Biogeosciences

Discussions

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Interactive comment on "Sensitivity towards elevated pCO_2 in great scallop (*Pecten maximus* Lamarck) embryos and fed larvae" *by* Sissel Andersen et al.

Anonymous Referee #1

Received and published: 7 July 2016

1. General comments The paper presents data describing the sensitivity of early-life stages (ELS) of great scallop to future acidification conditions while being well-fed. Results indicate that ELS are particularly sensitive to elevated pCO2, displaying reduced survival, delayed development, and increased abnormalities, and that feeding does not improve this sensitivity. In overall, I commend the authors on a well-written and well-explained paper, whose background rational is clearly explained (a follow-up experiment aimed at deepening their understanding). The data appear robust, and their discussion generally convincing, although there are space for improvements in this part. In my opinion, the discussion could be pushed a bit further, to put the results into a broader context, particularly considering the endpoints considered are not

particularly novel (I am not saying here that these are not useful, on the contrary, but they are the endpoints generally looked at, and the 'so what?' question automatically comes to mind). The authors came to the conclusion that future elevated pCO2 will negatively impact on several aspects of scallops' ELS, despite being well-fed, but do not discuss the implications of their findings. Are there repercussions for aquaculture practices? For population conservation? Therefore, section 4.5 could be improved in order to obtain higher impact. Nevertheless, the paper is throughout really good and deserves to be published. 2. Specific comments In this section, I will list a few remarks and modification that in my opinion could be made to improve the manuscript, of clarify some points, line by line, then comment on the tables and figures. Page 1, in section 1 "Introduction", line 25: "cause elevated CO2 levels" – specify where the CO2 levels are elevated. In the atmosphere? In seawater? That first sentence is a little awkward to read, although still understandable by the reader. Page 2, in section 2 "Materials and Methods": even if it was described in details in the earlier paper (2013), it would be useful to have a brief mention of which seawater parameters were measured and how often, and which were indirectly calculated and how. This would help the understanding of Table 1. Page 3, line 29-31: "At day 3. . . 'protruded velum'". The whole sentence is confusing. Reconsider the grammar (coma?), or rephrase. Do you mean that larvae that have not developed the muscle to retract the velum would be identifiable after being preserved by the presence of a protruded velum? Page 4, section 2.3 "Statistics": I am not the best at commenting on this, but the whole section could be made clearer, from line 15 onwards. E.g. what do you mean by "where Multiple Comparisons were too weak"? Page 5, section 3.2, line 13: "day 3, p<0.000" Is this an error? Page 6, line 4: You mention the coefficient of variation, but you did not mention this earlier in the method section. It would be worth to explain what it is and why you are using it earlier on. Page 7, section 4.3, line 24-25: This last sentence seems like a repeat of what is stated two lines above regarding slower/delayed development– unnecessary, or maybe rephrase saying that (line 21) "The percentages of unshelled larvae at day 2 and larvae with a protruded velum at day 3 were significantly higher in the 1337μatm

group, which is most likely a result of delayed development caused by elevated pCO2, is in accordance with the reports of slower development at elevated pCO2 levels reported in the earlier study of great scallop larvae (Andersen et al., 2013a) and also in other bivalve larvae (Talmage and Gobler 2011; Kurihara 2008).". In this order in my opinion, it is easier to read and follow the logic, and does not sound like you are repeating yourself. Page 8, line 12-14: so? You are just stating facts, but not trying to say more about it. Page 8, line 19: a reference regarding factors such as genetic variation or energy status would help back-up your explanation. Page 9, line 14: "main bottlenecks in the recruitment process" - reference for this statement? Table 1: Why do you only have AT data for intermediate pCO2 only? How did you calculate the other parameters (CO2SYS? What constants?). One of your aragonite saturation is below 1, how do think this could have affected shell development and growth? Figure 1: The colours used are not consistent between the header tanks and the exposure tanks. Also why are some exposure tanks drawn asides (left/right), and others superimposed (above/below)? Why not all aligned? Figure 5: In my opinion, the graphs would be more easily read if you used 'day 2', 'day 3' ... etc directly on the graph rather than letter A, B, C... But this is just a personal preference. 3. Summary This paper presents interesting results that are in accordance with most of the scientific literature regarding larval development of molluscs under elevated pCO2. It adds valuable insights on the beneficial/neutral effects of added food on the ability of larvae to withstand suboptimal conditions. The paper is clear and generally well-written, and I don't see any major reasons it should not be published, despite minor remarks on my part.