

## ***Interactive comment on “Variable metabolic responses of Skagerrak invertebrates to low O<sub>2</sub> and high CO<sub>2</sub> scenarios” by Aisling Fontanini et al.***

### **Anonymous Referee #1**

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Fontanini and co-workers investigated the respiratory responses of a range of invertebrates to short-term changes in oxygen and CO<sub>2</sub>. The paper gives some interesting insights which revealed the highly variable responses of invertebrates from a single area towards future scenarios. This reveals that e.g. general ecosystem models based on few species are not yet reliable. Therefore this study highlights the need for more experimental work. Currently the manuscripts lack some important experimental details which make it complicated to judge the quality of the measurements. For instance what was the rationale behind measurements on day 3 and 6 and were any differences observed? Considering the strong physiological differences between the investigated phyla e.g. a crustacean and a tunicate or echinoderm it is not intuitive why the animals were grouped according to the habitat and not according to the lifestyle in figure 1. This

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could mask certain significances. I have a couple comments and the MS would benefit from some careful corrections thus I recommend major revision.

Specific comments Page 1 Line 25 that the responses of respiration of the respiration – please change

P 2 line 6 please change to acidic water

P2 Line 7 what do you mean by ‘Control’? more precisely speaking: the biochemical processes which change seawater pH?

P2 Line 18 Internal is not a precise term, intra- and extracellular pH regulation are two completely different processes. I assume you refer to extracellular pH as intracellular pH is commonly well regulated? Please specify.

P2 Line 20 Hemoglobin is not common in invertebrates which this study is focused on.

P3 Line 31 what is meant by ‘a history of North Sea upwelling’? commonly observed?

P3 line 3 and following? Where the salinity similar at surface and bottom of the Fjords as all animals were exposed to the same high salinity during the acclimation phase?

P4 Line 3 and following Based on this paragraph, *P. bernhardus* was the only species which was fed during the experiment? Is there any specific reason for this decision?

P4 Line 8 and following Several species and sometimes specimens were kept in the same aquaria for logistic purposes? However can you exclude that a number of co-variable influenced respiration rates similar to the observed abnormal mortality in one tank?

P4 Line 16 and following The animals were kept in closed systems without any waster exchange. Did you check the water quality in order to monitor potential accumulation of waste products due to metabolism and mortality?

P 5 Line 15 and following As respiration was only response variable measured in this

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study, more detailed information needs to be provided such as: Volume of the containers, did you control for a linear decline of oxygen concentrations? In particular, as this is the focus of the study, how much did oxygen decline during the incubation? Strong declines would severely affect the study concept.

P 4 line 34 Why did you use two different pH meters and what differences did you observe?

P 6 line 7 Here you state a target of 1000 ppm whereas it is 1300  $\mu\text{atm}$  in the M&M, even if target and measurement were not identical, the target should be uniform.

P6 Line 37 A non significant response may only called a 'trend towards'

P 7 line 7 the experiment did not last long enough to draw any reliable conclusion on survival rates

P7 line 14 To support this hypothesis you need to add a reference which documents higher mortality for populations from habitats with less abiotic stress

P7 line 17 and following Please consider that the RI hypothesis and in particular the definition of an exact threshold is still under debate: <https://www.biogeosciences.net/10/2815/2013/bg-10-2815-2013.pdf>

P8 Line 37 Even though calcified structures and the calcification process might be affected by undersaturation it is not clear why this should be detectable in the rates of aerobic metabolism

P9 line 6 Hypoxia is necessarily always coupled to elevated CO<sub>2</sub>

Table 3 please give the unit for respiration rates

Some references are either missing in the text or in the reference list e.g. Grans or Gräns? et al. is not in the list

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