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Interactive comment on "Environmental and biological controls on Na/Ca ratios in scleractinian cold-water corals" *by* Nicolai Schleinkofer et al.

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Review of Schleinkofer et al 'Environmental and biological controls on Na/Ca ratios in scleractinian cold-water corals'

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The new cold water coral Na/Ca, Mg/Ca and Sr/Ca data presented by Schleinkofer et al are a welcome addition to the literature, and overall the authors do a nice job of assessing the environmental controls on these elements. My greatest concern is that given the relatively limited dataset, the wording around some of the results can

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be a overly strong, and caveats need to be added relating to the limited number of data points, and the fact that some of regressions are really only driven by one or two data points. The discussion also gets a little creative regarding pumps and calcification mechanisms, and is far too long given the limitations of the dataset.

Crucial information is missing from the methods regarding how pH was measured (probe, photometric dye, ALK+DIC)? What scale is pH on? If it was measured by different methods/on different scales, where efforts made to homogenise the dataset?

This is important because, despite the limited range in pH in the dataset (and likely the large uncertainty in the measured pH values), you see a significant relationship between Na/Ca and pH.

Given that temperature also influencing Na in your dataset it would better to regress Na against T and pH in multiple regression i.e. Na/Ca $\sim$ f(T + pH).

If you say Na is a promising T proxy, then what about the pH effect? This needs to be elaborated on.

It is important to add a new plot showing the covariance between predictor variables (T,S, pH) in your dataset.

Given that coral distribution (and thus optimum growth rate) is discussed in relationship to seawater density, why not regress Na/Ca against seawater density? It would be interesting to see if the Na 'peak' around 35 PSU relates to the optimum habitat density.

Minor comments: Line 38: I would describe Na/Ca in forams as a 'potential' tool, rather than a 'promising' tool. The relationships seen between Na/Ca and S in different studies conducted on the same species can vary wildly.

Line 50: it is not clear what you mean here – at a global scale it is not correct to say density is mainly governed by salinity (compare surface of warm salty tropical atlantic to cold fresh north pacific)

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Line 108: see first comment – give the wildly different relationship between Na/Ca and salinity in different studies of same species it is not accurate to say Na in forams is largely function of salinity.

Line 135: much more information on the pH measurement method is needed here. What scale is pH given on?

Line 159: why is it important it can measure both axially and radially?

Line 218: given that coral distribution discussed in relation to seawater density, why not plot (and regress) Na/Ca (and Mg/Ca and Sr/Ca) against density? Interesting to see if Na 'peak' at 35 PSU relates to density preference of corals.

Line 241: you need to add this is essentially driven by one data point at ∼21.5 oC

Line 233: correlation with pH very interesting given limited pH range (and likely large errors). Na/Ca should be regressed against T and pH in a multiple regression to account for both variables.

Line 363: try plotting against density

Line 400 and 401: typo on signs in sensitivities

Lines 422-599: given the limitations of the dataset, this section needs to be made much shorter

Line 567: there really isn't enough data to say this. . .

Line 580: it is not all clear what you mean by 'Advantageous to Li/Mg ratios are the missing species-specific vital effects.' – if you are saying there are not vital effects in Na/Ca, there simply isn't enough data to say this

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2019-40/bg-2019-40-RC2-supplement.pdf

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