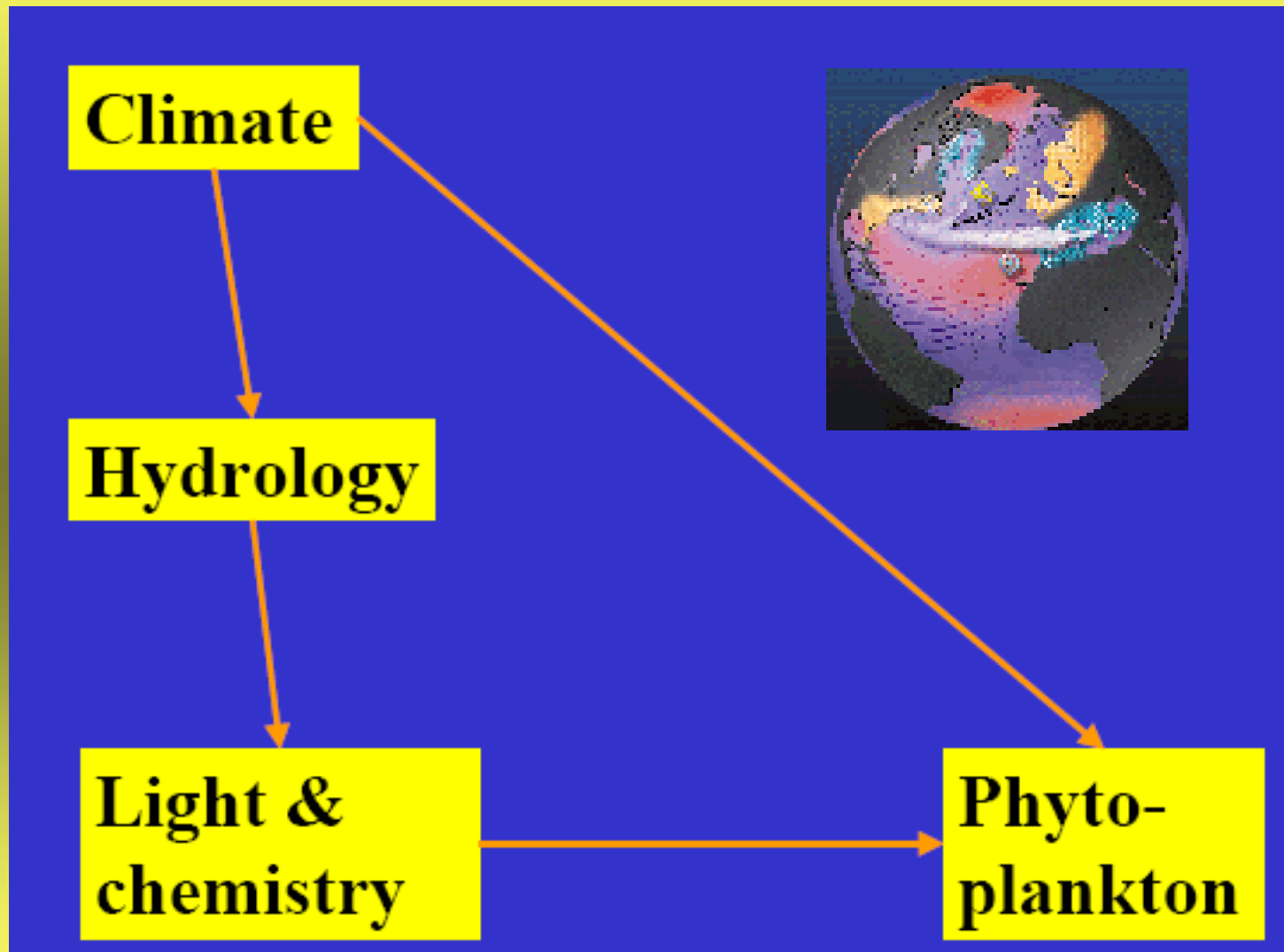
**T. Alliksaar, A. Heinsalu, A. Järvet, A. Kisand, R. Laugaste, Ü.
Leisk, E. Loigu, H. Luup & P. Nõges**

http://www.ices.dk/projects/balticsea/CD/Biodiversity/T.NOGES_

Consequences%20of%20changed%20nutrient%20loading%20and%20climate.pdf

IGAUNU PIEREDZE:

