Grazing by amoebae causes a dramatic shift in the genetic structure of a bloom of the cyanobacterium *Microcystis*

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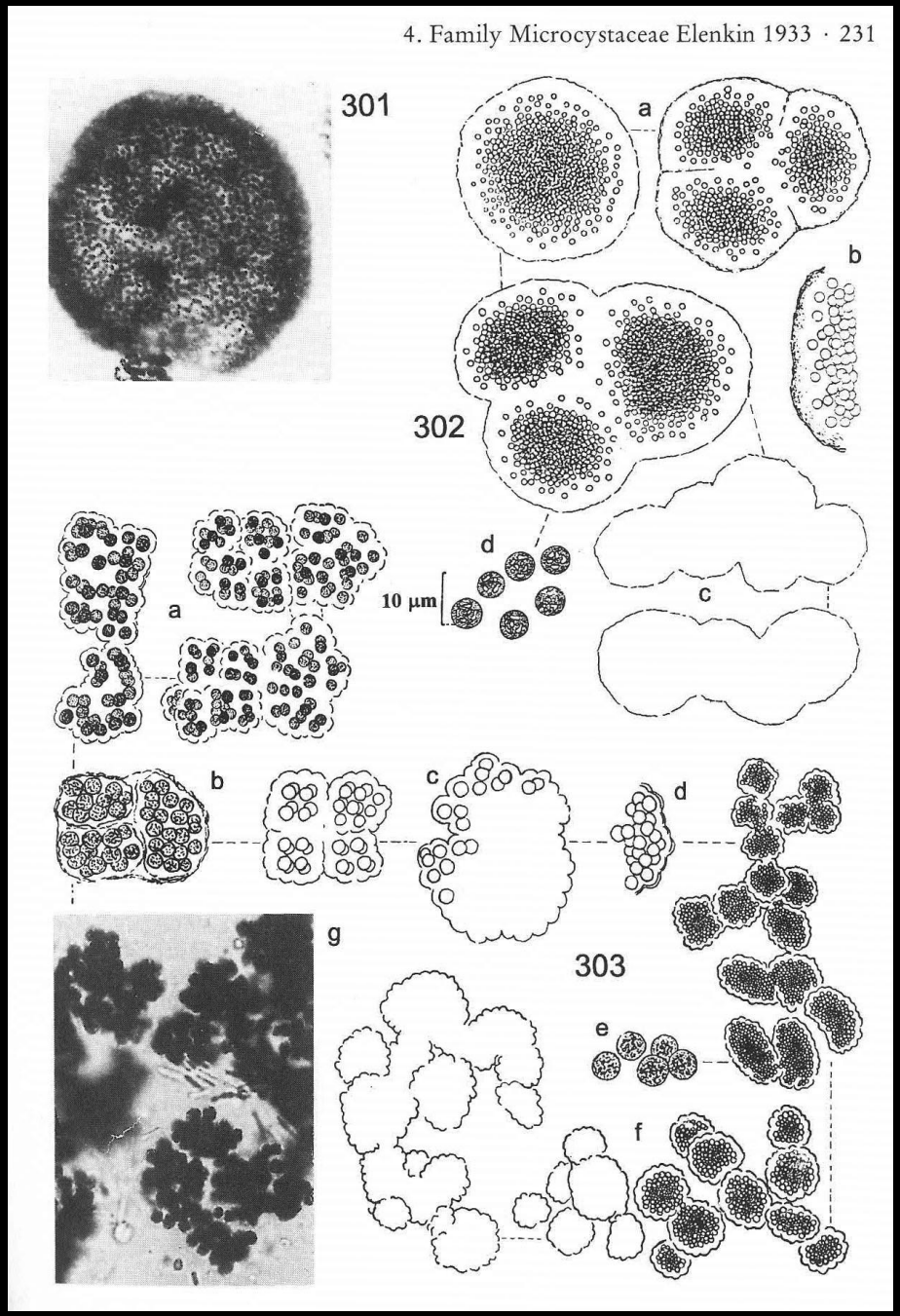
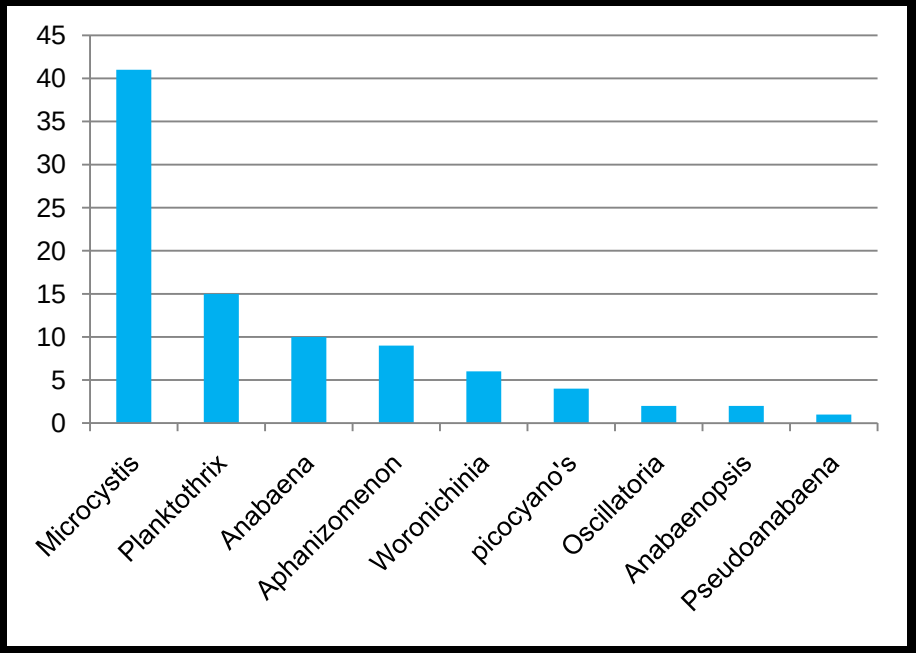
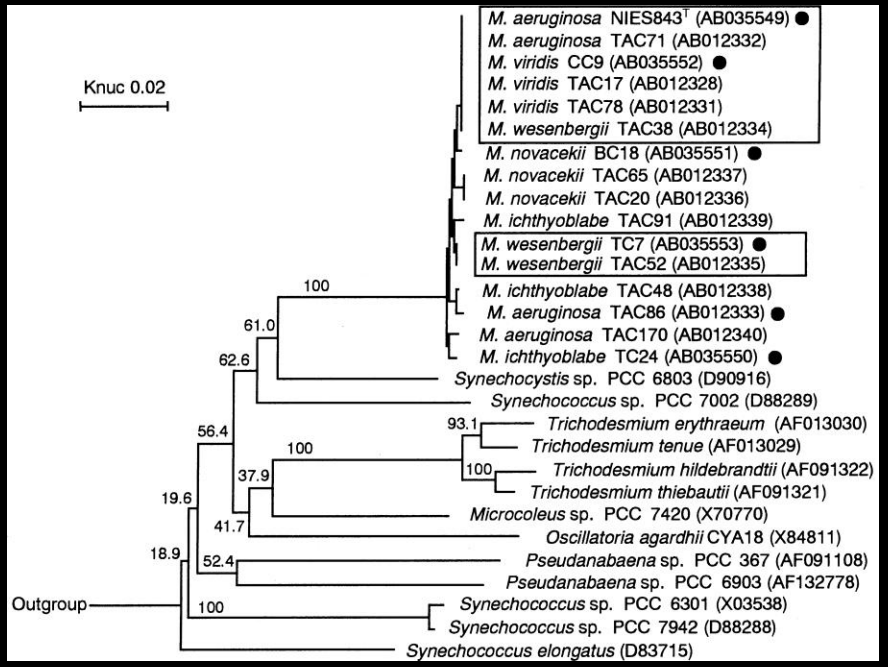
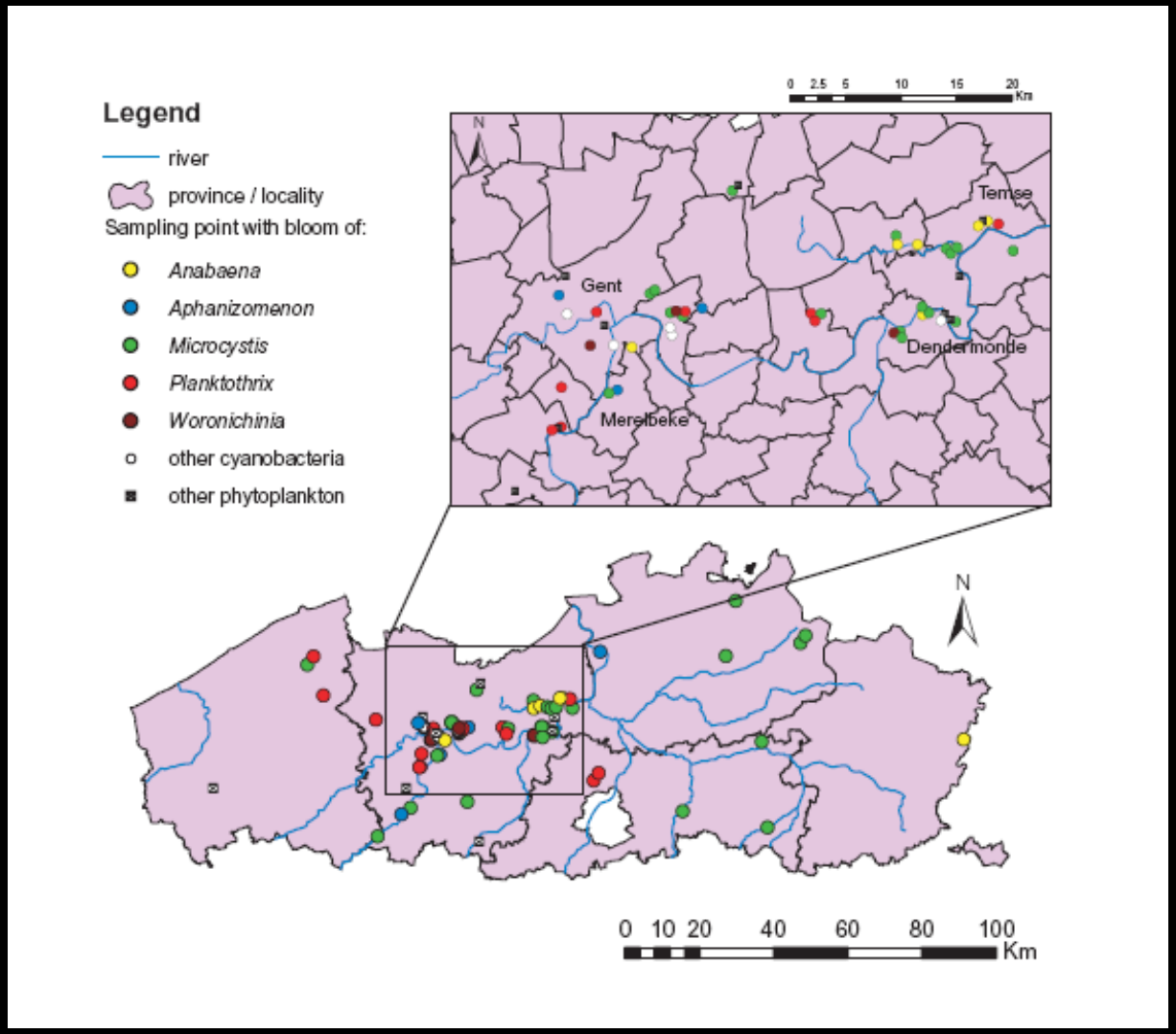






Otsuka et al. 2001. *Int. J. Sist. Evol. Micr.* 51:873-879.

