

EFFECT OF OCEAN ACIDIFICATION ON THE NUTRITIONAL QUALITY OF PHYTOPLANKTON FOR COPEPOD REPRODUCTION



Morgan Meyers^{1*}, William Cochlan¹, Wim Kimmerer¹, Ed Carpenter¹

¹Romberg Tiburon Center – San Francisco State University



*Contact presenting author at mtmeyers@mail.sfsu.edu

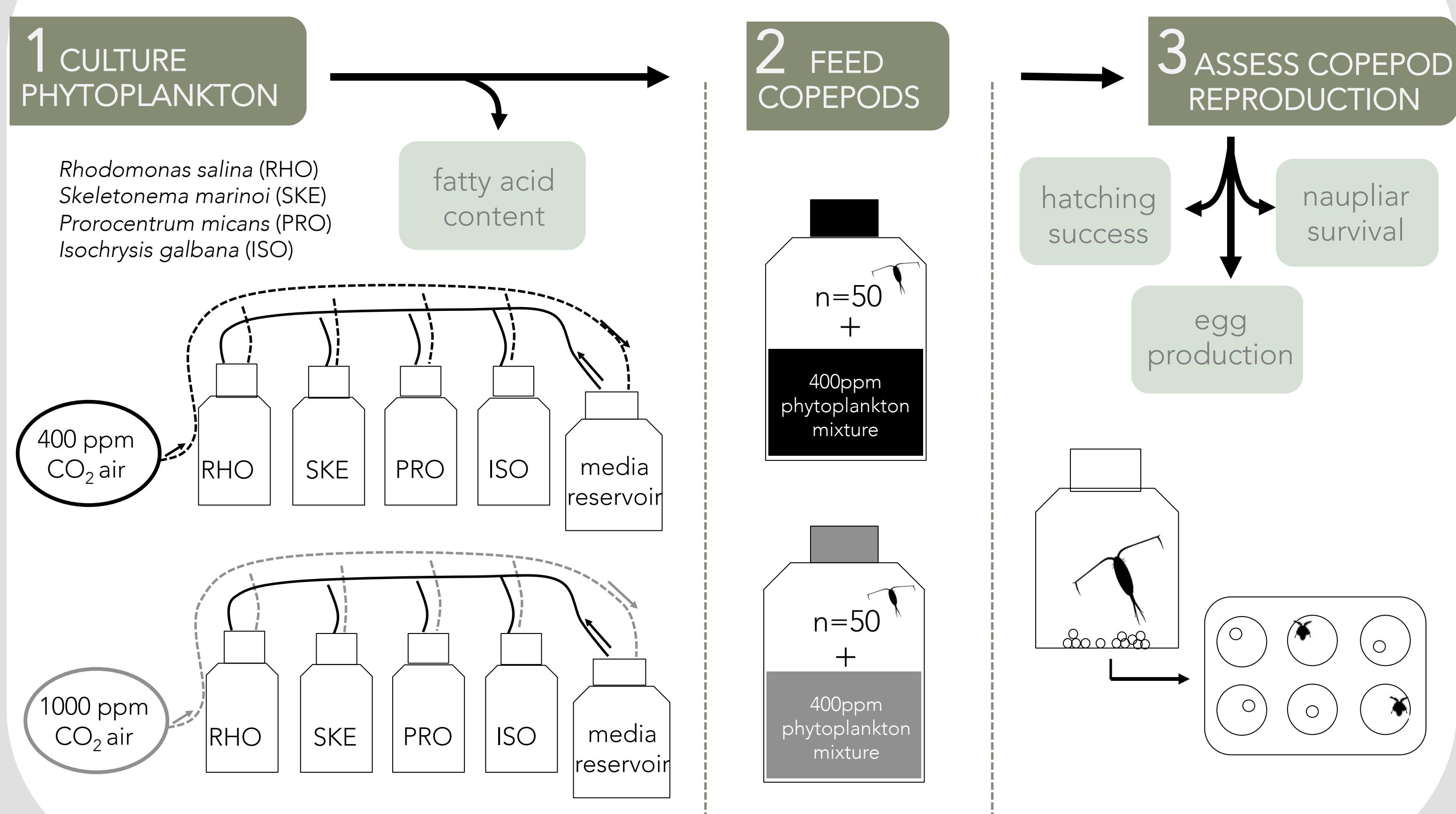
INTRODUCTION

Phytoplankton are the oceans' primary producers of polyunsaturated fatty acids (PUFA), some of which are considered essential fatty acids (EFA) because animals cannot synthesize them *de novo*. These EFA support the health and reproduction of heterotrophic marine organisms at higher trophic levels. It is hypothesized that future ocean acidification (OA) conditions due to increased pCO₂ could change the availability of phytoplankton PUFAs for ecologically significant consumers such as copepods, affecting their reproductive success in an increasingly acidified environment¹.

