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Biogeosciences Discussions

Interactive comment on "Comment on "Effects of long-term high CO_2 exposure on two species of coccolithophores" by Müller et al. (2010)" *by* S. Collins

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Dear Dr. Suzuki,

Here is my revised manuscript "Comment on "Effects of long-term high CO2 exposure on two species of coccolithophores" by Müller et al. (2010). I have addressed all of the reviewer concerns. In particular, I have expanded the manuscript to include more detailed descriptions of how the Price equation may be used, added general comments on the use of laboratory evolution experiments to gain knowledge about natural populations, and added detail explaining why I think that marine microbes are challenging systems in which to do experimental evolution now, but are good candidates for devel-

opment as future model systems.

sincerely, Sinead Collins

Referee 1:

"...ecological tools such as thePrice equation can be used to facilitate the study of evolutionary change in these organisms. However, it is unclear how this approach will overcome several of the limitations listed previously, such as the requirements for low cell densities, multiple independent replicates etc., as all these considerations still apply to the generation of data required for calculation of the Price equation. This should be clarified."

How the Price equation may be used has been clarified and expanded. In particular, the type of data needed has been listed.

"...raises an important point regarding the paucity of knowledge on the life cycle of many marine phytoplankton. I think the discussion would benefit from a comment on the validity of extrapolating from the study of long term evolutionary change in cultured asexual diploids to natural phytoplankton communities in which there may be high levels of genetic mixing."

I have expanded the discussion to include a short paragraph on the lack of general knowledge about phytoplankton life cycles and the problem of scaling up from laboratory experiments. Note that these problems are not particular to marine phytoplankton, and I have referred the reader to a more extensive and general review of using model systems in experimental evolution.

Referee 2:

"The abstract is rather short and could contain more detailed information."

The abstract has been expanded.

"There is no doubt that marine microbes have the potential to complicate experimen-

tal evolutionary experiments, however, as single celled organisms have a high division rate, they represent at the same time many advantages in comparison to other organisms (see details in Elena and Lenski 2003, cited also in the MS)."

This has been noted in the revised manuscript. I have expanded my section on why marine microbes present challenges as experimental evolution model systems right now, and added that I think they are compelling systems to develop for the future.

"Firstly a competition experiment between the evolved genotype and its own ancestor and secondly a comparison of fitness parameters under the given conditions. I do not however agree that the first named approach is impossible, due to the fact that for some microbesâĂŤperhaps not for coccolithophores (here Emiliana huxleyi)âĂŤmany necessary tools are at our disposal."

This has been noted in the revised manuscript, and a more optimistic view of the available tools has been added.

"The MS, in particular the discussion, would further benefit from a more general discussion of not only coccolithophores, but perhaps all major planktonic groups such as diatoms, dinoflagellates and even other haptophytes."

I have added a short comment saying that the ideas in my manuscript apply to other phytoplankton groups, but since the ms is a comment on a specific experiment done with coccolithophores, I have kept the main focus of the comment on coccolithophore model systems. I am happy to expand this further if the editor deems it necessary, but I think that detailed comments on comparative phytoplankton biology are outside the scope of this comment, the experiment it is commenting on, and my expertise. (I suppose this is one of the perils of dialogue across disciplines?)

Interactive comment on Biogeosciences Discuss., 7, 2673, 2010.