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Biogeosciences Discussions

Interactive comment on "Physiological basis for high CO_2 tolerance in marine ectothermic animals: pre-adaptation through lifestyle and ontogeny?" *by* F. Melzner et al.

Anonymous Referee #2

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There is an increasing number of publications in the scope of ocean acidification. However, this topic is very young, and most of studies just investigate the effects of decreasing pH on some biological parameters and on some selected animals. Physiological mechanisms underlying the mechanism of sensitivity of marine animals, and thus their tolerance to CO2, are still unknown, even if some publications, among which those of the authors of the present review, were published during these very last years.

A key parameter to understand the effect of ocean acidification is the acido-basic equilibrium, well-known from respiratory physiologists but poorly known by most of biologists or geochemists working on ocean acidification and for the usual reader of BGS.

Melzner et al gave in their review the keys to understand this process and more broadly respiratory physiology, which is closely linked to acido-basic equilibrium.

The goal of authors is to present the physiological basis underlying tolerant versus sensitive physiotypes. Due to the presence of real extracellular body compartments able to buffer external variation of pH (and/or CO2), vertebrates are the most CO2-tolerant group, while invertebrates are more sensitive. I found interesting to highlight the fact that a doubling of pCO2 is totally different for an adult fish or a fish egg for example and I agree with the authors of the importance of existing ion-regulatory mechanisms. It is also important to show that even invertebrates may tolerate high pCO2 values. Perphaps the authors should add some comments on animals which exhibit large variations in external acid-base status like rock pool animals as a good example of pre-adaptation. I am not sure that Figure 5, based on only 4 animals (even if teleosts is the mean of 6 species) will be relevant for a generalization of CO2 tolerance.

My only concerns is on the title of the review that may be misleading since it suggests that the physiological basis of CO2 tolerance is based only on extracellular acid-base status, while the sensitivity of intracellular enzymes or pathways may be also an important parameter. I would suggest: Physiological basis for high CO2 tolerance in marine ectothermic animals: pre-adapatation through extracellular acid-base status and ontogeny.

Interactive comment on Biogeosciences Discuss., 6, 4693, 2009.