Sampled blooms in Flanders



About 40 % of cyanobacterial blooms contained microcystins

Leeuwenhofvijver (Drongen) 08 – 09 2004









Tiense broeken 07 – 08 2005

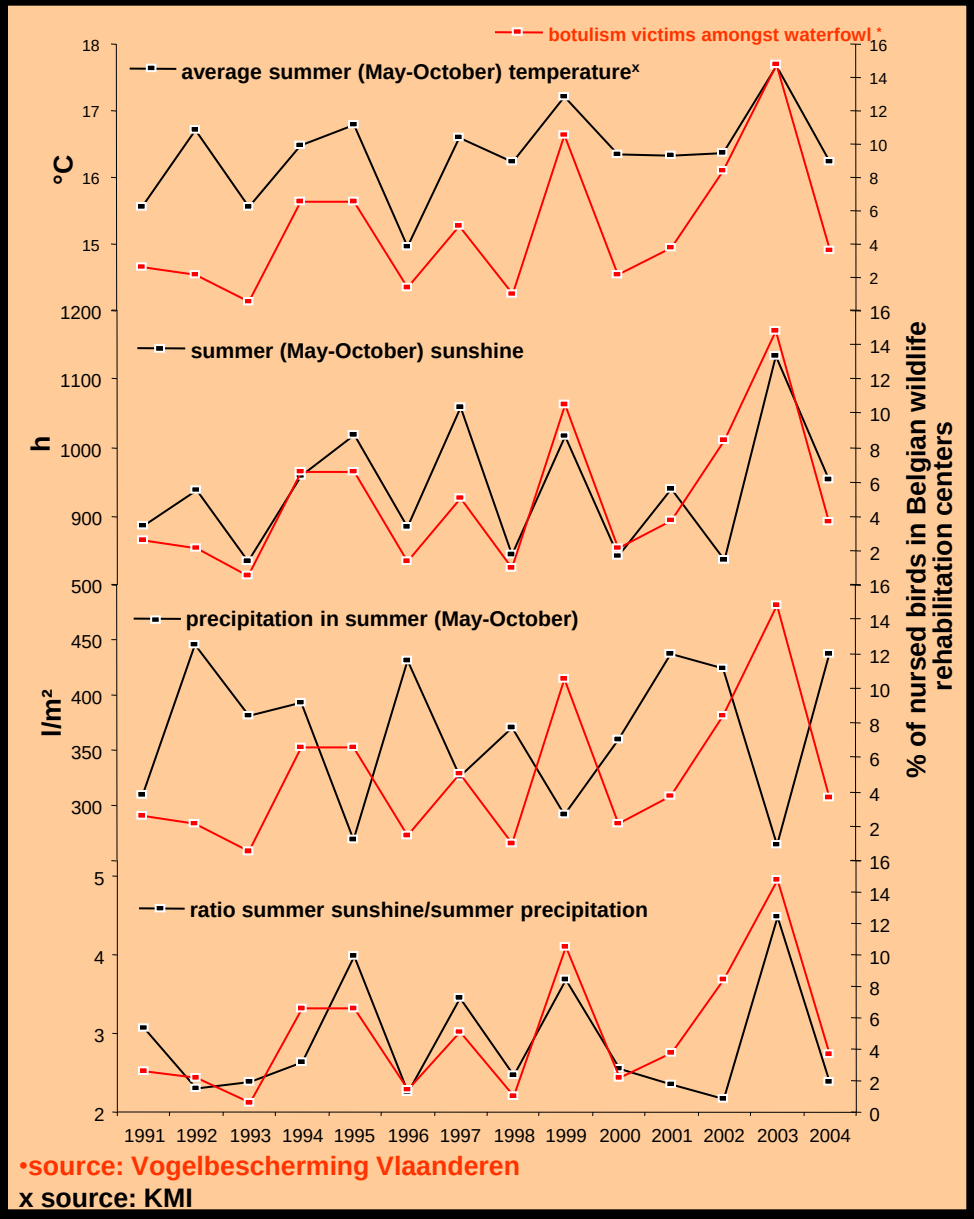






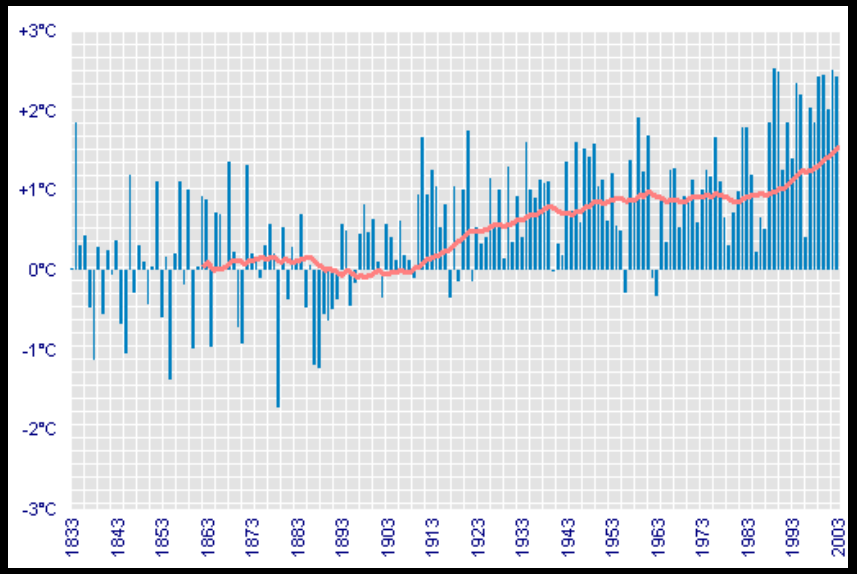


Environmental factors favouring avian botulism in Belgium



Climate change

Evolution in average temperature in Belgium (Ukkel, 1833-2003) (source KMI)



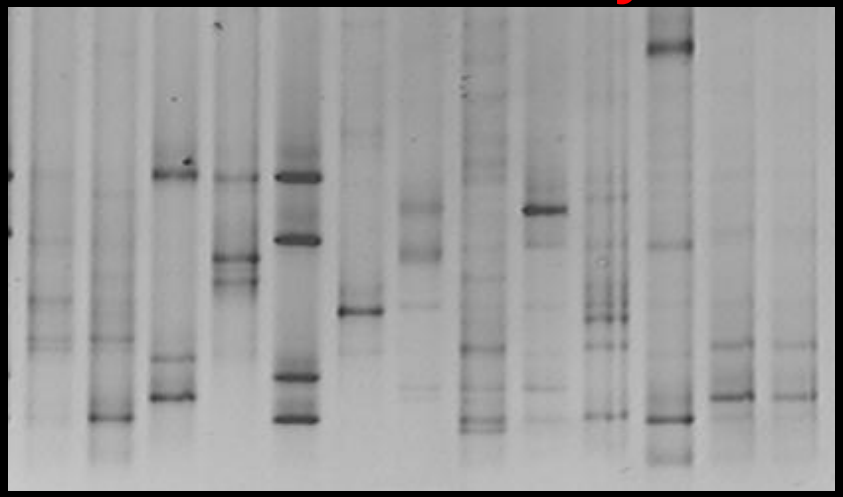
Same requirements for proliferation Cyanobacteria

Problems in lakes of high recreational value

Gavers, Harelbeke 03-04/2007

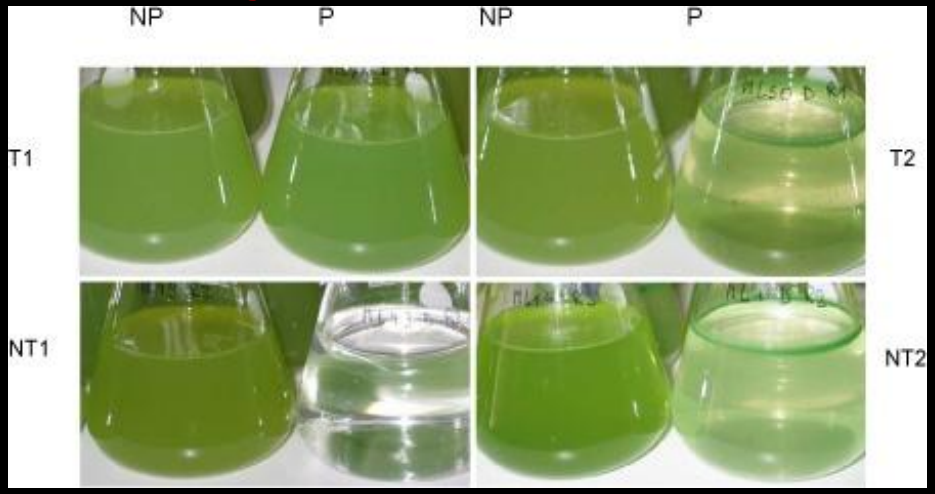
Schulensmeer, Lummen 08-09/2007

Microcystis ITS rDNA diversity



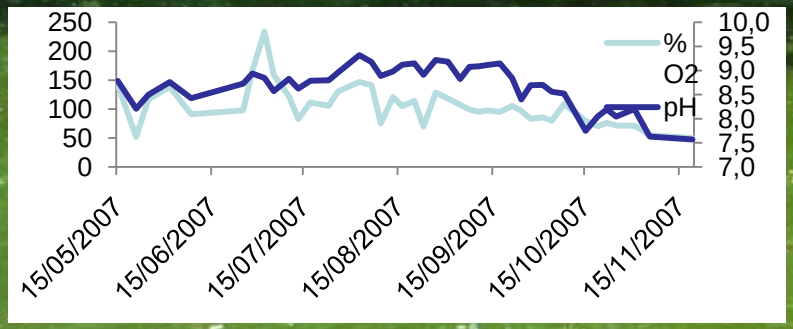
High local and regional ITS diversity of *Microcystis* blooms
Average number of ITS genotypes per sample: 3.6 (range: 1-10).
Correlation with environmental variables?