RESEARCH QUESTIONS:

- I. Does high pCO₂ change the fatty acid composition of phytoplankton?
- II. Does this change in dietary phytoplankton fatty acid composition affect copepod reproductive success?

METHODS



RESULTS

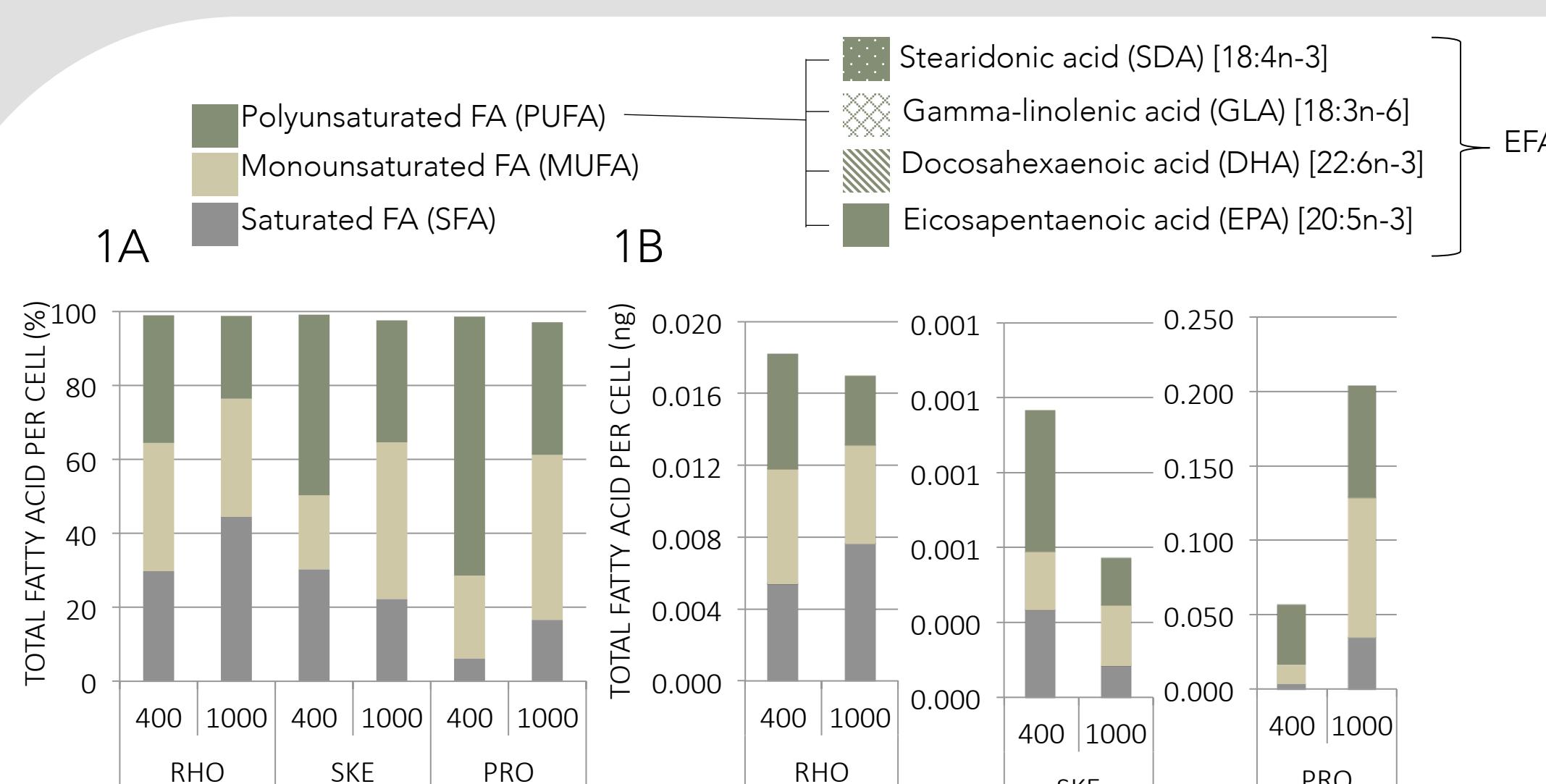


Figure 1. December 2014 – Relative (A) and absolute (B) total fatty acid content