Tiina Nõges

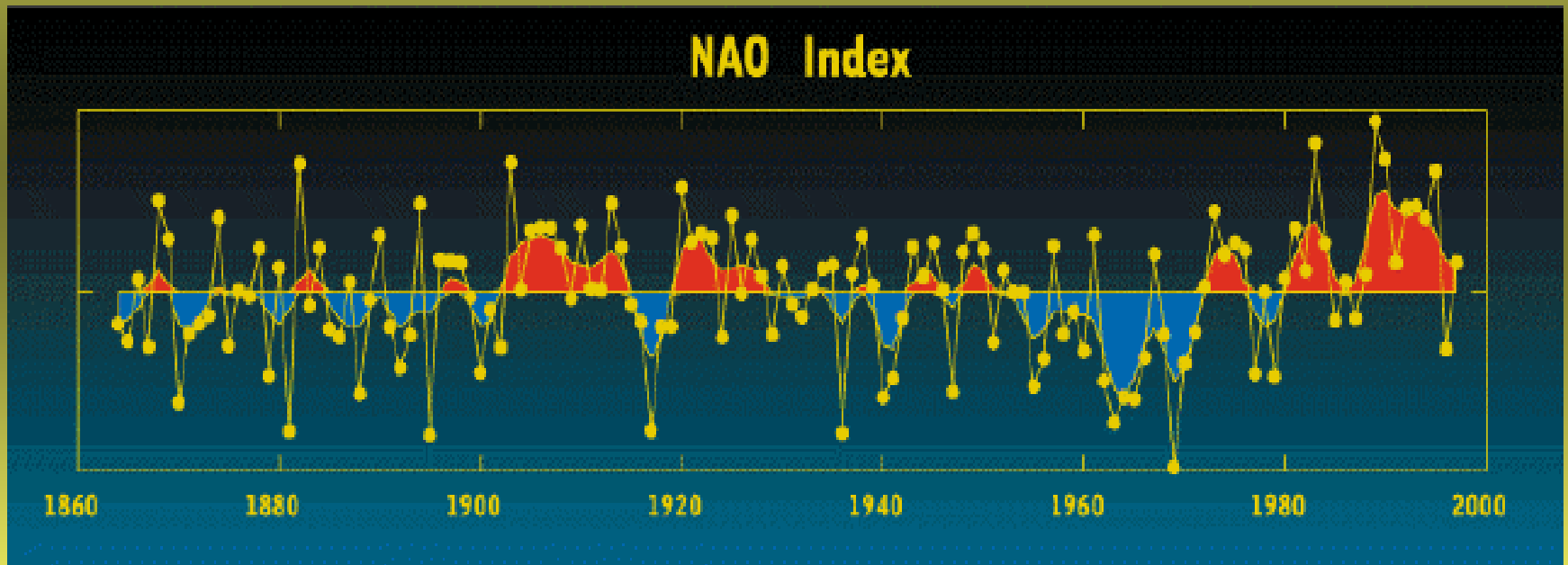


<http://www.ices.dk/projects/balticsea/CD/Biodiversity/T.NOGES>

Consequences%20of%20changed%20nutrient%20loading%20and%20climate.pdf

North Atlantic Oscillation

The NAO is the dominant mode of winter climate variability in the North Atlantic region ranging from central North America to Europe and much into Northern Asia. The NAO is a large scale seesaw in atmospheric mass between the subtropical high and the polar low. The corresponding index varies from year to year, but also exhibits a tendency to remain in one phase for intervals lasting several years.



<http://www.ideo.columbia.edu/NAO/>

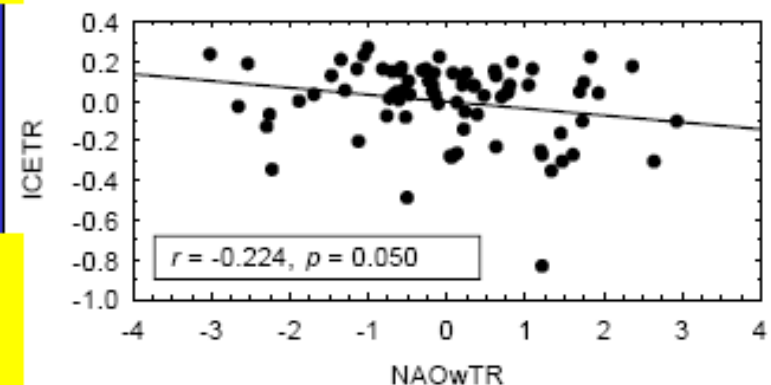
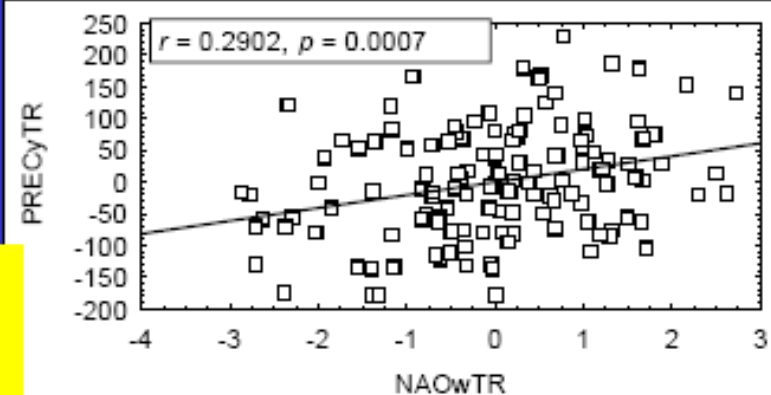
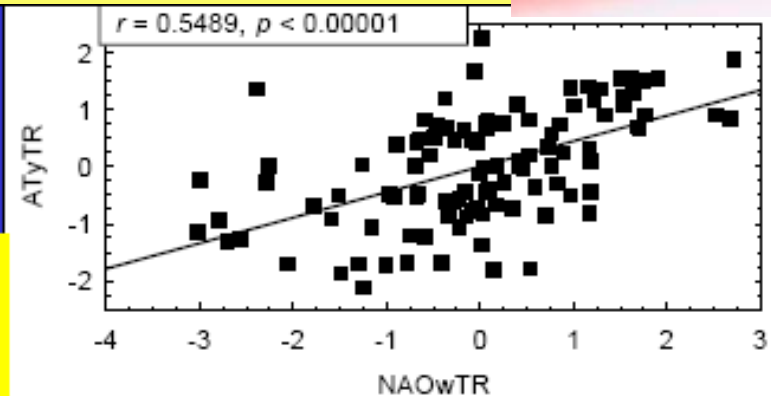
This results in warm and wet winters in Europe and in cold and dry winters in northern Canada and Greenland

