

Emiliana huxleyi can't tell TA from DIC manipulation

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Introduction

- For the coccolithophore *Emiliana huxleyi*, apparently conflicting results regarding its sensitivity to ocean acidification have been published (Riebesell et al. 2000; Iglesias-Rodriguez et al. 2008; Fig. 1).
- As possible causes for discrepancies, intra-specific variability and different effects of CO₂ manipulation methods (TA or DIC manipulation) have been discussed.
- In this study, closed TA as well as open and closed DIC manipulation methods were compared with respect to *E. huxleyi*'s CO₂-dependence in growth rate, POC and PIC production.

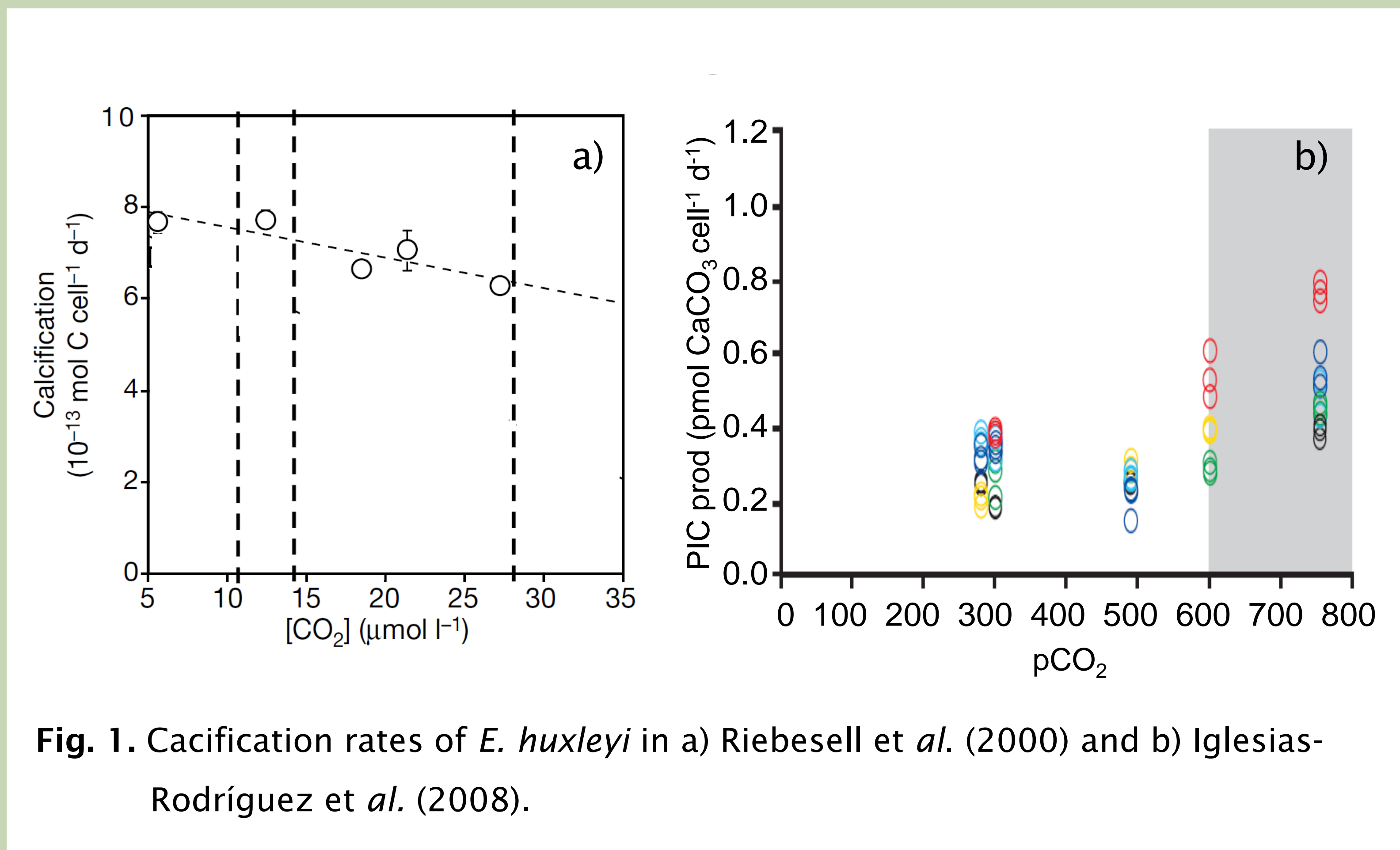


Fig. 1. Calcification rates of *E. huxleyi* in a) Riebesell et al. (2000) and b) Iglesias-Rodriguez et al. (2008).