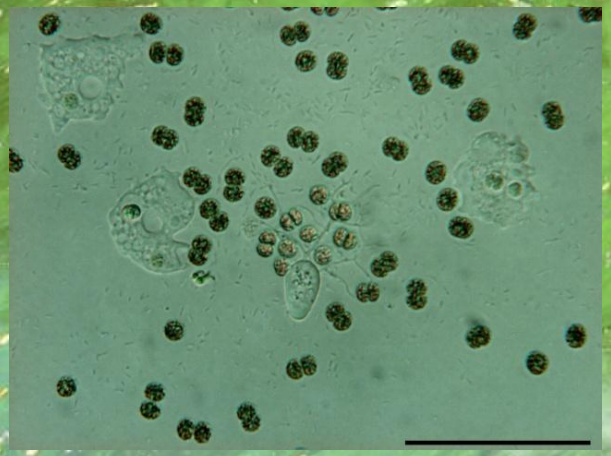
Microcystis functional diversity

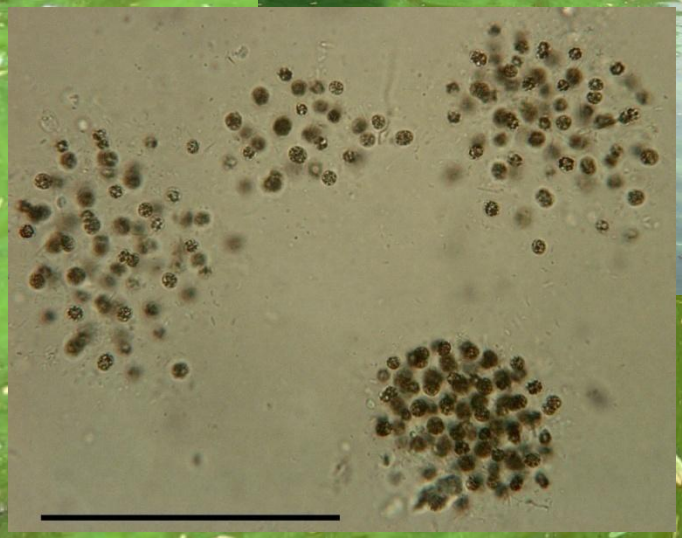


Consequences for bloom dynamics and food web structure

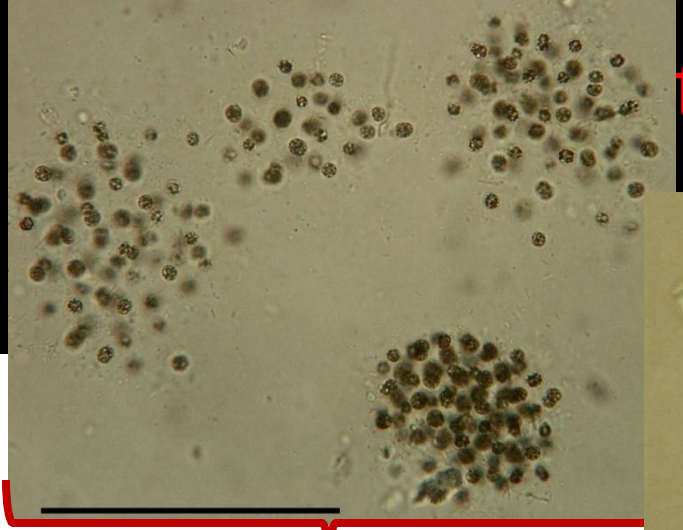
Park Westveld, Sint-Amandsberg

