

Interactive comment on “High temperature decreases the PIC / POC ratio and increases phosphorus requirements in *Coccolithus pelagicus* (Haptophyta)” by A. C. Gerech et al.

A. C. Gerech et al.

a.c.gerech@ibv.uio.no

Received and published: 12 February 2014

We would like to thank Anonymous referee #1 for the timely comments on the manuscript. We would like to address the main issues at this point to foster continued discussion, and submit a revised Table 2 (Table R2). We will revise the other tables accordingly.

1) Disagreements between statements in the text and data given in table 2 and inconsistencies within table 2.

The experiments with *ssp. braarudii* (replete and P-limited cultures at 15°C) and *ssp. pelagicus* at 10°C (replete and P-limited cultures) were run twice because data for

C60

PIC quota was not obtained from the first experimental run. The experiment with *ssp. pelagicus* at 15°C (replete and P-limited cultures) was run only once. In Fig. 2, only the POC quota for the second experimental run ($n=3$) is presented to allow for comparison with PIC quota, which is only available for this run. In table 2, the POC quota is averaged over both experimental runs ($n=6$). They therefore do not match the POC values presented in Fig. 2 as POC quota differed strongly between the two experimental runs. To clarify this, the data from the two experimental runs has now been separated and are presented separately in Table R2.

2) The interpretation of the PIC/POC ratios is confusing.

In the manuscript, two abiotic parameters were tested for their effect on PIC/POC, phosphorus (P-) limitation and elevated temperature. Whereas the effect of P-limitation was tested on both subspecies (*ssp. braarudii* and *pelagicus*), the combined effect of temperature and P-limitation was tested on *ssp. pelagicus* only. The high temperature treatment (combined with P-limitation) was carried out by growing replete and P-limited cultures of *ssp. pelagicus* at 15 instead of 10°C. Subspecies *braarudii* was grown in replete and P-limited medium at 15°C only, which was considered the “normal” temperature (i.e. a temperature near the original isolation temperature) for this temperate strain. The high temperature treatment in the manuscript therefore refers to *ssp. pelagicus* grown at 15°C only, not to *ssp. braarudii* grown at the same temperature. The statement that P-limitation did not have an effect on PIC/POC ratios only refers to the experiments carried out at “normal temperature” (i.e. *ssp. braarudii* 15°C, *ssp. pelagicus* 10°C), not to interactive effects of temperature and P-limitation as observed in *ssp. pelagicus* grown at 15°C.

This will be clarified in the text and a discussion of the combined effects of temperature and P-limitation in *ssp. pelagicus* will be included.

3) This is actually the first dataset showing an increase in malformations in response to P limitation.

The discussion will be rewritten to highlight the effect of P-limitation and temperature on malformations in *Coccolithus*. In rewriting the discussion, the referee's further suggestions, especially regarding the literature on *Emiliana huxleyi* will be taken into consideration.

Interactive comment on Biogeosciences Discuss., 11, 1021, 2014.

C62

Table R2. Cellular quotas and molar ratios derived from paired high-P and low-P media batch experiments (n=3) with *Coccolithus pelagicus* ssp. *braarudii* (RCC1200) grown at 15°C, and ssp. *pelagicus* (J23) grown at 10°C and 15°C. Note that cell concentrations reflect those at time of sampling, and that maximum growth rate (μ_{max}) was calculated during exponential growth phase. Low-P cultures were in stationary phase at time of harvest. Reported are the averages of triplicate batch cultures.

a) Main experiments:

<i>C. pelagicus</i>	ssp. <i>braarudii</i> (RCC1200)		ssp. <i>pelagicus</i> (J23)			
	high-P 15°C	low-P 15°C	high-P 10°C	low-P 10°C	high-P 15°C	low-P 15°C
Cell concentrations (cells mL ⁻¹)	12750	11800	10000	13200	8442	9640
μ_{max} (d ⁻¹)	0.42	0.37	0.24	0.36	0.32	0.34
POP (pg cell ⁻¹)	5.9	2.8	5.0	2.6	10.3	4.4
POC (pg cell ⁻¹)	155	168	245	230	217	212
PIC (pg cell ⁻¹)	208	199	313	334	119	189
POC:POP (mol mol ⁻¹)	68	155	126	228	54	124
PON:POP (mol mol ⁻¹)	7.5	18	10	23	6.7	17
PIC:POC (mol mol ⁻¹)	1.34	1.18	1.28	1.45	0.54	0.89

b) Additional experiments:

<i>C. pelagicus</i>	ssp. <i>braarudii</i> (RCC1200)		ssp. <i>pelagicus</i> (J23)	
	high-P 15°C	low-P 15°C	high-P 10°C	low-P 10°C
Cell concentrations (cells mL ⁻¹)	17550	15000	16400	13650
μ_{max} (d ⁻¹)	0.49	0.52	0.35	0.29
POP (pg cell ⁻¹)	4.7	2.3	5.9	2.6
POC (pg cell ⁻¹)	207	231	371	437
PIC (pg cell ⁻¹)	n/a	n/a	n/a	n/a
POC:POP (mol mol ⁻¹)	114	259	162	433
PON:POP (mol mol ⁻¹)	13	24	22	56
PIC:POC (mol mol ⁻¹)	n/a	n/a	n/a	n/a

Fig. 1.

C63