NAOw is related to

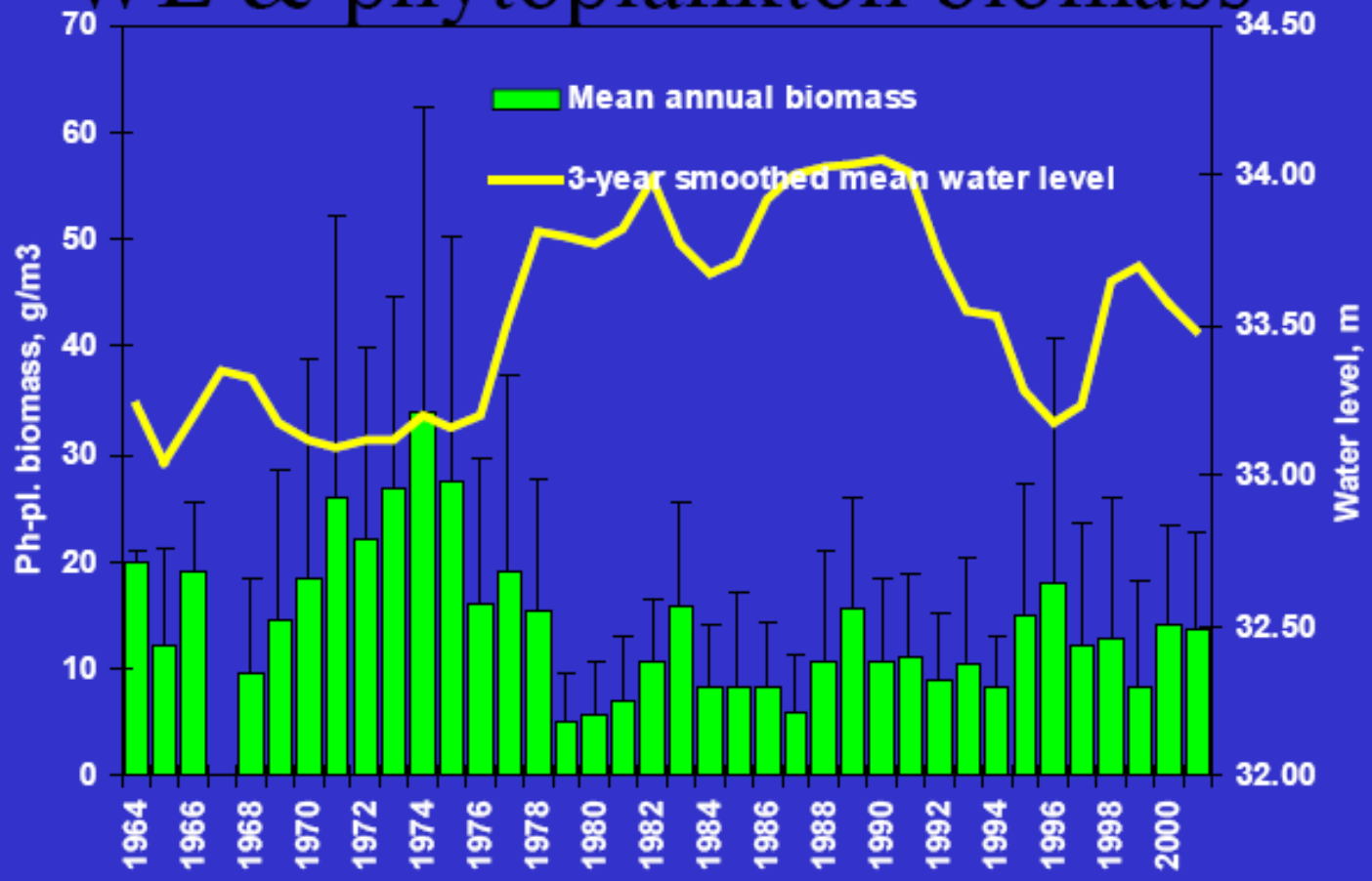
air temperature
in Estonia

amount of precipitation
in Estonia

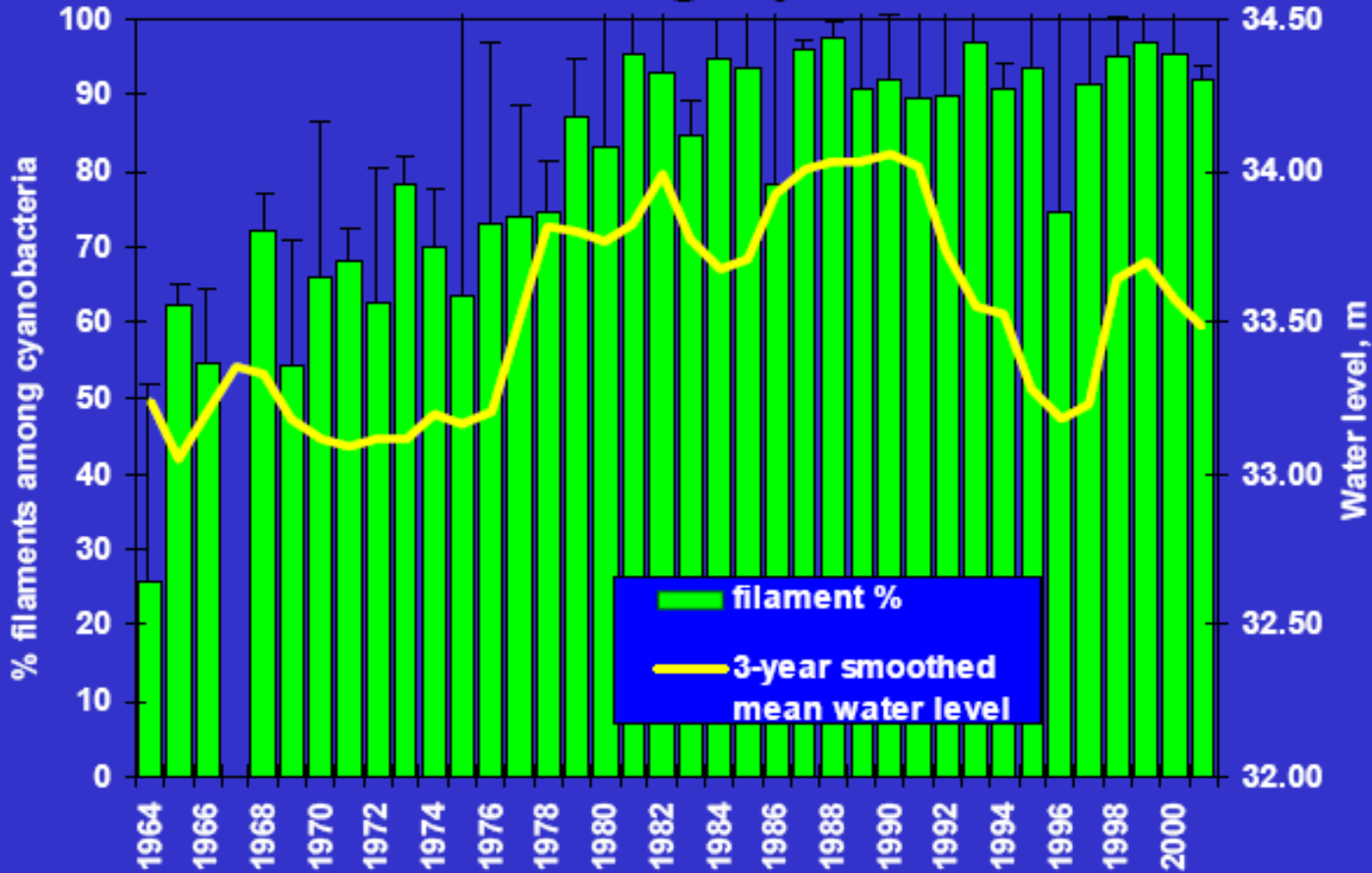
duration of ice cover
on Lake Võrtsjärv



WL & phytoplankton biomass