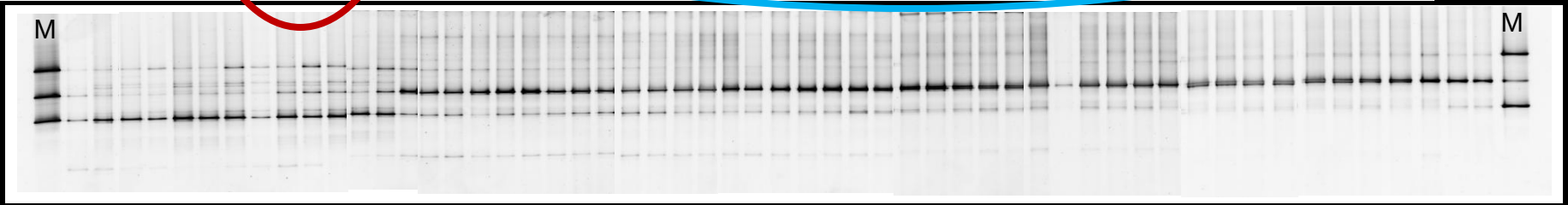


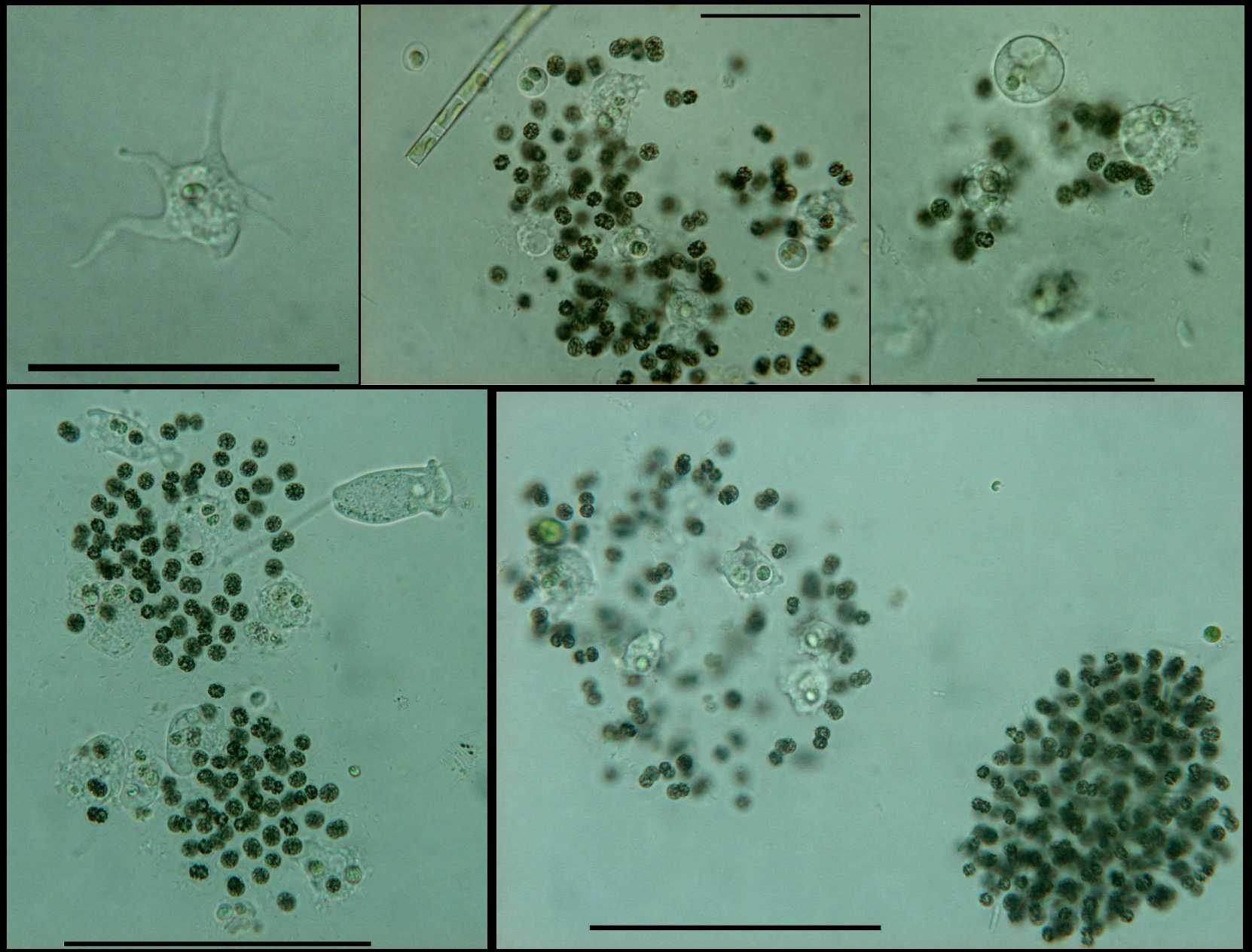




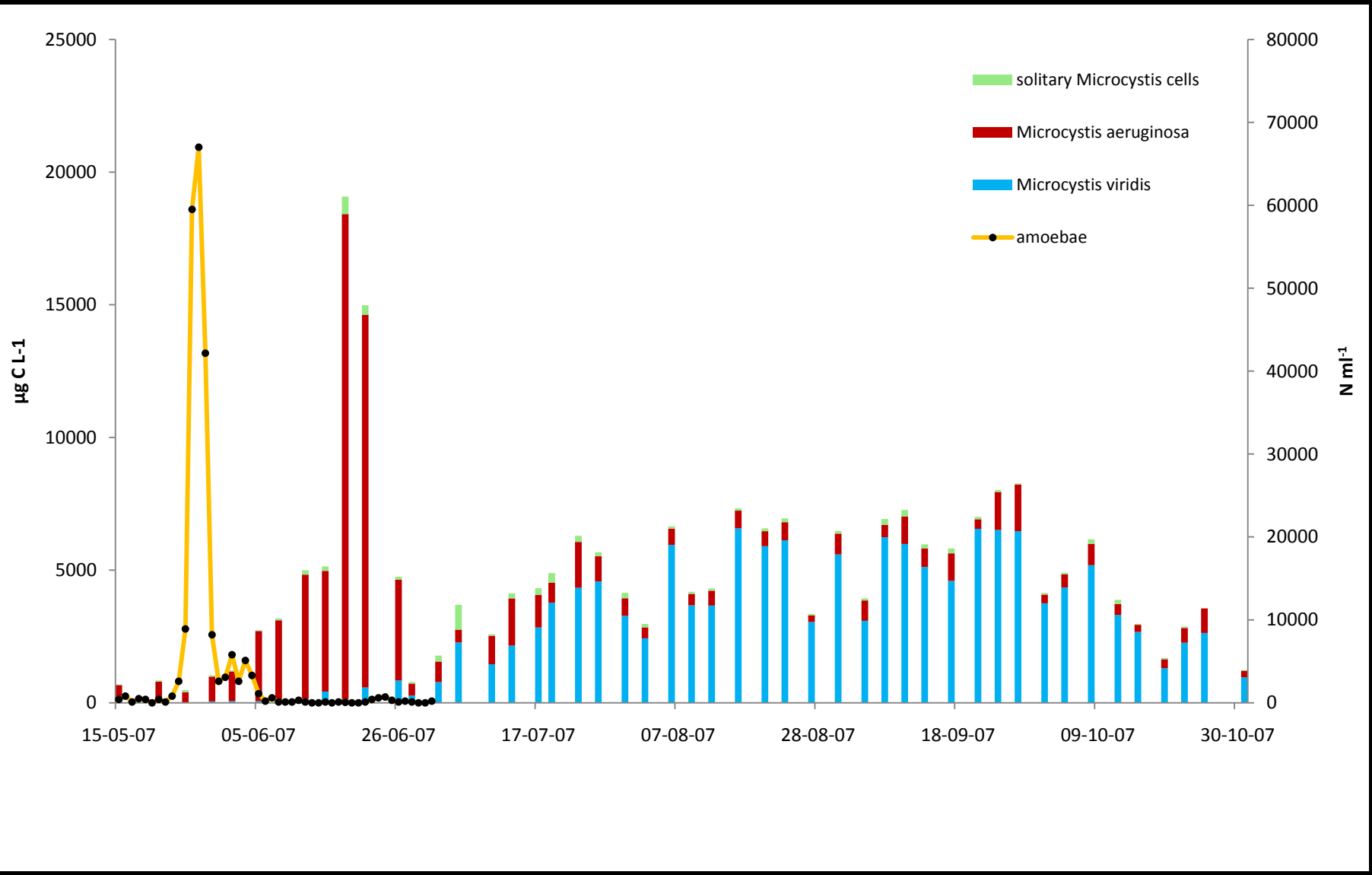
Microcystis ts





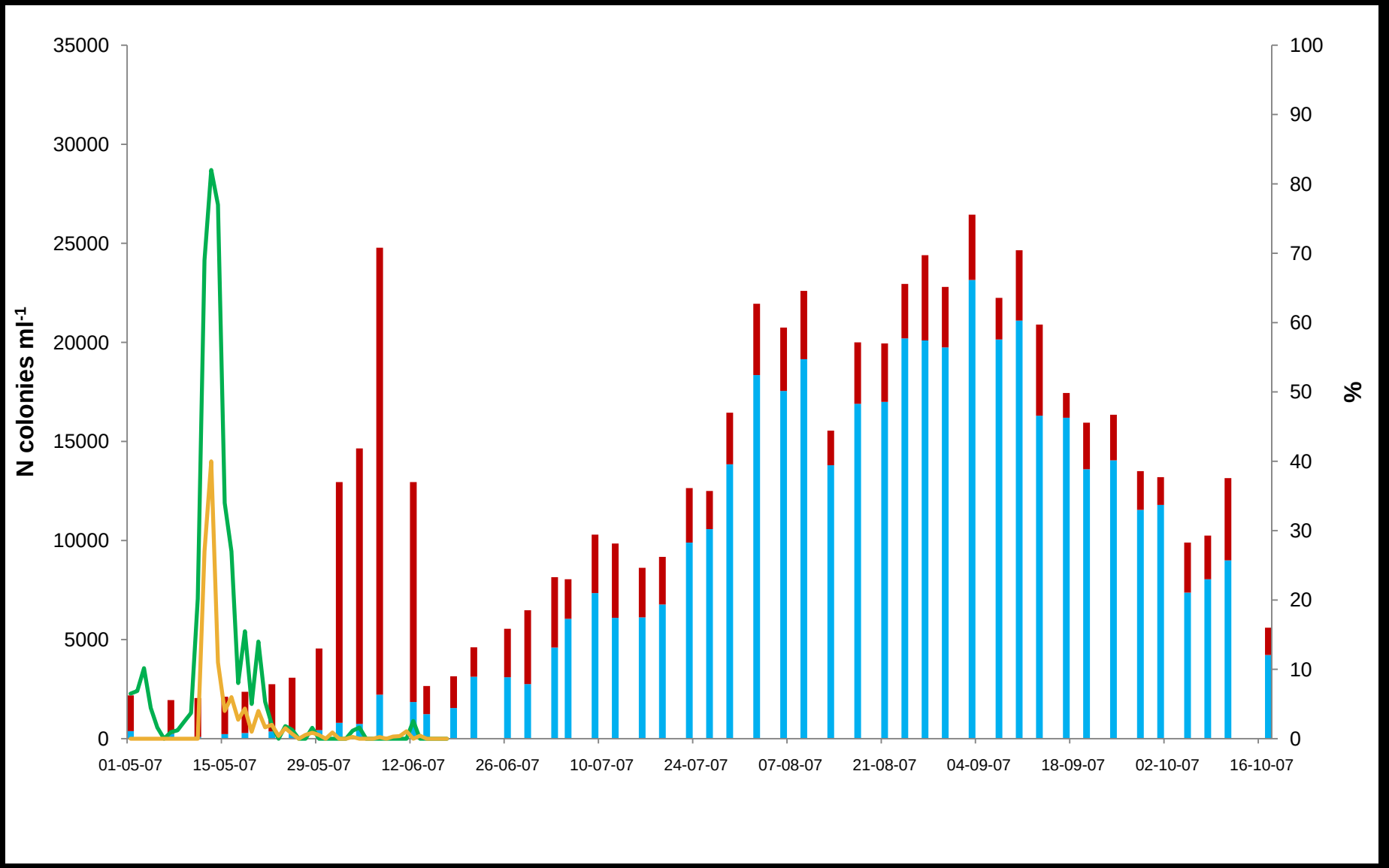


Amoebae seem to cause a temporary bloom collapse and an abrupt change in population structure

