Biogeosciences Discuss., 9, C4486–C4489, 2012
www.biogeosciences-discuss.net/9/C4486/2012/

Biogeosciences
Discussions

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

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Received and published: 4 October 2012

A main concern of referee # 1 regards the origin of the data discussed here. Effectively, part of the data were obtained during the ATOS-Arctic expedition in 2007, and have been partially published in Polar biology (Alcaraz et al., 2010). The revision suggested was already considered in the mentioned paper, where the available published data on Arctic zooplankton metabolism were included, compared to the new data presented, and discussed. The conclusions drawn here have been based in a further analysis of the data, after selecting them according to the average individual biomass and once the lack of relationships between temperature and average individual biomass had been verified in order to discard any bias in metabolic rates as a function of individual biomass. We agree with referee # 1 about the variability in zooplankton metabolic rates as derived from food concentration and prey characteristics. Examples are given in Thor et al. (2002), Saba et al. (2009) and Almeda et al. (2011), among others. However, in their experiments zooplankton were incubated with food, so the estimated metabolic rates included SDA (Specific Dynamic Action, the increase in metabolic rates associated to feeding, Grisolia and Kennedy, 1966), while in our case zooplankton were incubated in 0.2 μm filtered water (see methods, P. 4 lines 14-21), thus avoiding the variability induced by differences in prey abundance and characteristics. Although we know that zooplankton incubations in filtered seawater would result in underestimations of their metabolic rates (Ikeda 1977, Almeda et al. 2011), as discussed in Ikeda (1977), the changes should affect similarly respiration and excretion. Another possible source of error mentioned by referee # 1 (i.e., the effects of possible relationships between temperature and in situ food conditions that would bias the relationships between temperature and metabolic stoichiometry) has been tested. Neither the biomass of the potential zooplankton food (ZF, from autotrophs to heterotropic dinoflagellates and ciliates, see data of Table II in Calbet et al. 2011,) nor the proportion of autotrophs in ZF (the ratio Chl a/ZF, as an index of potential herbivorism) were related to temperature (see equations 1 and 2 below). Similarly, the scarce contribution of diatoms as zooplankton (copepods) food as compared to ciliates and dinoflagellates during our cruise (specific ingestion rates given by Saiz et al., submitted) confirm the negligible effects of previous feeding conditions on the relation temperature - metabolic rates. (We suggest to discuss these facts, and give the equations, but probably is not necessary to show the figures). A suggestion from the referee (that individuals from different locations should have been treated to a range of identical temperatures), would have given us response to acute temperature changes (i.e., the effects of acclimation), that were not the aim of this study.

Equation 1: Relationship between the biomass of potential zooplankton food (micro autotrophs plus microheterotrophs, ZF (Calbet et al. 2011), and temperature (T in ° C).

ZF = 35.4 – 1.25 T, r2 = 0.0079,

Equations 2: Relationships between the ratio Autotrophs/Total zooplankton food, Chl a/ZF (Calbet et al., 2011) and temperature (T °C).

Chl a/ZF = 4.25 – 0.07 T, r2 = 0.0049

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Interactive comment on Biogeosciences Discuss., 9, 7443, 2012.