

Ref #2

Answers

Biogeosciences review

General Comments:

This is an interesting and well-planned study. It is nicely focused and well-suited to address the question outlined by the authors. I do not see any major flaw with the experimental design or the interpretation, however, I think there are several places where some more clarity and/or improved organization would be helpful to the readers.

My “major” comments are that the authors could setup arctic vs boreal comparison a little more purposefully and clearly in the introduction.

Done, p 6.

Also, a map of the sampling area would be really helpful as I (and I think most people) do not have a good image of this region in my head, it could be a supplemental file if need be.

We now provide a simple map, which we suggest to make available as supplementary information (Fig suppl). Geographical position of the sampling sites can also be visualized through the map tool in the Pangaea database.

There are also a number of typos and grammatical errors that need to be addressed. Aside from those, I have also outlined below some minor comments that may help improve clarity and a few places where some more context or broader discussion is warranted. Overall, I enjoyed reading this manuscript and the methods, statistics, and interpretation are sound.

Specific Comments:

Pg 4

L8: I would think that each compound should be defined first with the name and formula in parentheses, then you can use the formula after that

OK, corrected

L10-13: This sentence and really the whole first pp is on one hand a logical introduction, yet it still leaves me with the thought “what is the point of this pp”? Can the authors make it a more cohesive and setup the transition to N fixation (in the next pp) a little better? (and in the second pp it starts with N fix then goes back to DIN)

We rephrased according to suggestion

L22-26: This last sentence in the paragraph could be clearer. I follow the first half ok, but the second half starting on L24 is not clear to me.

removed

P5

L21: This goes back to a topic discussed in the first pp so I think some more context is needed here because it is a sudden transition to an earlier topic. Also what “observed variations” do the authors refer to here on L22?

L22: Maybe use “DIN” instead of “nutrient” to be more specific
L22: Instead of “a combination of variations” maybe just use “variability”
Entire sentence (L21-24) rephrased

P6

L4: This pp might be a good place to clearly introduce arctic vs boreal
Done

Pg5

L4: This might be a good place to briefly discuss the dependence of nitrification on oxygen, which is not really stated anywhere upfront but that information is relevant think.
The information is given in the same sentence but we rephrased to make it more clear

L14: There is no anaerobic process quantified in Fiore et al. 2013
OK, reference removed here

Pg7

L21: average biomass for boreal sponges is given, is this true for arctic sponges too?
Yes, estimates for average biomass for both boreal and arctic sponge grounds is given in the discussion (chapter 4.4) and in the data sheet published in Pangaea

Pg3 – you mean Pg8?

L2 and 6: what is meant by “key” here, why were these species chosen? *We chose species that are typical and representative for this type of sponge ground, see added text about sponge ground characterisation*

L9-10: says that sediment was not collected here, so it seems like something about sediment should be mentioned in the paragraph before this one.

Moved this sentence to the section on sediment sampling

L17-22: I can tell the authors tried to make the sampling and setup of experiments clear but I am still a little confused. For one, it would be helpful to describe the shape of the sponges, presumably massive/round? Second, why were these cut into three pieces- for each isotope tracer, is that right? *Details on sponge shape added in text. The sponges were cut into three sections to aid dissection. To ensure that we used only the choanosomal portion of the tissue, the most practical way to dissect this from a large individual was to cut the sponge into three pieces. Three whole sponges (n=3) were collected for each species. The dissected tissue from a single sponge represents one replicate. Also these details were now added to the text.*

Pg 9

L17: This setup was on the ship yes? Might be good to remind the reader of that
On the ship for arctic species, in the lab for boreal species – clearly stated in line 13-15

L18: Why only sand filter for the boreal specimens?

It was the only option available in that lab facility.

Pg11 L13: Can the authors say how many samples were sampled at each time point rather than “a selection” – or am I missing something here?

Corrected: 3 samples per species (one for each replicate specimen)

Pg13 L12: This seems redundant because of pg 12, which would be ok, but it makes it a little confusing

As we did not detect any anammox, we could not calculate the rates or contribution of anammox to total N₂ production according to this method. Is this what the referee means by redundant?