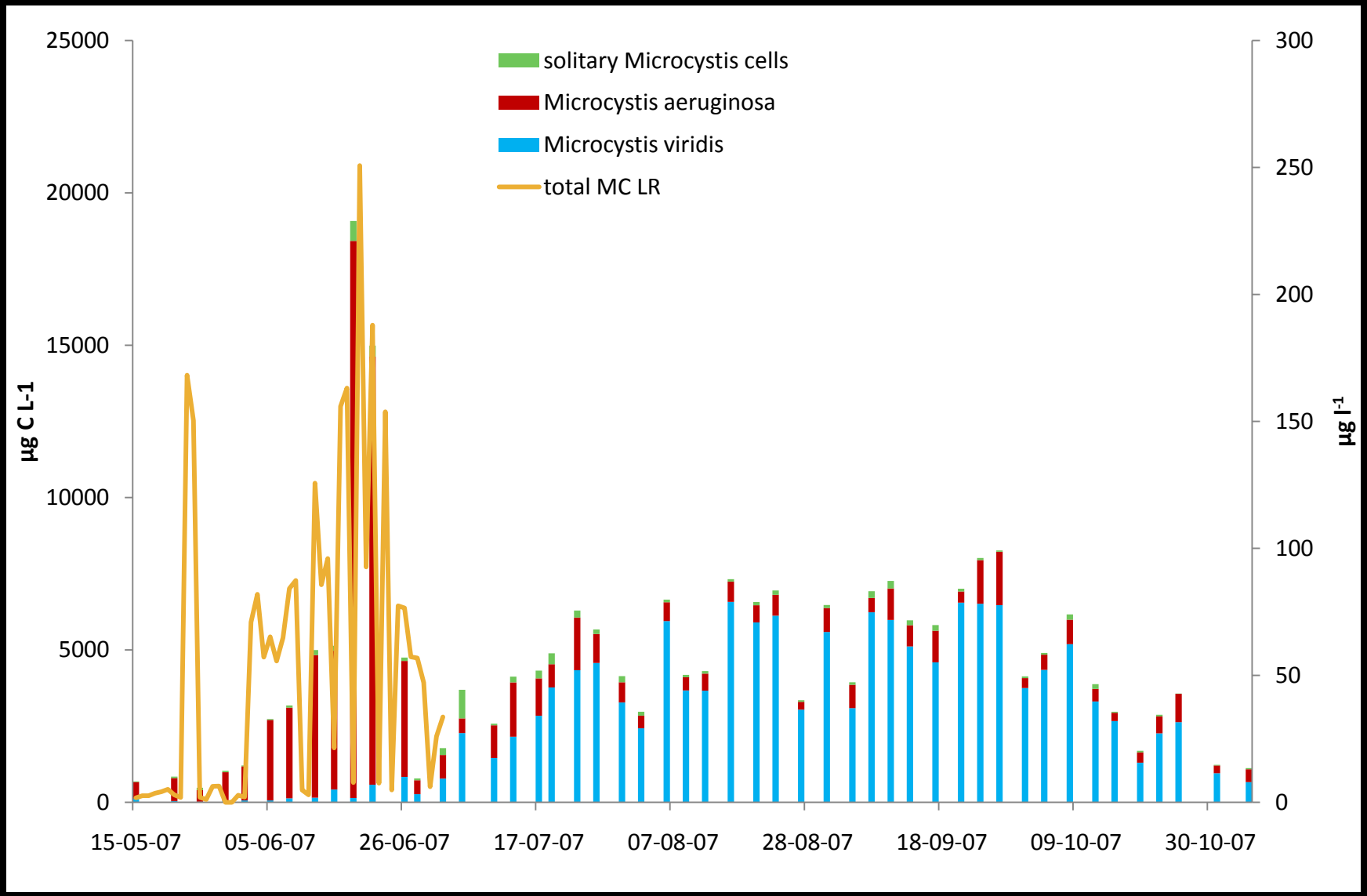


The amoebae seem to have certain food preferences

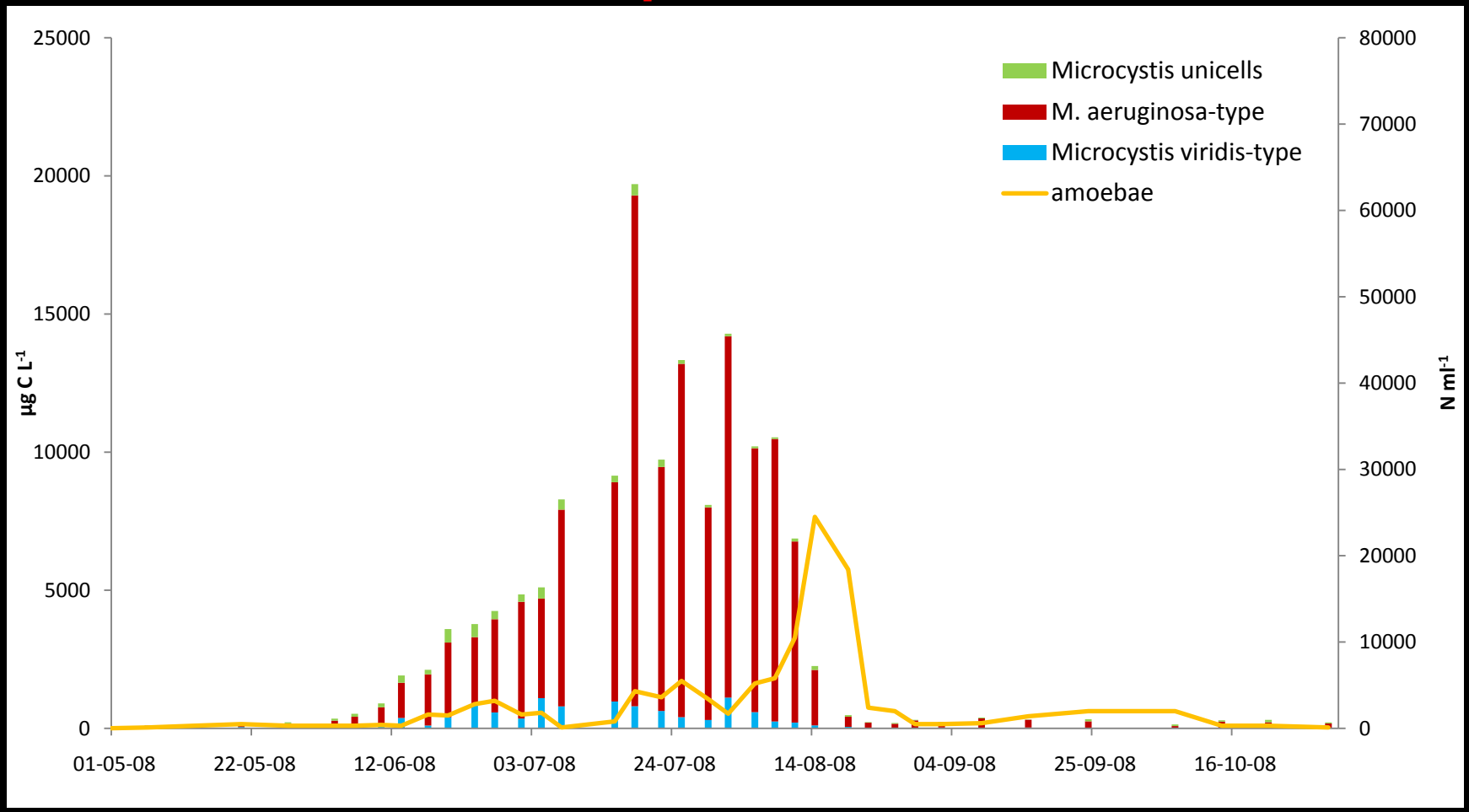
⟶ are they selective feeders?

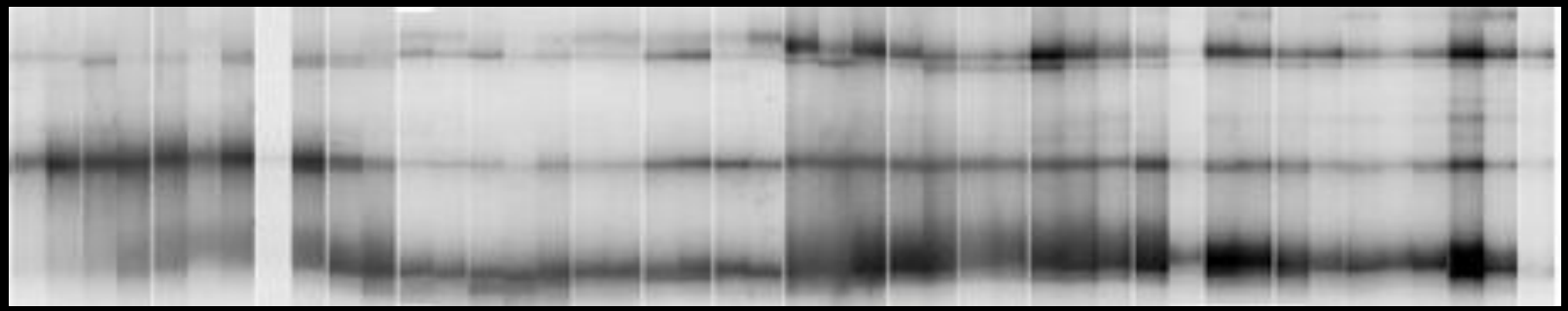


Consequences for bloom toxicity?

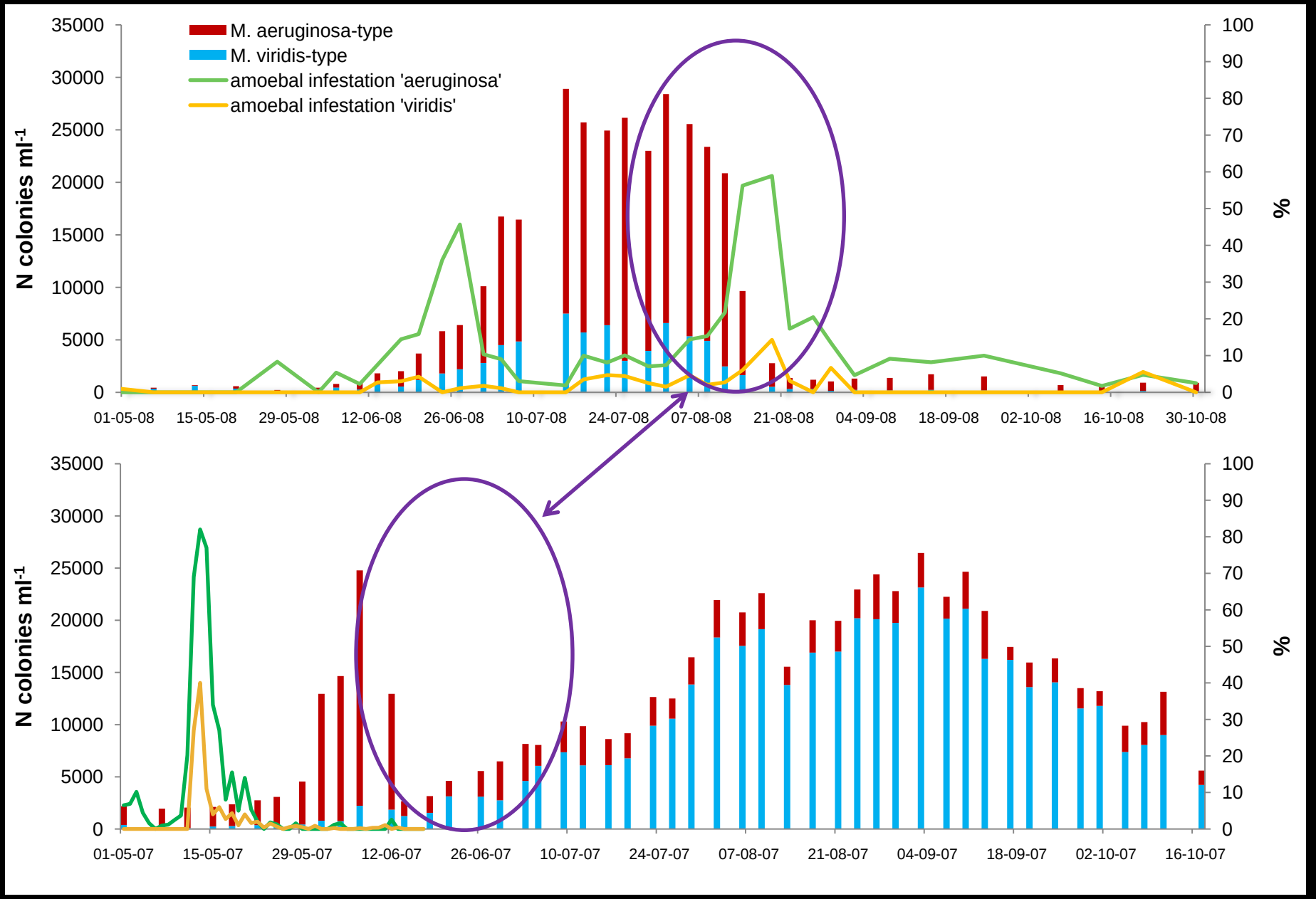


A recurrent phenomenon ?