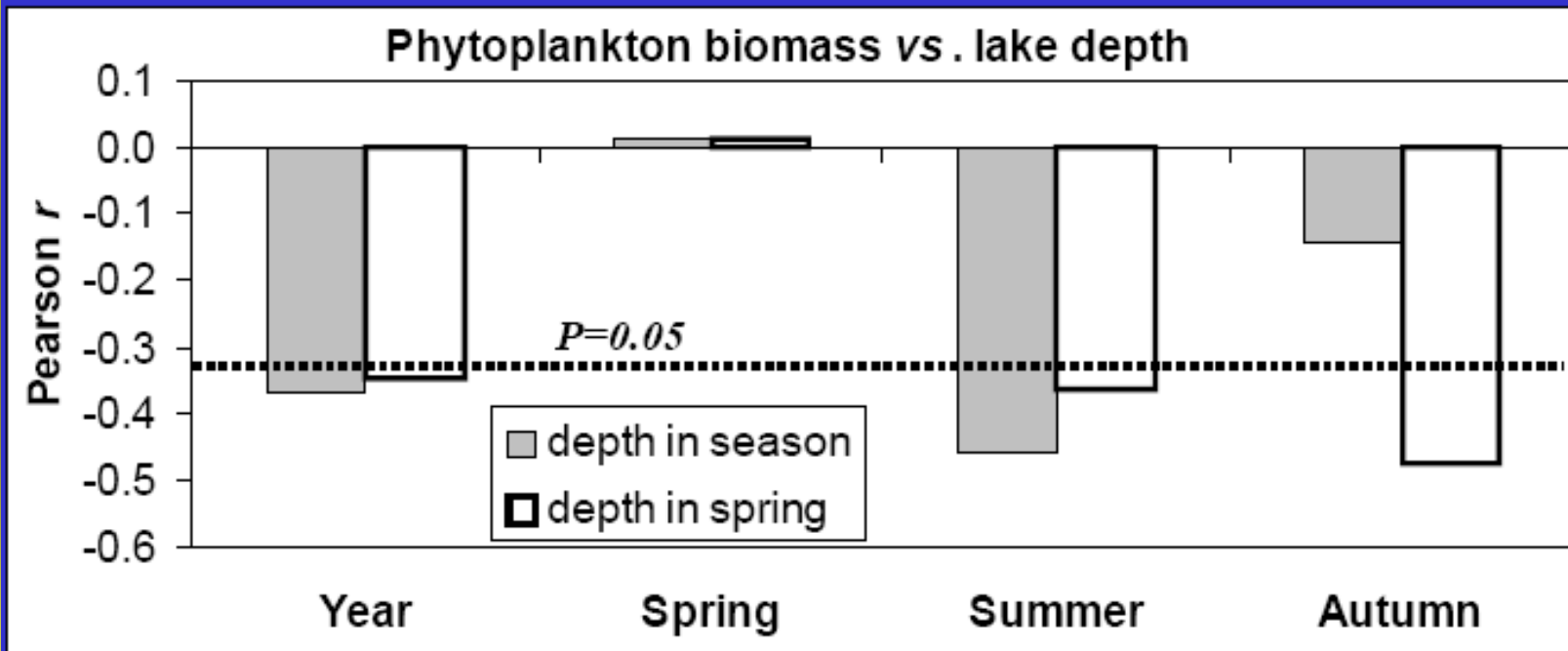
Filaments among cyanobacteria



<http://www.ices.dk/projects/balticsea/CD/Biodiversity/T.NOGES>

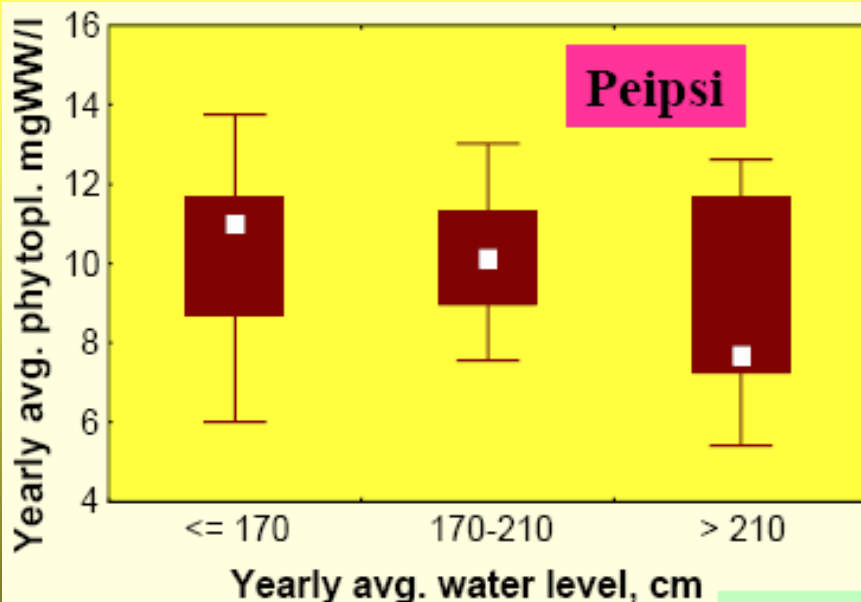
Consequences%20of%20changed%20nutrient%20loading%20and%20climate.pdf

