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Interactive comment on "I / Ca ratios in benthic foraminifera from the Peruvian oxygen minimum zone: analytical methodology and evaluation as proxy for redox conditions" *by* N. Glock et al.

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We thank the reviewer for his constructive comments and positive feedback. Since the main issue of this review was the balancing of some interpretations about our results we tried to mitigate these in our discussion and also considered the different approaches of interpretation suggested by the reviewer. The manuscript already was going through a so called "quick review" before it was published in Biogeosciences Discussions. This review is actually by word the same as this initial "quick review". Since the reviewer's comments have already been taken care in the version published in BGD we assume this is a misunderstanding. Below we comment in detail the points of revision.

AR2: Infaunal species showing a statistically better calibration in this sample set does not prove that infaunal species are better than epifaunal one for bottom water O2 reconstruction. The O2 penetration/gradient in shallow porewater are highly variable spatially and temporally. The living depth (below seafloor) may vary among infaunal species and may also change during the life cycle of the same species. Intrinsically, it is complicated to use infaunal species for quantitative bottom water O2 reconstruction. I will probably remain unconvinced until similar calibration for Uvigerina striata is observed in another location.

Reply: This might be a misunderstanding and maybe we were not careful enough with our formulations, but we did not interpret the better statistical correlation of Uvigerina striata as a proof that infaunal species are more suitable for bottom water O2 reconstruction. In our manuscript we just described our observation for which species we found the best statistical correlation. Nevertheless, the reviewer is right that the problems in respect to the use of infaunal species for bottom water oxygen reconstruction have to be addressed. Thus we added the following part to the introduction:

Infaunal foraminiferal species are able to migrate into the pore waters. Oxygen in the pore waters is consumed by the diagenesis of organic matter (Froelich et al. 1979), which might complicate quantitative O2 reconstruction through infaunal species. Nevertheless, bottom water oxygenation usually has a strong influence on the oxygen gradient and penetration depth into the pore waters (Morford et al. 2005), which justifies also the use of also infaunal foraminiferal species for this study.

AR2: My second major comment is about the vital effect. That indeed could be the reason for the large difference between striata and pergrina. However, the O2 and hence iodate gradients in porewater are very steep. Because of the foram migration within sediments, the actual calcification depths for these species may be slightly different within the same genus, which could correspond to very different porewater iodate concentrations considering the steep concentration gradient. I'm not sure it is a matured conclusion to pin it completely on vital effect, based on the observations in this study.

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Reply: We changed the following part to our discussion to balance the interpretation regarding the differences between these two species and not just to pin it on the vital effect:

This difference might either be related to a strong vital effect or to a species dependant difference in calcification depths. Oxygen gradients in the pore waters of a comparable OMZ off Pakistan are quite steep under suboxic conditions (Bogus et al., 2012) and IO3- probably follows this gradient. Thus, a difference in calcification depth might have a severe influence on the I/Ca ratio. These results suggest that a careful distinction of the analysed species is essential for the application of this proxy at least for the infaunal species.

Furthermore, we modified the following part in our conclusions:

There is a strong inter-species variability of I/Ca ratios in two infaunal species from the same location which indicates either strong vital effect or slight species dependant differences in the calcification depth of these species.

AR2: The large variability in P. limbata seems to be discouraging. However, can it simply be the real changes in bottom water O2? The OMZ boundaries could easily move up and down over time scales of seasons or even weeks. If I have to pick one calibration that I trust the most for bottom water O2, I may still pick epifaunal over infaunal ones, regardless of the variability within shells.

Reply: Indeed we also would have preferred to test more epifaunal species but Planulina limbata was the only epifaunal species we found in habitats with a broad range of oxygen availability. Nevertheless, we added the following part into the discussion to address the concern of the reviewer:

In general due to the steep chemical gradients in the pore waters mentioned above epifaunal species might be more suitable for oxygen reconstructions because they should directly represent bottom water conditions not influenced by the microhabitat

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in the pore waters. ... The strong inter-test variability might indeed be related to real changes in oxygenation of the habitat, since there are strong seasonal fluctuations in the magnitude of the OMZ (Paulmier and Ruiz-Pino, 2009).

AR2: For the analyses part, our JCp-1 is fairly homogenized straight out of the bottle. Measuring multiple powder splits or multiple dilutions from a single dissolved sample do not show large differences.

Reply: We just described our observation that the reproducibility of the JCp-1 significantly improved after regrinding the standard powder. Probably these problems and differences base on the use of different aliquots of the JCp-1.

Interactive comment on Biogeosciences Discuss., 11, 11635, 2014.