in *R. salina* (RHO), *S. marinoi* (SKE), and *P. micans* (PRO) under low (400) and high (1000) pCO₂ treatments.

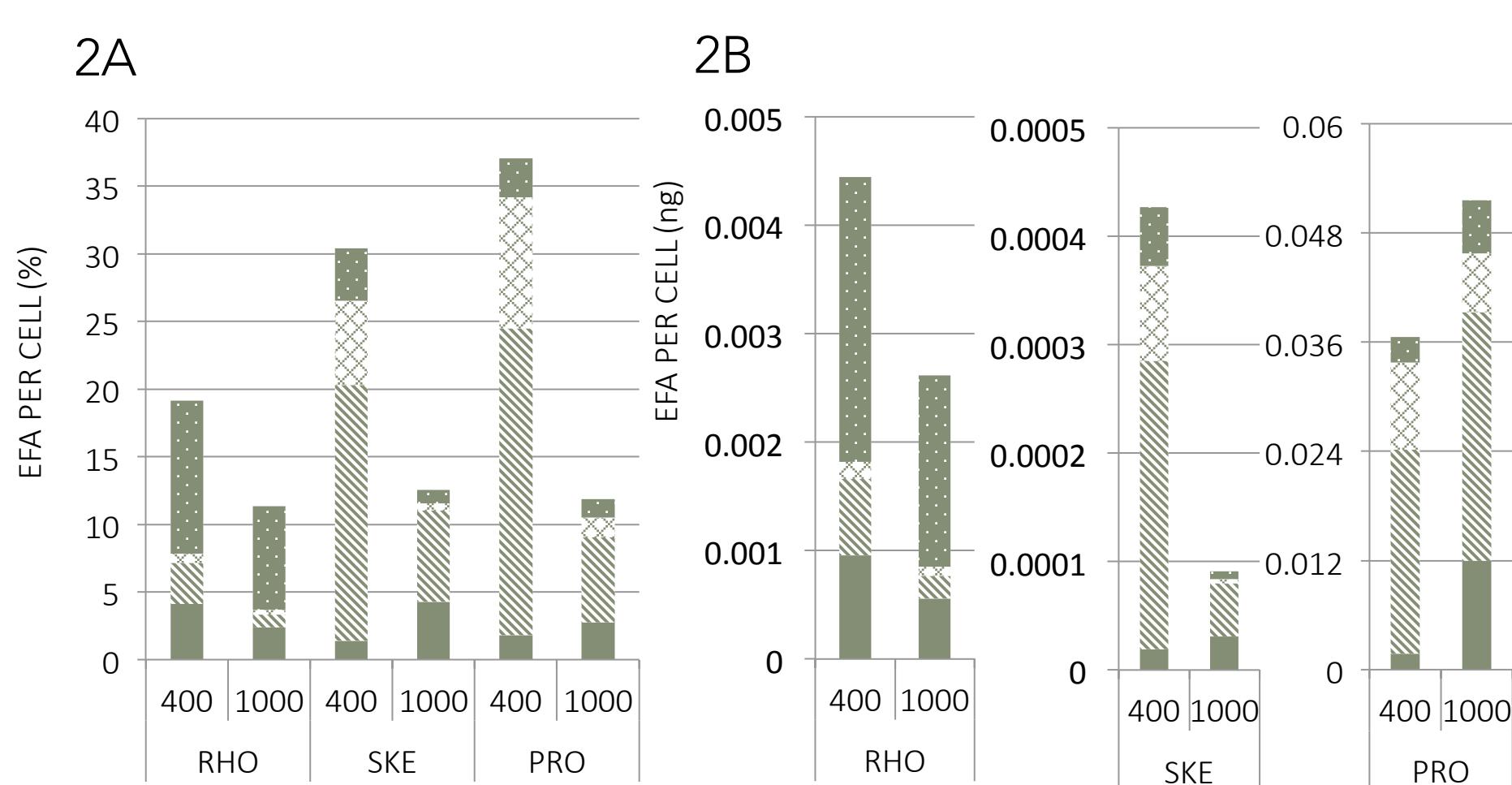


Figure 2. December 2014 – Relative (A) and absolute (B) EFA content in *R. salina* (RHO), *S. marinoi* (SKE), and *P. micans* (PRO) under low (400) and high (1000) pCO₂ treatments.