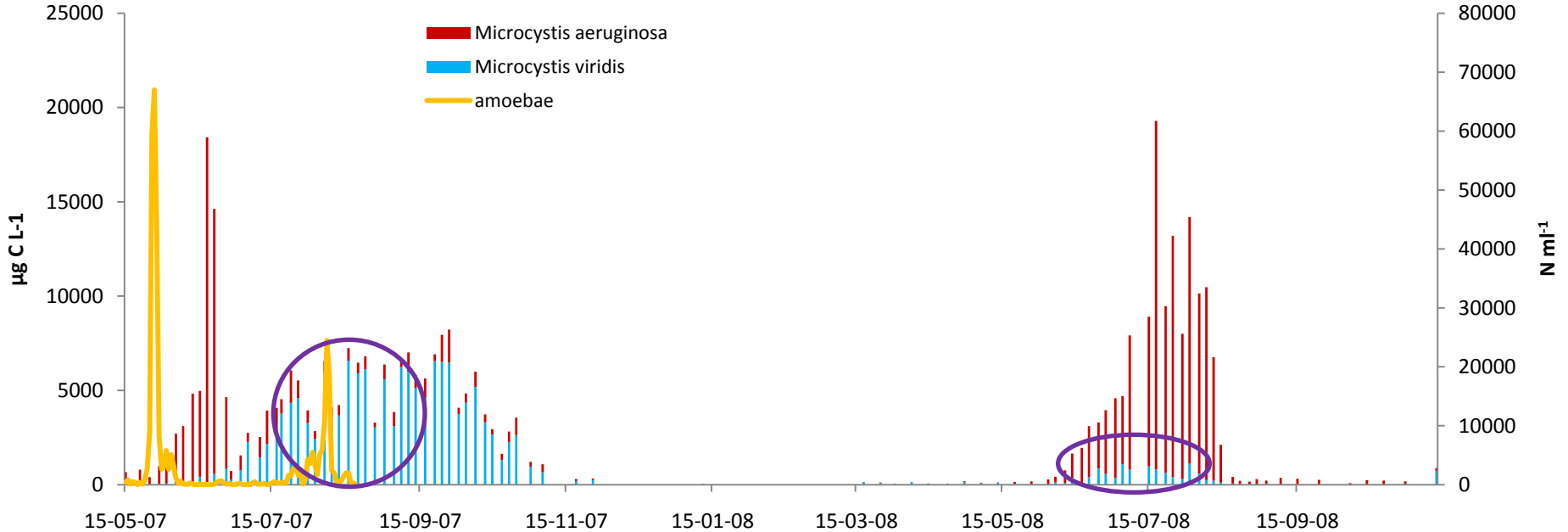


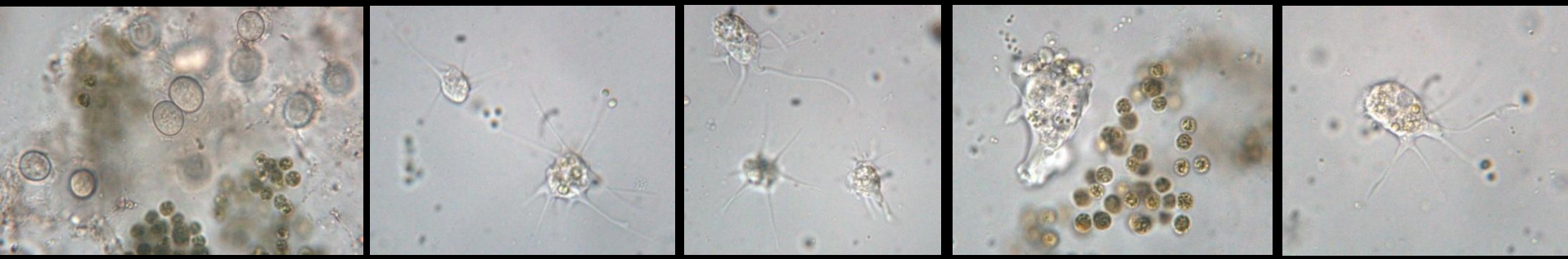


Influence of climatological conditions?



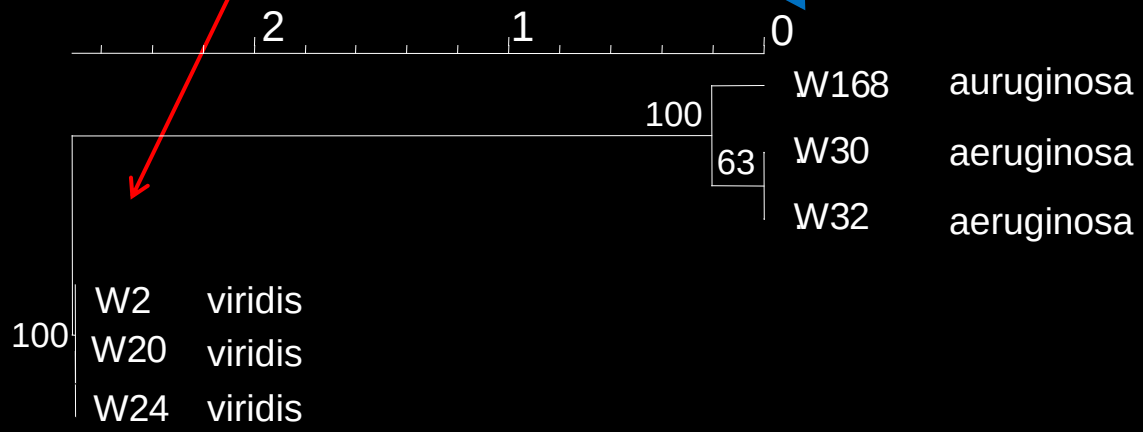
Verification of specificity of amoebae grazing: experiments





- Monocultures of different *Microcystis*-strains in WC-medium
- Amoebal cultures with mixed *Microcystis*-cultures as prey
- Cultivated at 24 °C and 12/12 hour dark/light regime