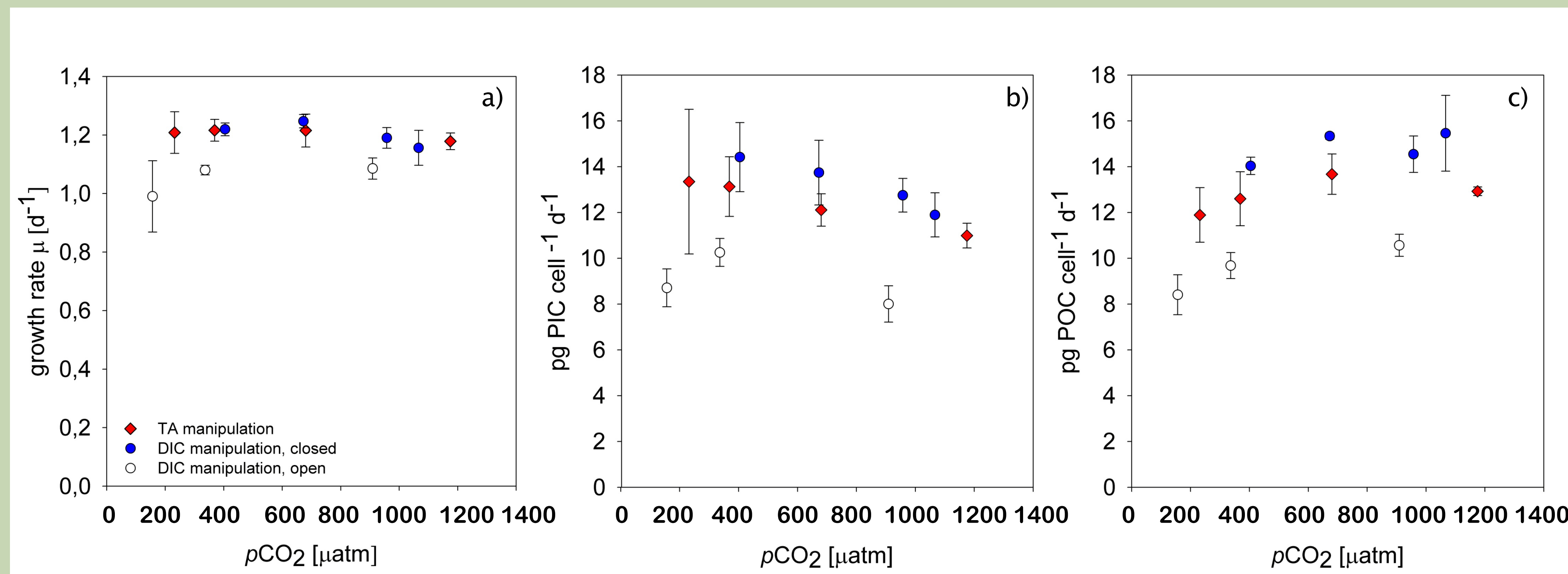


Fig. 2. a) Growth, b) PIC and c) POC production of *E. huxleyi* strain NZEH in response to different pCO₂ levels as found for different CO₂ perturbation methods. Data for strain RCC1256 not shown.

Responses to the different CO₂ perturbation methods

- The differences in carbonate chemistry between the two manipulation methods cause no substantial differences in the general ecophysiological responses of two strains of *E. huxleyi* (Fig. 2, Fig. 3).
- The two strains investigated showed different sensitivities to ocean acidification, RCC1256 being more negatively affected in growth rates and PIC production than NZEH (Fig. 3).

Conclusions

- Differences between TA and DIC manipulations do not cause differences in the ecophysiological responses of *E. huxleyi* to changing pCO₂ levels.
- Although strain-specific differences and overall trends were confirmed, the CO₂-dependent sensitivity within single strains of *E. huxleyi* seems to vary over time (cf. Langer et al. 2009). This favours the analysis of the sensitivity of this species in a semi-quantitative way, i.e. in terms of trends.
- After comparing the ecophysiological responses of all *E. huxleyi* strains described in the literature (Fig. 3), this species can be regarded as moderately sensitive to ocean acidification.

Study	Strain	Growth	PIC production	POC production	PIC:POC ratio
Riebesell et al. 2000	PLYB92/11	☐	☑	☑	☑
Sciandra et al. 2003	TW1	☐	☑	☑	☐
Feng et al. 2008	CCMP371	☐	☑	☐	☑
Iglesias-Rodriguez et al. 2008	NZEH	☑	☑	☑	☐
Langer et al. 2009	RCC1212	☐	☑	☐	☑
	RCC1216	☐	☑	☐	☑
	RCC1238	☐	☐	☑	☐
	RCC1256	☑	☑	☑	☐
Shi et al. 2009	NZEH	☐	☑	☑	☑
This study	RCC1256	☑	☑	☐	☑
	NZEH	☐	☑	☑	☑

Fig. 3. Overall sensitivity of *E. huxleyi* ecophysiological parameters to changes in carbonate chemistry as found in seven independent studies.

References

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 Shi et al. : Effects of the pH/pCO₂ control method on medium chemistry and phytoplankton growth, *Biogeosciences*, 6, 1199-1207, 2009.