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## ***Interactive comment on “Temperature dependence of Arctic zooplankton metabolism and excretion stoichiometry” by M. Alcaraz et al.***

### **Anonymous Referee #3**

Received and published: 20 September 2012

I have reviewed the paper by Alcaraz et al. on the effect of temperature on respiration and stoichiometry of excreted inorganic nitrogen and phosphate in incubations of zooplankton in Arctic waters in summer. The subject is interesting and topical, and of interest to the broader scientific community.

The paper is written very concisely, to the extent that it is difficult to follow the methods used, and therefore to understand or interpret the results, and needs to be revised prior to publication to improve clarity and provide more of the detail relevant to this study. The title could also be simplified, also for clarity.

#### General comments

I found the terminology very confusing. The paper would be greatly improved by clar-

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ifying upfront (in the Abstract and/or Introduction) that all results for metabolic rates estimated from incubations were normalised to 'per unit of carbon biomass' in each incubation (i.e. C-specific metabolic rates). Also, that estimates of respiration rates, based on oxygen consumption are expressed as C losses, which were calculated using a respiratory quotient of 0.97. In the results shown on Figures 2, 3 and 4 and in the relevant Tables, acronyms need to indicate more clearly that they are for measured rates, e.g.  $R_{C}$  for C-specific respiration, or something similar (e.g.  $C_R$ ,  $N_E$ ,  $P_E$ ). It is unclear when authors use C to symbolise a rate vs if/when they were using it for biomass.

The authors need to re-structure the paper, to better separate out the Introduction, Methods and Results Sections. The null hypothesis and links to previous studies on primary production need to be brought into the Introduction and/or Methods. All methods need to be in the Methods Section, and not described in the Results Section, or only on Table/Figure legends.

Methods used to set up and take down incubations are particularly unclear, and need to be described, at least briefly. They are also not clear in references cited. For example, it is not clear if the authors pre-screened the zooplankton prior to incubation, to remove microzooplankton and particulate material in the plastic cod-ends, and how the authors managed to incubate zooplankton with the required I.M. (mean =  $13.31 \mu\text{mol C ind}^{-1}$ , equiv to  $\pm 400 \mu\text{g DW ind}^{-1}$ , i.e. relatively large copepods) Or how faecal pellets were dealt with during and at the end of the incubations. It is also not clear how experimental controls were set up.

The Results Section needs to provide some information on the composition of the biological community/communities and other particulate material in the incubations, at least from the end of the experiments.

The Discussion of results obtained or used in this study needs to be improved, through discussion of limitations of experimental design and better comparison with results

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from other relevant studies. Certainly, values for Q10 from this study and estimates of primary production from previous work appear to be high.

#### Specific comments

##### Page 7444

Line 10: Replace 'less' with 'least'

Line 12: Does C represent the element C (in biomass) or C-specific respiration? Presumably only the latter is a metabolic product. Use C carefully, to remove confusion.

Line 14: Improve grammar - 'would contribute to modify'

Line 15: clarify 'shifts in the characteristics of primary producers'

##### Page 7446

Line 20: clarify 'filtered'

Line 22: give units after 'Zooplankton respiration rates' (and after 'Excretion rates' on line 2 of next page).

##### Page 7447

Line 2: expand acronym RQ

Line 6: replace 'into' with 'in'

Line 7: replace 'closed with' with 'enclosed by'.

Line 24: Check equation - should the equation have a minus sign before the exponent?

Line 28 and Page 7448 line 9: clarify that 'eV' is the unit for activation energy, rather than a new term.

##### Page 7448

Lines 16 to 18: this is a strange and inaccurate statement, which needs to be re-worded

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to clarify what the authors mean.

Line 22: replace 'Arrhenius plots (EQ.1)' with 'plots using the Arrhenius equation (Eq. 1)'; relocate methods to Methods section

Page 7449

Line 8: null hypothesis not stated anywhere previously. . .

Line 13: end sentence by referring to Table 3

Line 14: there is no Table IV. The methods need to be given in the Methods Section

Page 7450

Line 11: replace 'an' with 'a'. Clarify what is meant by 'rising trait'

Lines 10 and 18: move 'here' to after 'obtained' and 'analysed'

Line 25+: Clarify the entire paragraph

Page 7453:

Line 13: spelling error in 'Antarctic'

Figures and Tables

Table 1 Legend – insert space before 'respiration'

Table 4 – most of what is in the legend needs to be in the Methods. On first line, replace 'at' with 'in'. At the end of the sentence, refer to Table 3.

Fig. 2: Y-axis: units are unclear. The \* symbol should be replaced by a full stop. The \* can be taken to indicate multiplication. Acronyms should be changed (see General comments)

Fig. 3. Clarify and improve legend. 'Abscissae' and 'ordinates' appear to be incorrect use of terminology.

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## Fig. 4. Improve acronyms and terminology

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