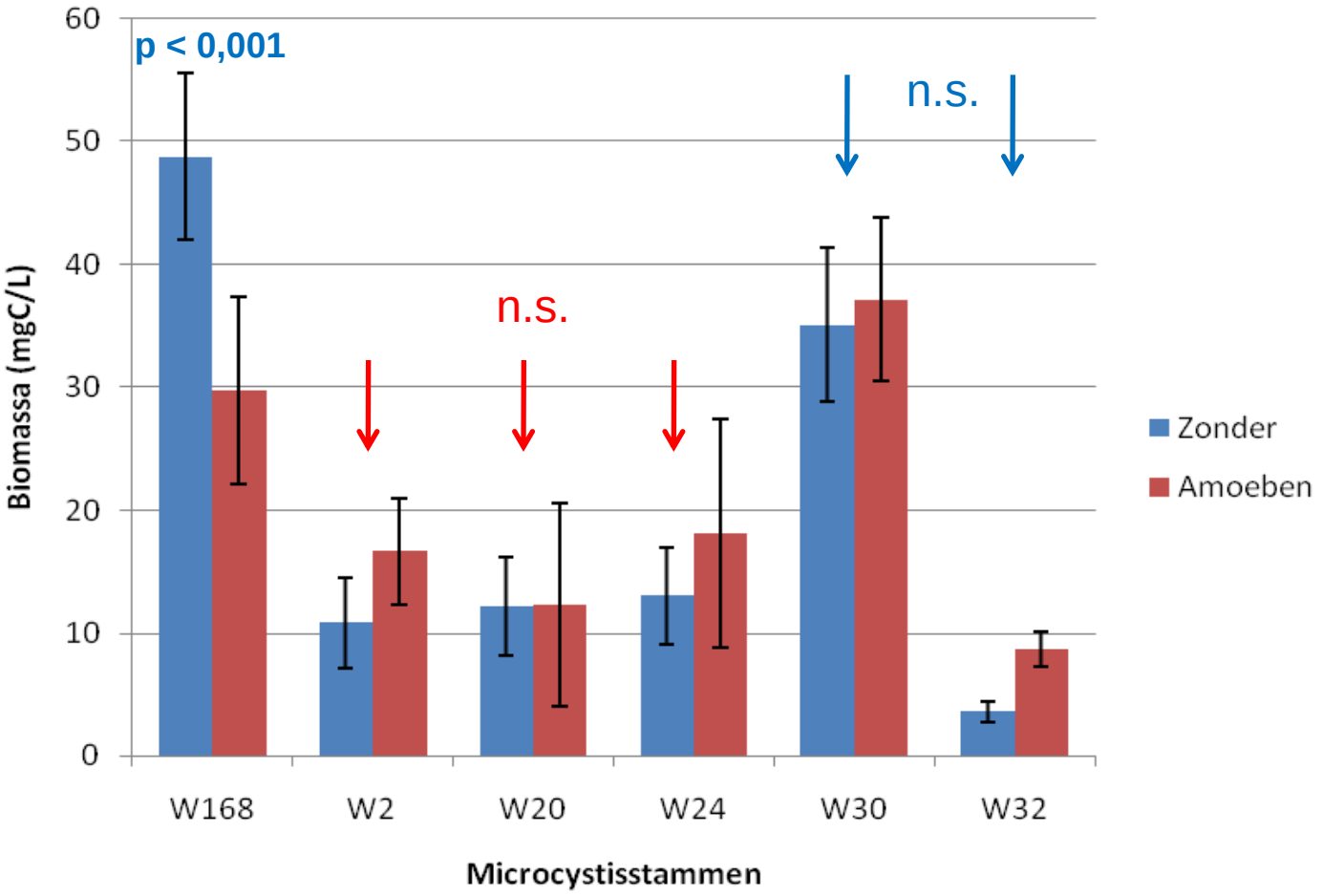
First preliminary experiments

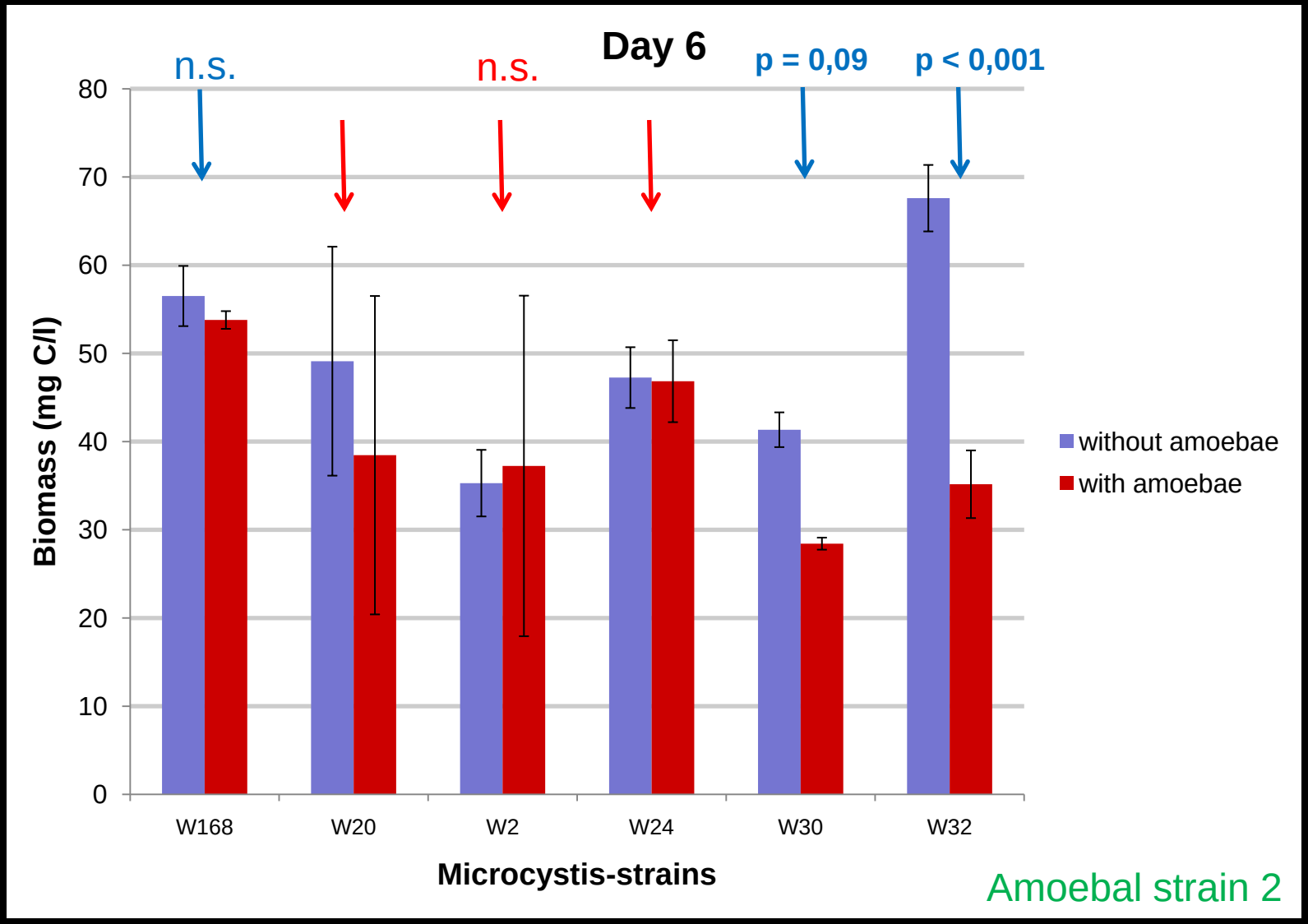


- 6 strains (3 ‘M.viridis’-type, 3 ‘M. aeruginosa’-type)
- 2 amoebal strains
- differences in biomass at beginning and end of incubation period measured by absorbance of chl a

Amoebal strain 1

Dag 12




Day 6
n.s.
n.s.
p = 0,09
p < 0,001
Biomass (mg C/l)
80
70
60
50
40
30
20
10
0
W168
W20
W2
W24
W30
W32
Microcystis-strains
without amoebae
with amoebae
Amoebal strain 2

Conclusions and perspectives

- Grazing by amoebae can cause a temporary bloom collapse and a sudden shift in genetic structure of a *Microcystis* bloom.

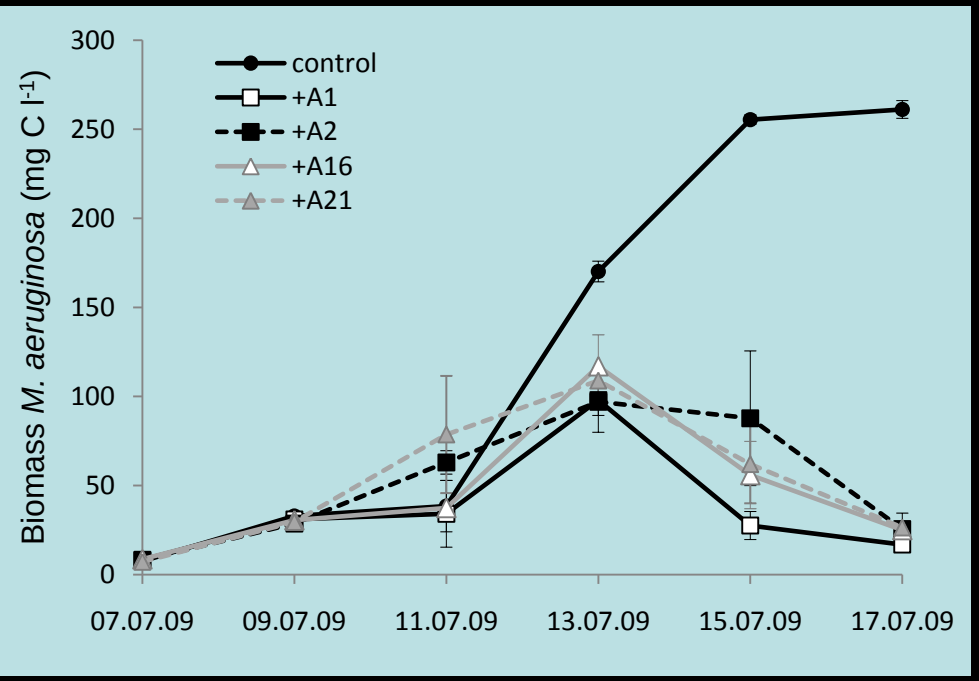
- Preliminary experiments show food preference by the observed amoebae for different *M. aeruginosa*-genotypes while *M. viridis* seems less susceptible.

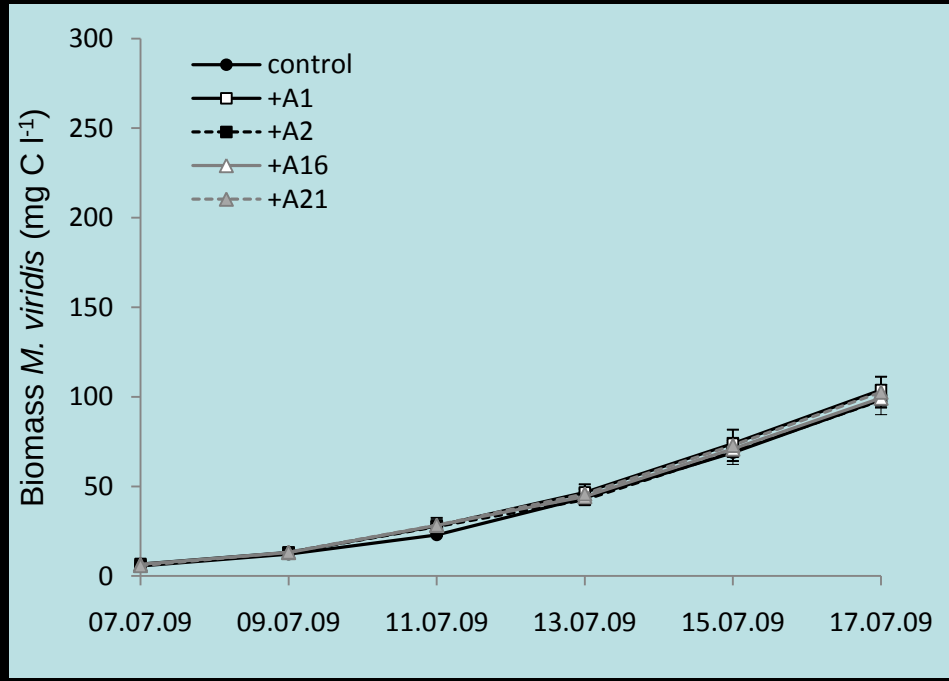
- Future work includes the characterisation of the different amoebal strains and more standardized experiments to unravel genetic variation in *Microcystis* resistance against grazing by amoebae to complement patterns observed in nature.

Voedselpreferentie-experimenten najaar 2009

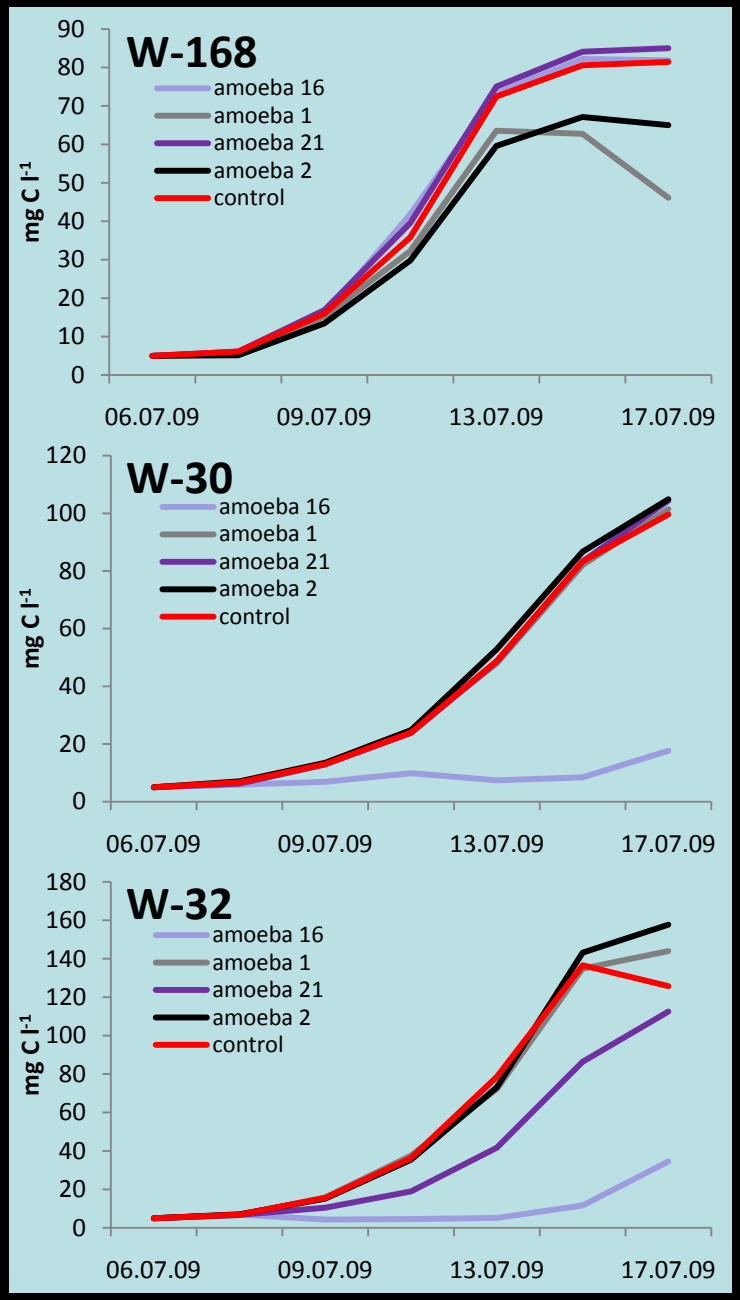
Invloed van *Microcystis*-stam en amoeben-stam (juli 2009)