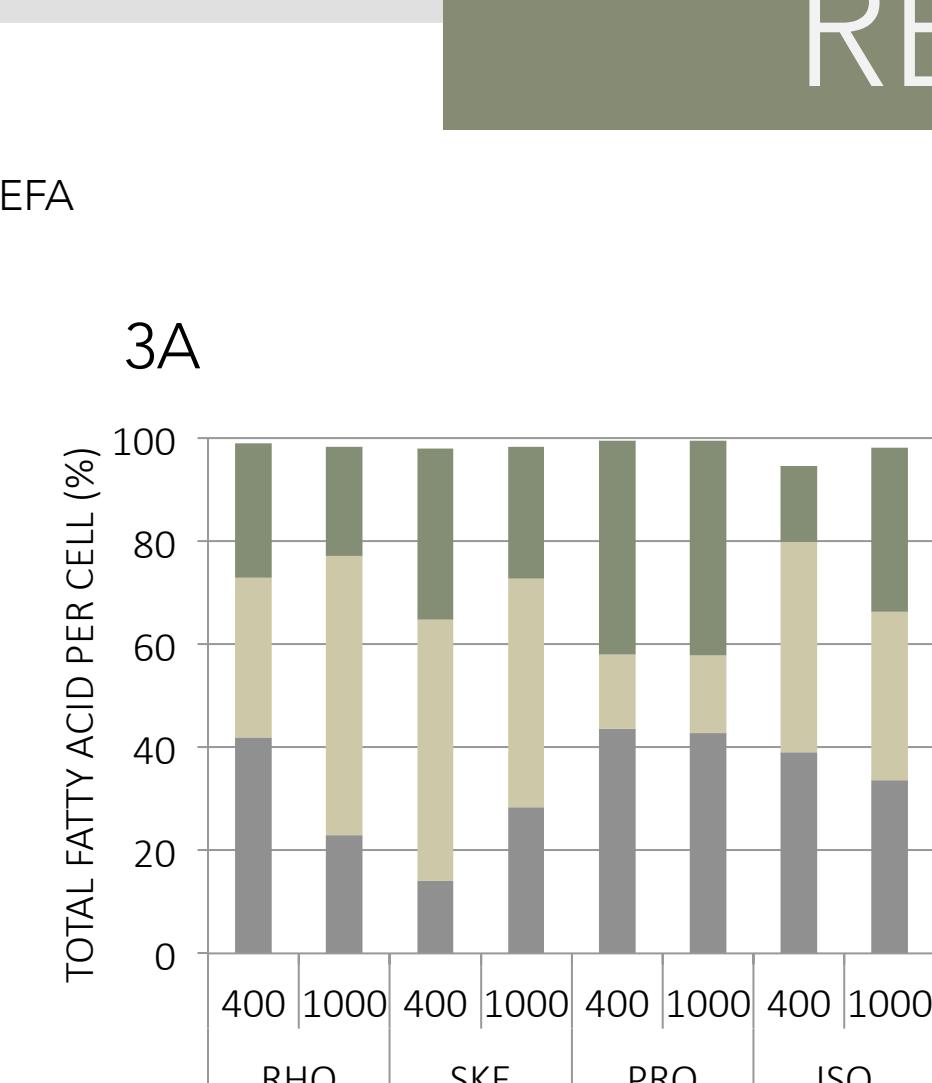


Figure 3. June 2015 -Relative (A) and absolute (B) total fatty acid content in *R. salina* (RHO), *S. marinoi* (SKE), *P. micans* (PRO), and *I. galbana* (ISO) under low (400) and high (1000) pCO₂ treatments.

