

Both phosphorus- and nitrogen limitation constrain viral proliferation in marine phytoplankton

Douwe S. Maat*, Corina P. D. Brussaard

*Corresponding author: douwe.maat@nioz.nl

Aquatic Microbial Ecology 77: 87–97 (2016)

Table S1: Volume specific cellular nutrient quotas of *Phaeocystis globosa* and *Micromonas pusilla* under N- limited, P-limited, NP-limited and nutrient replete conditions. Cell volume was calculated from the cell diameter, which was based on a linear relationship between phytoplankton cells size (y) and mean cellular FSC (x) ($y=0.0075x +1.2373$; $r^2=0.9979$) of the three phytoplankton species *P. globosa* and *M. pusilla* and *Heterosigma akashiwo*.

	<i>P. globosa</i>		<i>M. pusilla</i>	
	P (fmol μm^{-3})	N (fmol μm^{-3})	P (fmol μm^{-3})	N (fmol μm^{-3})
N-limited		0.17		0.08
P-limited	0.04		0.02	
NP-limited	0.05	0.19	0.03	0.10
replete	0.06	1.85	0.12	0.52

Table S2: Viral latent periods and burst sizes of the preceding pilot experiment (n=3). The experiment was carried out 6 months before the experiments in the presented study and according to the same methods. NP-limitation was not tested (n.d.;not determined)

	Latent period (h)	<i>P. globosa</i>		Latent period (h)	<i>M. pusilla</i>	
		Burst size (viruses cell ⁻¹)	Burst size reduction (%)		Burst size (viruses cell ⁻¹)	Burst size reduction (%)
N-limited	12-16	72 ±6	91	8-12	62 ±3	72
P-limited	12-16	198 ±26	75	8-12	70 ±4	68
NP-limited	n.d.	n.d.		n.d.	n.d.	
replete	8-12	801 ±112		4-8	219 ±10	