Pg13 L23: Is it possible to give a little more guidance on the calculation of nitrification derived nitrate? It would be helpful for the reader and worth the word count since this becomes an important piece of information in the discussion.

Section is now extended including equations

Pg 14: Out of curiosity, why was amoA not quantified? Since the authors are interested in nitrification rates as well

This work focusses on denitrification. Coupled nitrification/denitrification was of interest in this context, but it was never our intention to quantify total nitrification rates or the genes involved. Nitrification in sponges is well explored already, while denitrification is not.

Pg 17 L3 – I suggest adding some of these calculations (even brief) in a supplemental document

Done

Pg18 L23: “proving” is a strong word... maybe “demonstrating” works better? (when possible in

other instances for the use of “prove” is there another word that could work?)

Rephrased

Pg18 L24: Fiore et al. 2010 is a review paper so I don't know that that fits in here with this sentence

OK we took it out

Pg19

L3-9: The information in this pp is fine, but I don't really see the point of the pp. It could use some language to tie it into the paper more.

The aim of this paragraph is to explain why we were not able to reproduce the (very low) anammox rates that we had quantified in one of the species previously. If the reviewer and the editor advice to delete this paragraph, we will do so.

L11: This sentence is awkward, try to reword without using “being”- just using “As denitrification is an...” would be much more straightforward.

OK, rephrased

L15-16: certainly interesting, but this sentence also leaves me wondering, what is the point? It would be nice to have it tied in more clearly for the reader.

The point is that an aerobic process and an anaerobic process happen at the same time. Even though this has been described before, it is unusual since aerobic processes usually take over as soon as oxygen is present. We think we have a point here?

Pg20

L1-6: It would be helpful to have more context here on any work that has been done to measure pumping activity – has anyone done this? Do we have any idea of these deep sea

sponges behave the same as others? The authors do get to this type of info later in the discussion but this pp seems lacking a bit as is.

We think that the references we give here and the information we provide later is sufficient.

L7-8: The use of “(anaerobic)” and “(some)” is confusing to me

Agree, clarified

Pg21 L16-17: The first point here about oxygen in the specimens here vs explants is confusing as to what the point is. I think I get what the authors want to say but it is not all that clear here and could be tied in better.

Section entirely rephrased, as re-calculation of the data gave a much better fit with literature values, so there is no need any more to explain differences.

Pg22 L20: “prepared and optimized” – I get hung up on “optimized” here, is there better way to say this? I think the authors mean the community is well suited to this environment or adapted to this environment, but optimized sounds odd to me

Agree, rephrased

Pg23 L8: instead of “apparatus turned on” maybe say “genes expressed”

Agree, rephrased

Pg24 L14: would be helpful to give some of this info briefly (sediment denitrification rates)
I think there is no need to go into detail, this information can be looked up in the cited references.

Pg25 L19-22: seems more to the point here to contrast with nitrification studies showing release of nitrate, rather than discussing “nutrients” as a whole which is vague
No, it is the contrast with both nitrification studies showing release of nitrate, and mineralisation studies showing release of ammonium. Good point, we made this more clear now.

Pg26 L4-5: This sentence is not tied in well, so it reads a bit awkward

Rephrased

Pg26 L6-7: This last sentence is a bit awkward and unclear at the end.

Rephrased

Technical Comments:

L10 abstract: “thus lead to that”

We were not able to find this sentence

pg 5 L21: “This opens for”

Rephrased

Pg 7 L15: check reference format

Reference format is generated automatically in EndNote. We will do the formatting when the manuscript is accepted and no references have to be removed or added.

Pg 15 L 6: “Standard of qPCR”

Rephrased to “qPCR standard”.

Pg19 L21: parentheses for references- it looks like it should be: (e.g., Wilson....).

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Pg22 L4: "origin" should be "originate" I think

OK

Pg24 L10-11: are the "-" supposed to be there? Yes

Pg24 L18: "since we do know" – maybe just remove "do"

ok

Pg25 L5 and 12: extra parenthesis

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