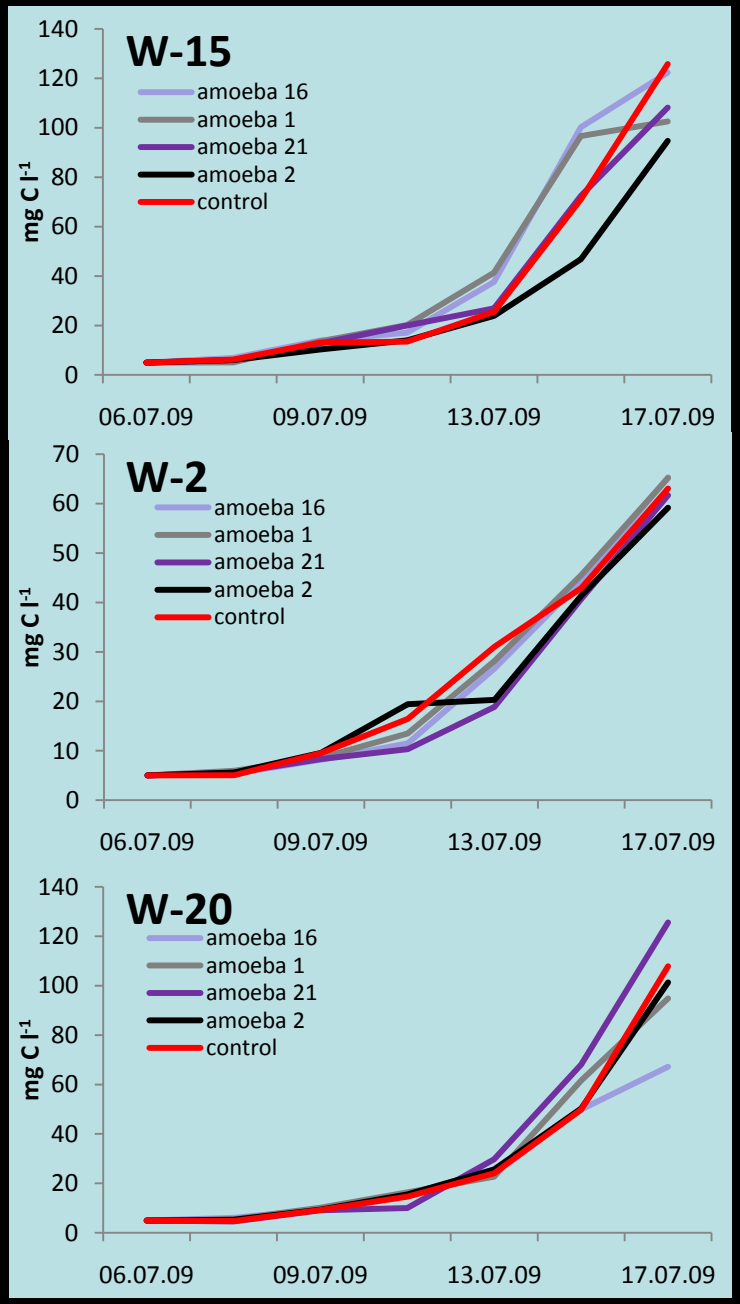
4 stammen *M. aeruginosa*: drie 1-cellig (W168, W30, W32), één kolonievormend (M31)
4 stammen *M. viridis*: allen kolonievormend (W2, W15, W20, W24)
4 amoeben stammen, twee dactylopoidale type, twee reticulate type





Sterk begrazingseffect op *M. aeruginosa* en niet op *M. viridis*



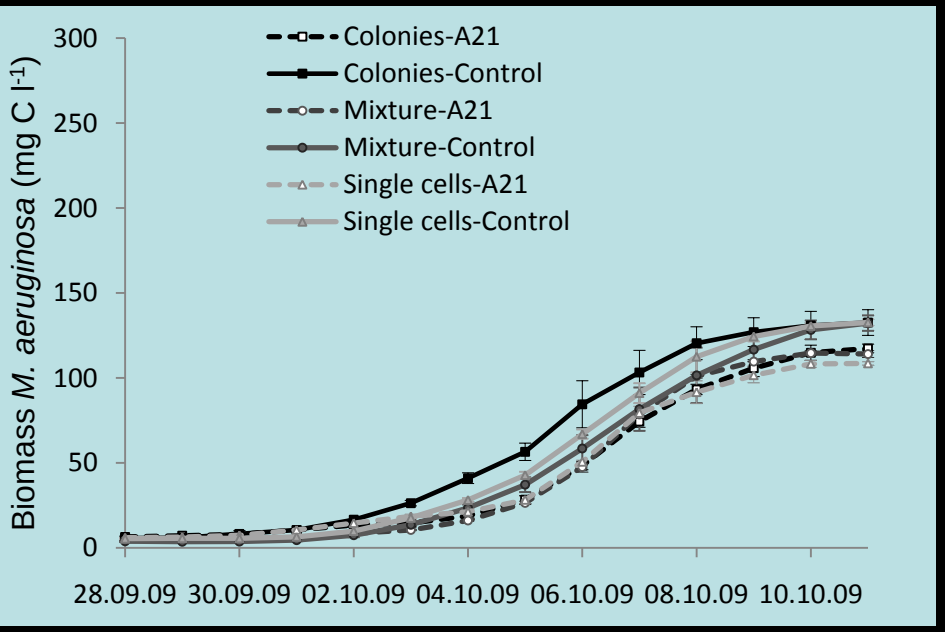


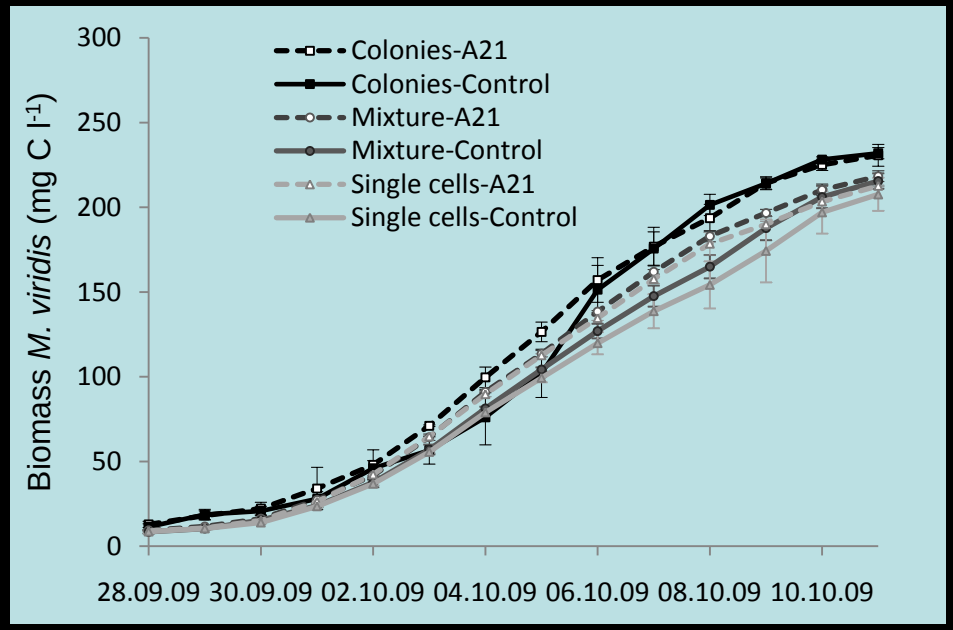
begrazingseffect niet homogeen voor *M. aeruginosa*, wel voor *M. viridis*

Invloed van *Microcystis*-morfologie op amoeben begrazing (september 2009)

M. aeruginosa-stam M31: enkelcellig, kolonies, mengsel
M. viridis-stam W24: enkelcellig, kolonies, mengsel

Amoebenstam: A21





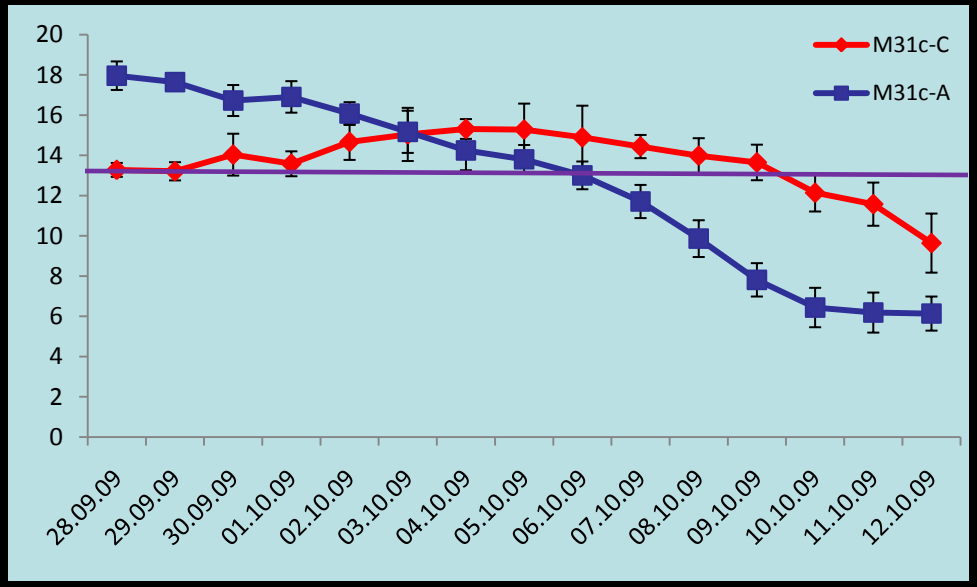
Morfologie speelt geen rol bij beide morphotypes

Graassnelheid van amoeben op *M. aeruginosa* (september 2008)

M. aeruginosa-stam M31: mengsel (15 mg C L-1)

Amoebenstam: A21 (10.000 ind. ml-1)

12 dagen incubatie in donker



Er vindt begrazing plaats, maar traag