More phytoplankton in shallower lake, but not in spring

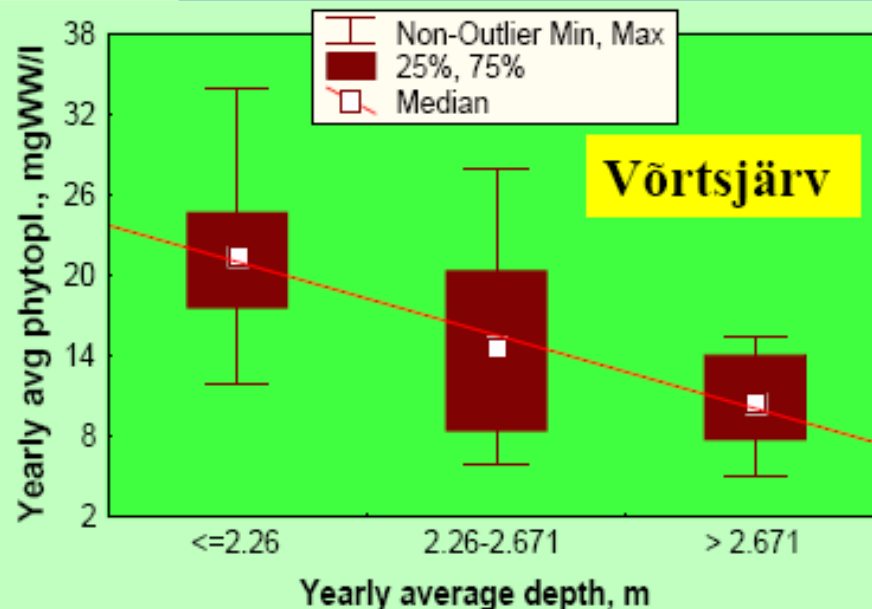


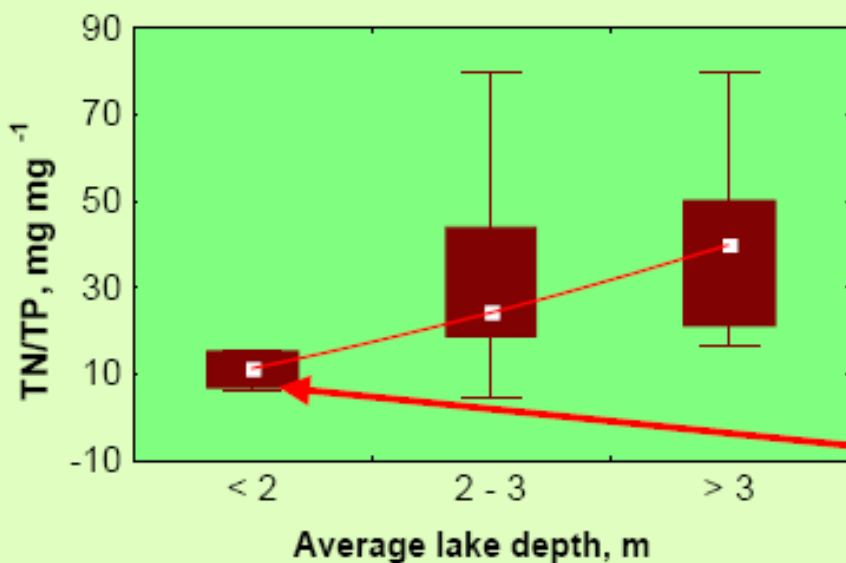
In spring – direct climate effect

In summer-autumn – climate effect mediated by water level



In deeper Peipsi the influence of WL on phytoplankton is not as strong as in Vörtsjärv



