

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

### **Anonymous Referee #1**

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The manuscript by Schleinkofer et al reports Na/Ca, Mg/Ca and Sr/Ca measurements in three cold-water corals. Their variations (mainly for Na/Ca) are discussed in view of the potential environmental and biological controls. Globally, the manuscript is well-written and easy to follow. Nevertheless, I think that the text could be shortened particularly in the introduction and improve in some explanations.

My comments are the following: -L23: please add the error - L48-63: I am not convinced that this part is really useful for the rest of the study. - L142: Specify here that the study of Branson et al (2015) is on foraminifera - L151: How this "0.18 mmol/mol" is calculated? Or is it measured? - L172: Why the measured Sr/Ca ratio is clearly higher

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than the admitted ratio? - L174: Why do you mean by "accuracy amounts"? How was it calculated? - L189: Please define 'COC-like' - L190: Is there any relation between the increase and the species? - L200: Please indicate the errors on the measurements - L211: "As the P-values [...] in all these regressions." I do not understand this sentence. Please explain. - L222-224: the temperature is given with too many significant figures - L225: "Inorganic distribution coefficient is". Please correct. Please specify the temperature for the inorganic coefficient. - L234: Please add the errors - L239: There is only one study of Mg/Ca ratio in *L. pertusa*? - L247: same remark - L252: Please add the errors. One dot has to be removed in this sentence. - L255: Please add the errors - L257: Please correct the title - L267: Is there any reference for the influence of kinetics on Na? - L268: Is there any evidence for this concentration in the ECF? If there are some  $\text{Ca}^{2+}/\text{H}^{+}$  pumps as stated by some authors, it would change the  $[\text{Ca}^{2+}]$  of the ECF. - L274-275: I do not understand. As it was explained before, you constrained your calculation to have a mean  $[\text{Ca}]$  of  $\approx 10$  mmol/mol. So of course, the calculations will give a mean  $[\text{Ca}]$  close to 10 mmol/mol. Could you please better explain your point here? There is something that I do not understand in all these calculations. The  $K_d$  of corals is determined from the measurements in corals, divided by the concentration of the elements in seawater. So I do not see how you can calculate after that the  $[\text{X}]$  of the ECF. As an example, for Mg, the mean is the concentration of seawater, as we could expect from this calculation. You could perhaps try to calculate the concentrations in the ECF by assuming the partition coefficients of inorganic aragonite. - L308: I do not agree about this elevation of pH in the COC as the  $d_{11\text{B}}$  values are lower in the COC than in fibres. - L312: This combination of different compartments with kinetic effects was already proposed in Meibom et al (2008) and Rollion-Bard et al (2010). - L336-338: Are these kinetics effects higher for Mg than for Sr? - L354-355: Please remove the sentence about foraminifera - L363-365: Is there any optimum of growth with T and/or pH? If yes, why is it not detectable on the relationships of Na/Ca and Mg/Ca with these parameters? If there is an effect of salinity on growth rates, why is it not observed in the relationship of Mg/Ca and salinity? - L382-388: In these studies, what is

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the difference in Sr/Ca ratios between COC and fibres? Why the possible contribution of COC could be problematic for Sr/Ca and not for Mg/Ca and Na/Ca? - L445-L447: Please be consistent in the writing of Na<sup>+</sup>/K<sup>+</sup>-ATPase - L487-488: Previously some calculations were done with [Na]=455 mmol/mol. So what are the implications of a much lower [Na]ECF is your previous calculations? - L494-496: I am not convinced by the calculation of the Mg concentration in the ECF as I explained above - L501-502: As far as I know, Mg has an inhibitory role in the precipitation of calcite and not aragonite. Could you please add some references and more explain? - L514: "and" is in italic. Please correct. - L536-537: Please add references to Robinson et al (2014) and Rollion-Bard and Blamart (2014) as these two studies reviewed the geochemical differences between COC and fibres - L542: Why only this in situ technique? Are other techniques like EPMA and SIMS not suitable? - L574: Na/Mg instead of Mg/Na to be consistent - L581: Could it be also easier to measure Na than Li? - L589: Please specify that it is for cold-water corals. For tropical corals, please cite the study of Swart (1981)

Figure 1: What is the significance of the different symbols? I do not see the five areas.

Figure 2: Please add a picture of the sample that was measured for the location of COC and COC-like

Figures 3c, 4c, 4b and 4c: Why the averages are not represented in these figures?

Figure 6: Rollion-Bard and Blamart (2015) instead of Rollion-Bard et al (2015)

Figure 8: Why the value of Rollion-Bard and Blamart (2015) is not reported here?

Table 1: I do not understand the two temperatures of the lines 4

Please add a Table with the entire dataset.

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