Biogeosciences Discuss., 5, S71–S76, 2008
www.biogeosciences-discuss.net/5/S71/2008/

Biogeosciences Discussions

Interactive comment on "Microzooplankton grazing and phytoplankton growth in marine mesocosms with increased CO_2 levels" *by* K. Suffrian et al.

Anonymous Referee #2

Received and published: 22 February 2008

Within the frame of the mesocosm CO2 pertubation study PeECE III, this manuscript investigates the effects of three different pCO2 levels (350, 700 and 1050 μatm) on the relationship between phytoplankton growth and microzooplankton grazing. Laboratory experiments have shown effects of decreased PH on selected species, but studies on communities and trophic interactions in response to ocean acidification are sparse. Thus, the data presented here in conjunction with other findings from PeECE III are of interest to a wide community of marine ecologists and biogeochemists.

In the present study, phytoplankton growth and microzooplankton grazing was measured by the dilution method, which is a widely used and accepted method. The de-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

scribed experimental set-up appears thorough and is adequate for investigating the trophic interaction between auto- and heterotrophic protists. The results are presented in a clear way. Unfortunately, the manuscript does not manage to set the own findings into a larger context, both with other findings from PeECE III as well as other ecological studies. Especially the discussion needs to be worked over, as does the language throughout the manuscript. The legibility of the manuscript suffers from partly very long sentences that could easily be divided into two or three single sentences.

Special comments/questions:

Introduction:

-Consider briefly describing the development of the planktonic community in the mesocosm over the course of PeECE III. That would help the reader seeing the result of the dilution experiments in the light of other findings within the mesocosm experiment. This also may make the discussion of the results easier later in the manuscript.

-Which response of phytoplankton growth and microzooplankton grazing in response to elevated pCO2 concentrations was expected by the authors?

Methods:

-Nutrients were added to the incubation water of the dilution series from day 13 on, to prohibit that nutrients limited the phytoplankton growth. This is a common routine. However, the so achieved phytoplankton growth data cannot directly be transferred to the natural, nutrient poor conditions. Landry 1993 writes: “In situations where excess nutrients are added to experimental bottles, the intercept of the regression line with the growth rate axis may or may not represent the true specific growth rate of phytoplankton in nature. Thus it is essential…to also have incubated undiluted samples without added nutrients. The specific growth rate of phytoplankton, calculated from these samples as the sum of the estimated grazing mortality and the net growth of phytoplankton without added nutrients, is interpreted as the rate of phytoplankton

BGD

5, S71–S76, 2008

growth under nutrient-limited field conditions.” I understand that sometimes logistical restrictions do not allow for conducting experiments ideally. However, this is an important point to take up in the discussion of your results, since this may have biased your estimates of k and g during the second half of the mesocosm experiment.

-The incubation water was taken from the surface of the mesocosms. Do you have an idea about the vertical distribution of protists? Is the protist abundance of the surface water representative for the rest of the mesocosm?

-The incubation water was pre-screened on 200μm to exclude mesozooplankton. Did you check the incubation water for nauplii and small copepods like Oithona spp.?

Discussion:

-I found it unlucky to start the discussion with a paragraph on specific pigment markers. Without doubt, the choice of right markers is essential for the presented work; however they are not the focus of the manuscript. I suggest starting the discussion with the main finding that answers the working question/hypothesis stated in the introduction.

-I found the whole paragraph 4.2 hard to read since other studies are referenced in a manner premising that the reader is familiar with the referenced publications. References are given 4-5 times throughout the manuscript with additional notes, such as “see discussion and references in …”. Especially in the manuscripts’ discussion, the authors could briefly describe some of the discussions that they refer to in this manner. This would give the reader, who is unfamiliar with the referenced literature, the chance to follow the authors’ train of thoughts and argumentation.

-Explain the two possible mechanisms behind the studies results (page 422, line 8-13) more in detail. What did Riebesell et al. (2007) describe? As a reader I would like to understand your argumentation without first reading another publication.

Technical comments text:

BGD

5, S71–S76, 2008

Page 412, line 10: Range given for the highest instantaneous growth rates is not consistent with Table 3 a-c. Abstract gives range of 0.02-0.99 d-1, while the table gives a range of 0.12-0.99 d-1

Page 412, line 17: Range given for the standing stock daily grazed of diatoms and prymnesiophytes during the bloom phase (day 7-9 according to definition page 414, line19) is not consistent with Table 3 a-c. Abstract gives range of 14-43 %, while Table 3b gives 7% for diatoms on day 8 and Table 3c 2% on day 9.

Page 413, line 16: Please include a reference for the statement “…while other algal species…might benefit from an increase in the surface ocean CO2 concentration”

Page 414, line 4: There is no National Mesocosm Centre in Norway. You mean the Biological Station Espegrand.

Page 414, line 26: Please give the approximate in-situ temperature you incubated at, since this is important information for evaluating your growth and grazing rates. Please also include information on how long you incubated the dilution series.

Page 415, line 17: Please indicate that the light measurements are not shown.

Page 416, line 1: Whatman GF/F filters have a particle retention of 0.7μm (http://no.vwr.com/app/catalog/Product?article_number=513-5242)

Page 416, line 20: Please specify whether the pure E. huxleyi samples from Bergen were a lab culture or cells isolated from the fjord/mesocosm.

Page 416, line 27: You write that you used 19-hex and partly also 4-keto-hex to identify prymnesiophytes, but you only show results from 19-hex. In which way are results from 4-keto-hex presented in this manuscript?

Page 417, line 15: Please check equation 3. According to Menden-Deuer 2000 (p.575, Tab 4) the log pg C cell-1 is log a+b*log Vol (μm3). For protist plankton excluding

BGD

5, S71–S76, 2008

diatoms the equation should be log pg C cell-1= -0.665+0.939*log Vol.

Page 419, line 19: You used two digits behind the comma in paragraph 3.2, so please give the range 2.1-2.5 μg l-1 in the same manner to be consistent.

Page 420, line 15: Write day 20-22

Page 422, line 20: Were the algae in the 3xCO2 treatment richer in carbon? Give reference!

Technical comments tables and figures:

Table 1: Please add in the table text that nutrients were measured in the 100% ambient water and that nutrients were added from day 13 on. The table contains two times information on the day the experiment was conducted (under column DAY and EXP). You may consider taking out column DAY.

Table 3a-c: The table text in Table 3a includes all information needed for Table 3b+c. Thus the three tables could be fused into one. If you like to keep three single tables, you can delete the information on the three different treatments in table text of Table 3a.

Figure 1: Please explain in the figure text which of the graphs is representing which treatment (what stand 1xd1 for), so that a reader can understand the figure without having to read the manuscript. Please also write that the figure shows the biomass of heterotrophs in the 100% ambient water.

Figure 2: Please indicate clearly which figure column (or colour) presents which CO2 treatment. Take out panel a-d in the figure text if you do not label the figure accordingly.

Reference

Landry MR (1993) Estimating rates of growth and grazing mortality of phytoplankton by the dilution method, in Kemp PF, Sherr BF, Sherr EB, Cole JJ (eds) handbook of methods in aquatic microbial ecology. Lewis Publishers, Boca Raton, 715-722

BGD

5, S71–S76, 2008

Interactive Comment

Interactive comment on Biogeosciences Discuss., 5, 411, 2008.

BGD

5, S71–S76, 2008

Interactive Comment