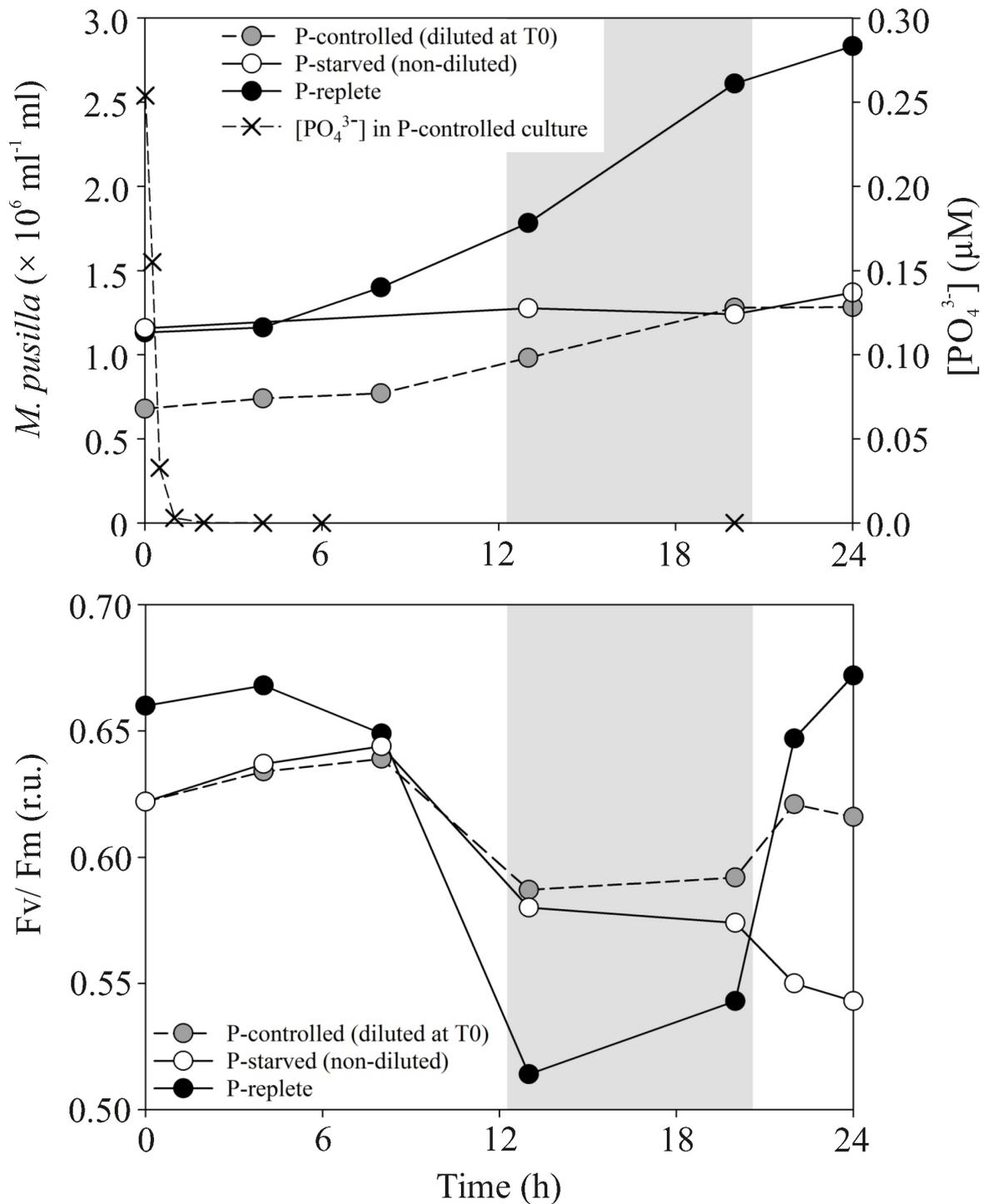


Figure S1. Diel cycle of *M. pusilla* growth (A) and Fv/Fm (B) under P-controlled semi-continuous culturing. The diluted semi-continuous culture (grey circle) shows similar dynamics as the p-replete culture (black circle, indicating that discontinuous supply of nutrients does not affect balanced nutrient limited growth (i.e. no feast and famine, but rather continuous nutrient limited state). Phosphate added to the P-controlled (A; cross) culture at t_0 are taken up (to below limit of detection) within 60 minutes after addition. Algal cells displayed synchronized cell division related to the dark period (shaded areas). Under batch condition (i.e. stopped supply of limiting nutrient to culture, inducing starvation) cell abundance stays constant over the 24h. Fv/Fm initially follows the diel pattern of the semi-continuous culture, but at the end of the 24h it declines due to P-starvation.

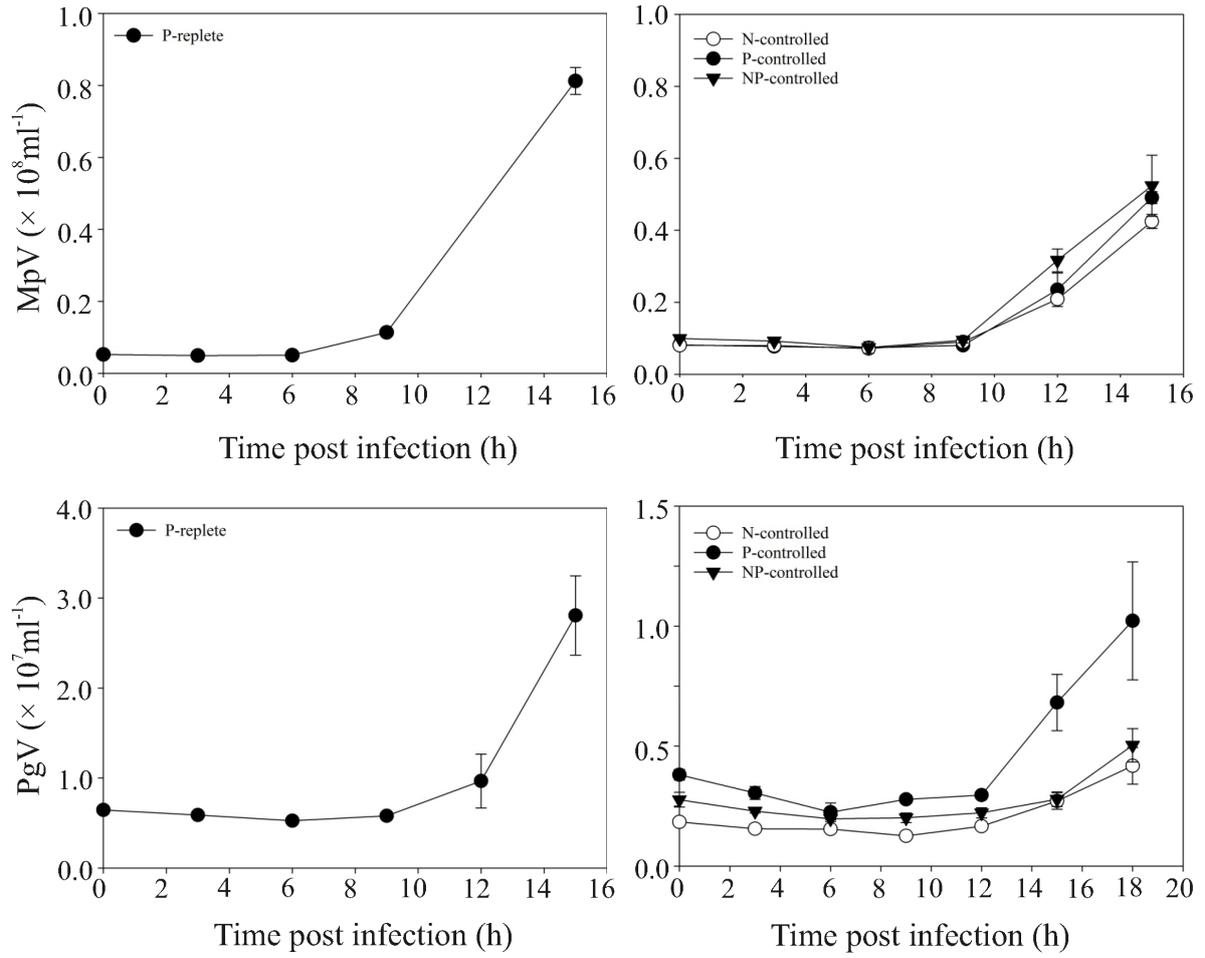


Figure S2. Viral abundances over time in the first day post infection to show the latent periods in more detail. The latent period was determined as the time interval with a clear increase in viral abundances, that continues throughout the following time-points. Error bars show standard errors.