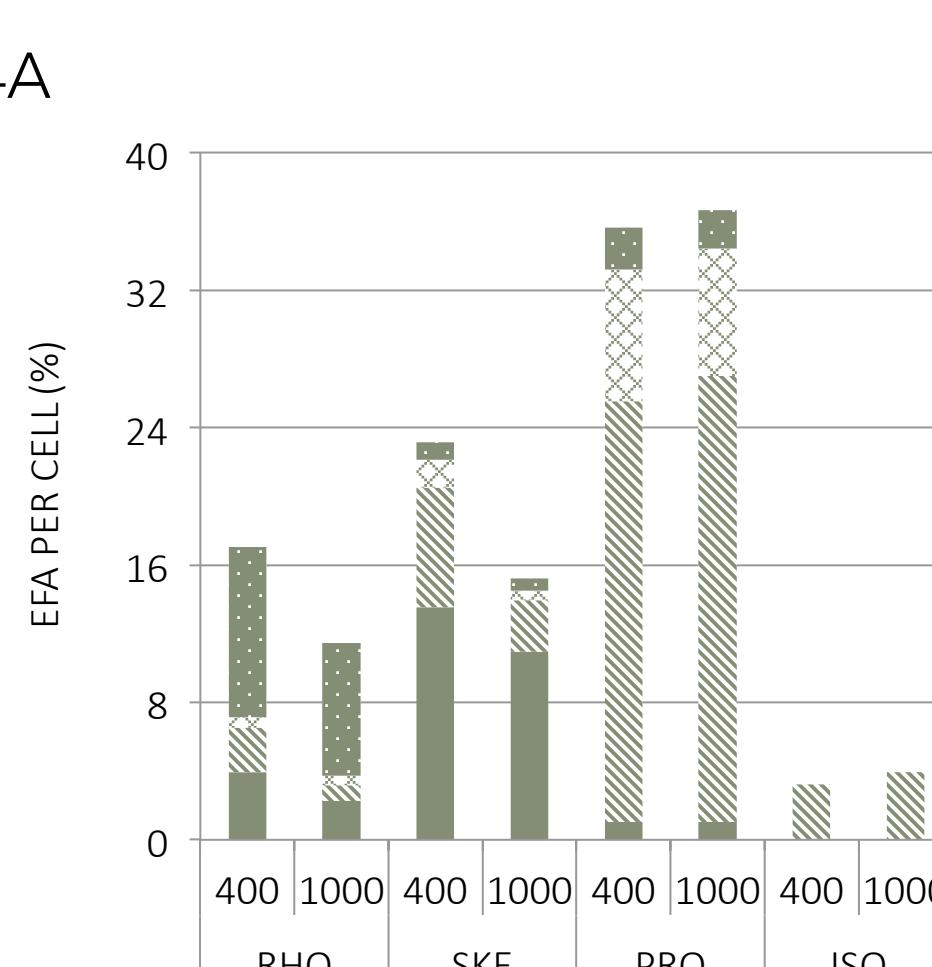


Figure 4. June 2015 -Relative (A) and absolute (B) EFA content in *R. salina* (RHO), *S. marinoi* (SKE), *P. micans* (PRO), and *I. galbana* (ISO) under low (400) and high (1000) pCO₂ treatments.