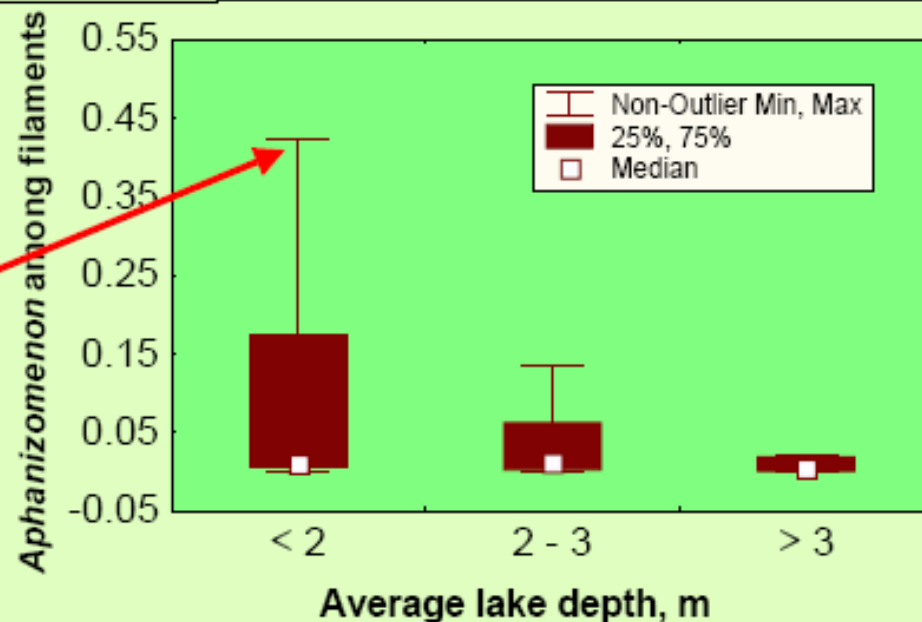


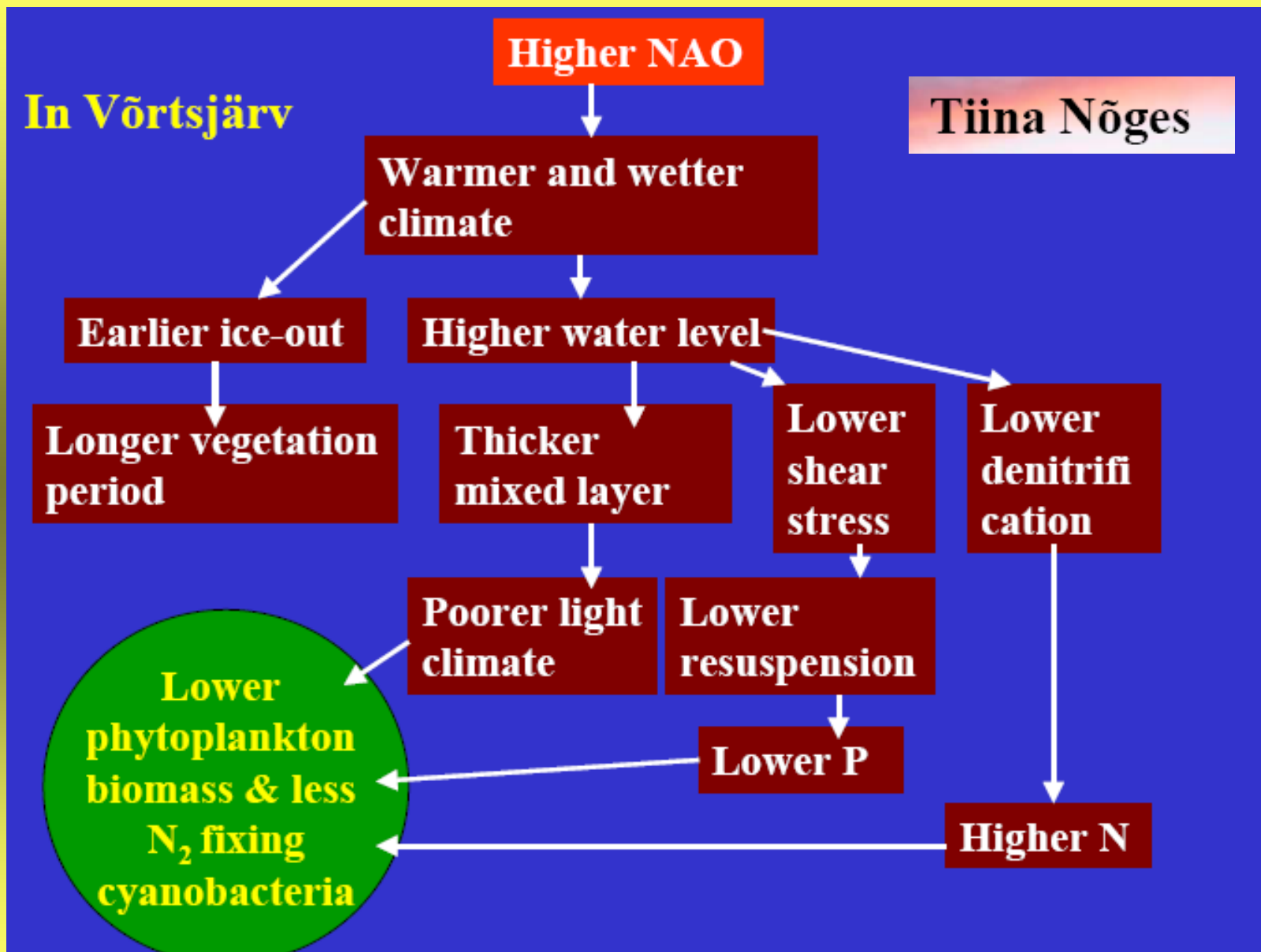
At low water level

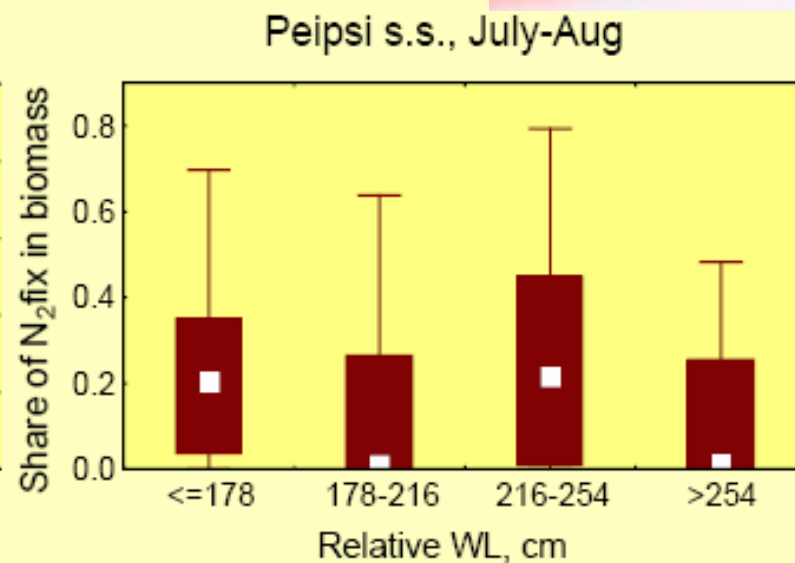
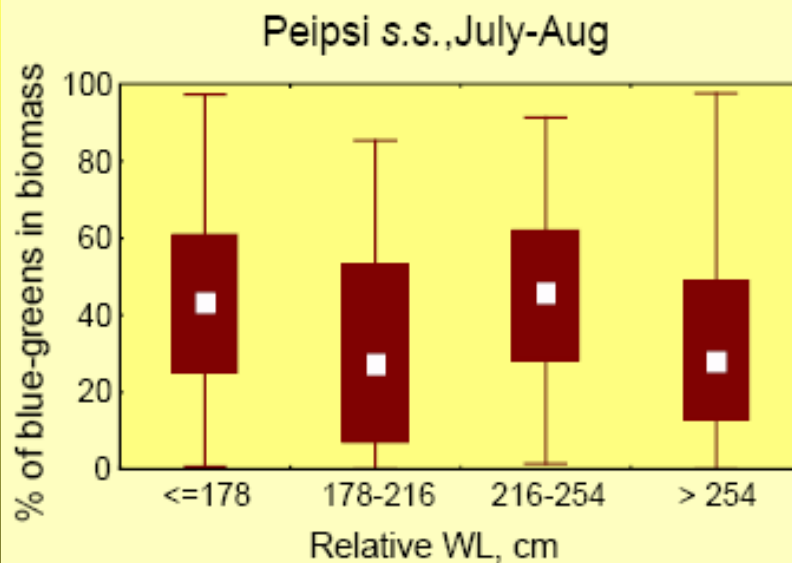
- ↓ N decreases
- ↑ denitrification
- ↑ P increases
- ↑ resuspension
- ↓ TN/TP decreases