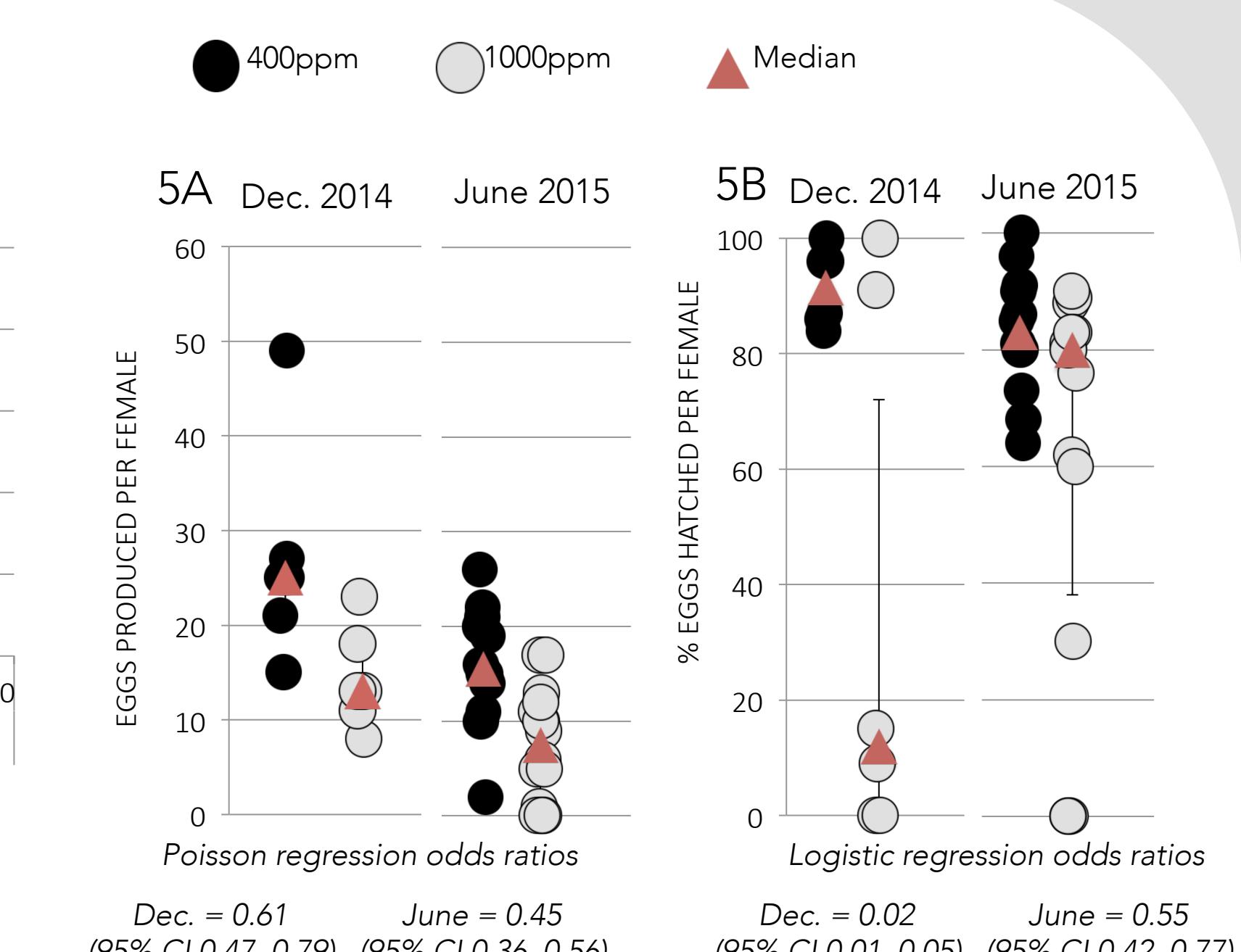


Figure 5. Egg production (A), hatching success (B), and naupliar survival (C) per female in December 2014 and June 2015 after being fed phytoplankton from either the low pCO₂ treatment (black) or the high pCO₂ treatment (gray). Each circle represents an individual female copepod. Error bars show Interquartile range.

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REFERENCES

1. Rossoll D, Bermudez R, Hauss H, Schulz K, Riebesell U, Sommer U, Winder M. (2012) Ocean acidification-induced food quality deterioration constrains trophic transfer. PLoS ONE 7(4): e34737. doi: 10.1371/journal.pone.0034737

CONTACT

Morgan Meyers, MSc candidate
(715) 220-1374
mtmeyers@mail.sfsu.edu

Carpenter Lab
Romberg Tiburon Center
3150 Paradise Dr.
Tiburon, CA 94920
(415) 338-3756



I. High pCO₂ affects the FA composition of phytoplankton

- Effect is species-dependent

- EFA contents of cryptophytes (*R. salina*) and diatoms (*S. marinoi*) are more susceptible than dinoflagellates (*P. micans*) and haptophytes (*I. galbana*)

II. Feeding on a high pCO₂ diet impacts copepod reproductive success

- Some parameters are more sensitive to dietary changes than others

- Differences in reproductive success could also be attributed to changes in feeding selectivity, sampled copepod population, and time of year

These results show the potential for future OA conditions to alter the EFA content of phytoplankton and affect the productivity of subsequent trophic levels.

CONCLUSIONS