Vörtsjärv

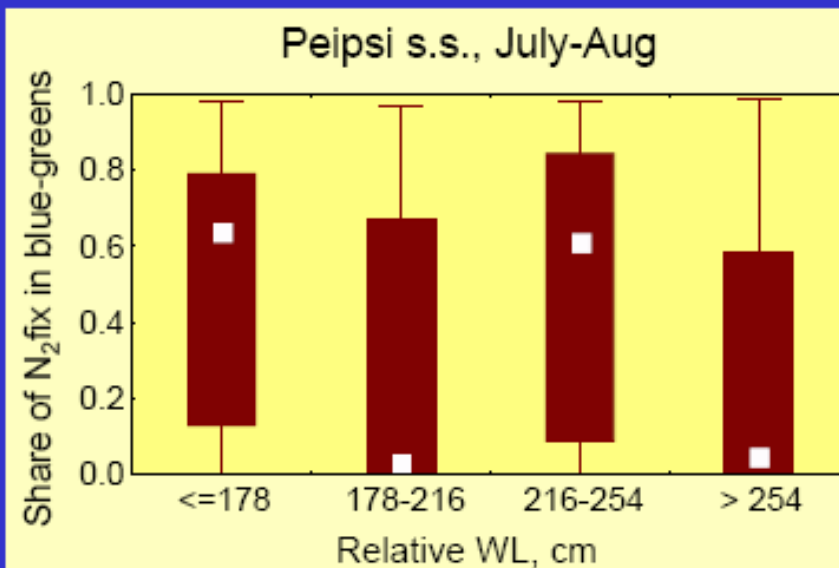
↑ N-fixing species are favoured



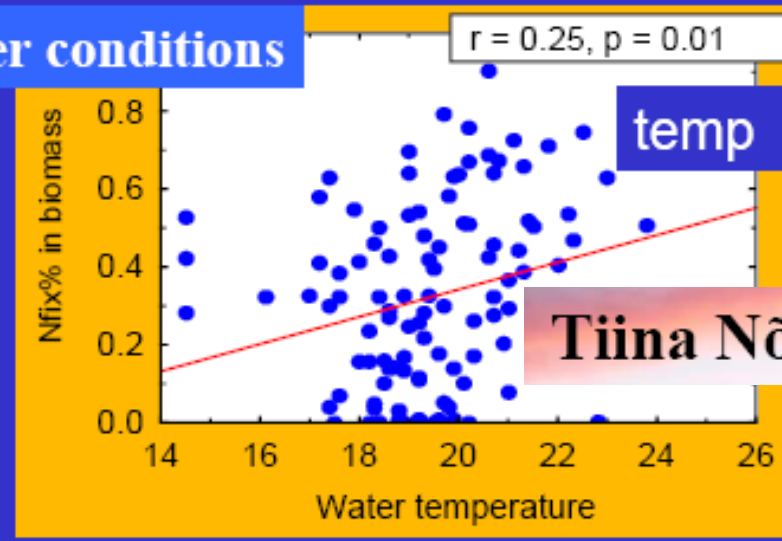
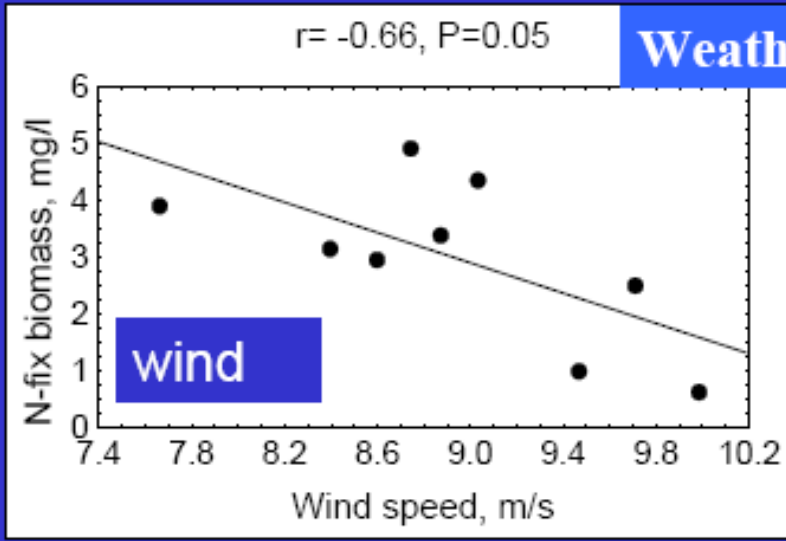
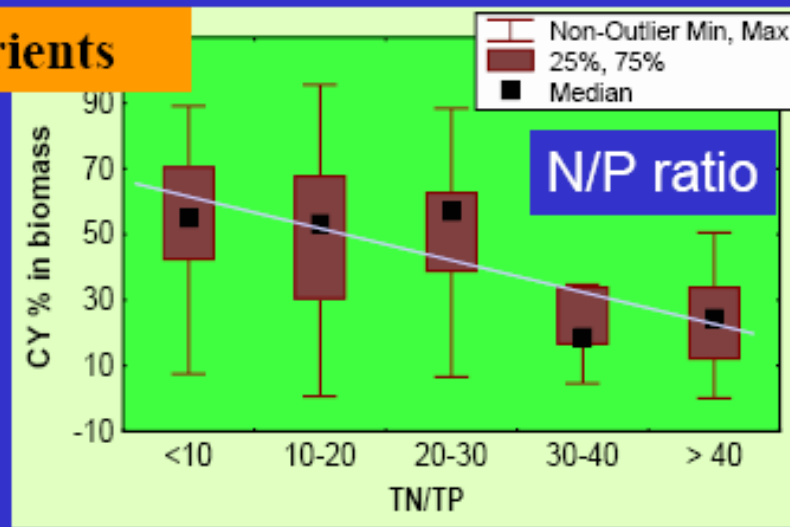
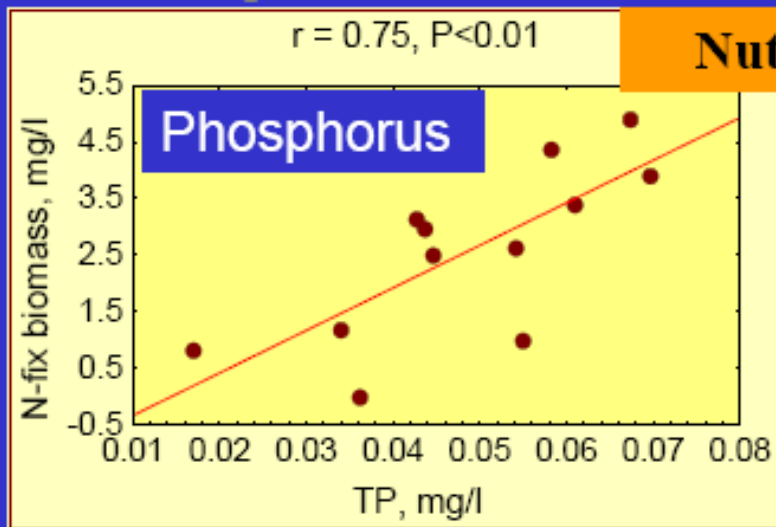




In deeper L.
Peipsi relation of
 blue-greens and
 WL is not
 evident



In Peipsi blooms are correlated with:



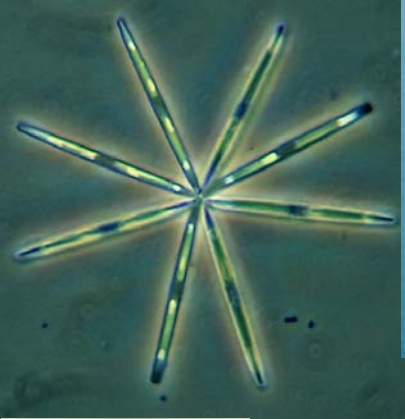
Tiina Nõges

<http://www.ices.dk/projects/balticsea/CD/Biodiversity/T.NOGES>

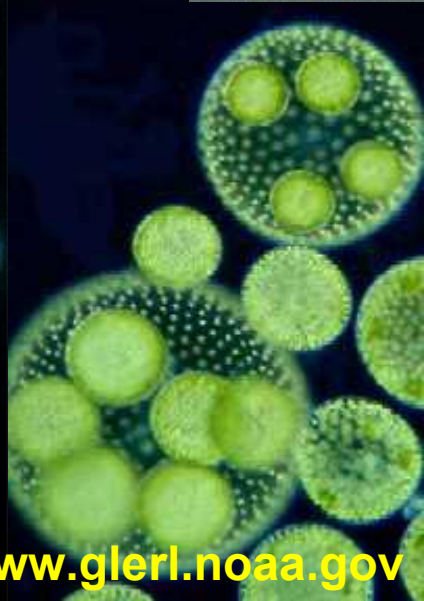
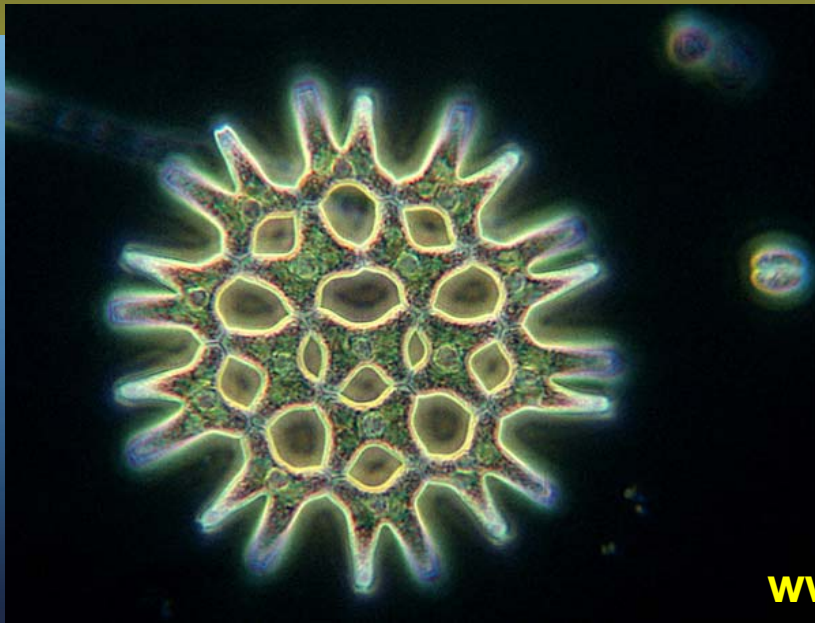
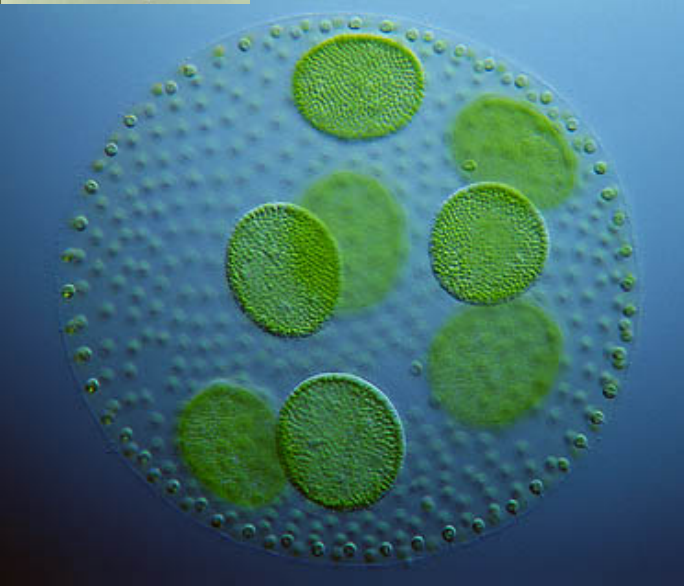
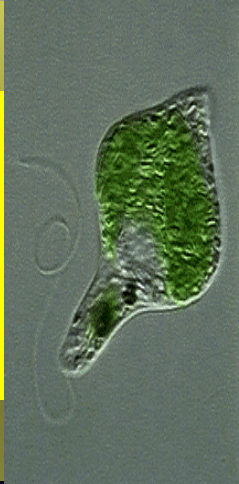
Consequences%20of%20changed%20nutrient%20loading%20and%20climate.pdf

In **Võrtsjärv** climate is the main factor enhancing blue-greens in summer and causing fish-kills in winter

In **Peipsi** low N/P and high P form background for climate forcing



PALDIES !



Latvijas ezeru ekoloģiskie tipi un tiem raksturīgās fitoplanktona biomasas

Ezeru tips	Augsta	Laba	Vidēja	Slikta	Ļoti slikta
1. tips Ļoti sekls dzidrūdens ezers ar augstu ūdens cietību	<0,5	0,5-2,5	2,5-5,0	5,0-10,0	>10
2. tips Ļoti sekls brūnūdens ezers ar augstu ūdens cietību	<0,5	0,5-2,5	2,5-5,0	5,0-10,0	>10
3. tips Ļoti sekls dzidrūdens ezers ar zemu ūdens cietību	<0,5	0,5-2,5	2,5-5,0	5,0-10,0	>10
4. tips Ļoti sekls brūnūdens ezers ar zemu ūdens cietību	<0,5	0,5-2,5	2,5-5,0	5,0-10,0	>10
5. tips Sekls dzidrūdens ezers ar augstu ūdens cietību	<0,5	0,5-1,5	1,5-5	5,0-10,0	>10
6. tips Sekls brūnūdens ezers ar augstu ūdens cietību	<1	1-2,5	2,5-5,0	5,0-10,0	>10
7. tips Sekls dzidrūdens ezers ar zemu ūdens cietību	<0,3	0,3-1	1,0-3,0	3,0-5,0	>5
8. tips Sekls brūnūdens ezers ar zemu ūdens cietību	<0,64	0,64-1,75	1,75-4,0	4,0-7,5	>7,5
9. tips Dziļš dzidrūdens ezers ar augstu ūdens cietību	<0,5	0,5-1,5	1,5-5	5-7,5	>7,5