

Review of the manuscript bg-2019-382.

General comments

The manuscript entitled “Foraminiferal community response to seasonal anoxia in Lake Grevelingen (the Netherlands)” by Richirt et al. consists of a field study which aims to analyze the benthic foraminiferal community characteristics during 1.5 years, during when seasonal hypoxia/anoxia occurs together with presence of H₂S. The results are very interesting and will be useful for the community, and the figures are clear and informative. However, the paper is poorly structured, and some statements need to be taken more carefully. Therefore, I suggest the following revisions before publication in Biogeosciences.

A restructuration of the material and methods section seems necessary. I suggest to create a studied area section, separated from the material and methods, with a description of the lake and the Den Osse Basin. It would be especially interesting as, as the authors say in the introduction, “a large amount of environmental data is available” (Line 64). This section should include all the references cited in the second part of section 2.1 (which should then be deleted) and in section 4.2 from the discussion. This section 4.2 is a description of already published results, not a discussion of the results from this paper. I suggest moving this paragraph to the studied area section.

The CTG method and a comparison with the Rose Bengal method was published in 2006, which is thirteen years ago. Since then, many studies have successfully used CTG to label their samples. I do not think that this part of the discussion about why the authors have chosen this method is necessary. The whole section 4.1 is a repetition of what you say in the introduction and does not bring anything new, it should be removed.

The discussion needs to be restructured as well. The first two paragraphs of section 4.3 are a description of the literature, not a discussion. I would move them in the introduction section, and cite these references where they are relevant, later in the discussion. Similarly in section 4.4, the 3rd paragraph is literature description that should or go in the introduction and/or be included later when discussing the results of the paper. I strongly suggest to reconsider the whole structure of the section 4.4, which I find not easy to read in the current state.

The authors should be very careful about the reaction times they give in the discussion and conclusion. For example, line 329, the “two months after” cannot be assessed for sure, as we do not have information about the fauna in October. Picking does take a lot of time, and I understand that picking all the months was not possible, but I recommend using more approximate times, especially for station 1. Moreover, for me at station 1 on Fig. 11, the foraminiferal response to H₂S appears immediate, as their abundance is lower already in July. Could the authors explain?

In the results, a full paragraph is dedicated to encrusted forms, together with a full plate of pictures, and two detailed graphs. I suggest to strongly develop this part in the discussion, which now consists of 4 lines, to include the information from the second paragraph of section 3.4 – and explanation given by these authors –, and the following references: Cedhagen 1996 (Phuket Marine Biological Center), and Heinz et al. 2005 (Marine Biology Research). Please also explain the current statements, do you suggest that the feeding cysts only get formed when *P. globosa* is blooming?

Please find below minor suggestions and text comments.

Minor comments

Abstract

Line 19: early diagenesis and organic matter recycling are mentioned here but never again in the paper. Please explain.

Line 30: This is in contradiction with your conclusion, is there not a “drop in standing stocks” for station 2?

Line 34-35: The two sentences are in contradiction, please rephrase.

Line 32: Replace “H2S” by “H₂S”.

Introduction

Please shortly explain what are foraminifera, what are their place and role in these types of environment, and why you chose them for your study.

Line 43-46: This sentence is long and confusing, please rephrase.

Line 46: Could you give some examples of these consequences?

Line 50: I suggest to specify which ones of these references are field or culture studies, and to reconsider the sentence accordingly.

Line 52: Could you explain why/how anoxia and H₂S are linked?

Lines 77-78: These references are already cited earlier. Please restructure.

Line 81: Please add references, even if they are “sparse”.

Line 82: Is there not any previous foraminiferal studies in the lake itself?

Lines 82-92: Please shorten this part, the CTG method is well known already.

Lines 96-97: This belongs to the method section, please remove.

Line 100: example of these indices?

Material and Methods

The description of the lake is not a part of the method. See also my general comments.

Please specify that SEM pictures were taken for the four dominant species including encrusted specimens, with which microscope and where were they taken.

Lines 112-114: This paragraph should be moved to the field sampling section.

Line 114: I guess a map is available in the cited paper? Maybe you can precise it here?

Line 118: “similarly”, by who?

Line 120: Please give more details about the sampling. I see in the acknowledgments that the r/v Luctor was involved. What kind of corer was used? How long were the cores? Were some environmental data taken at the same time?

Line 123: I know that CTG labelling happens on the field. But after that you talk about picking. As this is not a field sampling event, I would move this to the sample treatment section.

Line 127: Add “finally” before “investigated”. See my comment about Table 1.

Line 133: “previous studies”, where were they? Please add references.

Line 166: On which species was this done, and how many specimens were used?

Results

Line 178-179: Remove this sentence. You already explain it in the method, and the Figure 2 has a caption.

Line 179: Please check if you mean total or mean abundances here.

Line 183: I would be careful with the use of “early” and “late”, talking about the seasons. July is not early summer. Line 433, March is not winter. Please check through the paper, maybe giving the months is the most accurate solution.

Lines 194-195: Please remove this sentence, you have already explained in the method.

Line 197: Replace “Fig.4” by “Figure 4”. This sentence should be moved to the method section.

Lines 203-204: I suggest to remove this sentence, it does not bring anything new.

Line 206: Add “and Table 2” after Fig. 4.

Line 211: Remove “(fairly low)”

Line 213: We know that *T. inflata* was absent in 2011, as you said it line 205. Please rephrase. I think the way you described the results for the station 2 is clearer than for station 1. I suggest to also describe the station 1 species by species, instead of year by year.

Line 225: Please remove “Conversely to station 1”, this is confusing here.

Lines 230-233: This should be moved to the methods section.

Line 234: Please add “(Fig. 6)” after “station 2”.

Lines 256 and 258: same information, please modify.

Line 260: “Similar observations”, where?

Line 260-262: This part should go to the discussion section.

Line 263: Please remove this sentence and cite the Figure 9 in the following sentence.

Discussion

I think the section 4.1 should be removed from the paper. See also my general comments.

The information given in the 4.2 section are not results from this paper, they are a description of the site citing already published papers. This should go in the studied area section. See also my general comments.

In section 4.3, the actual discussion starts on line 321. See also my general comments.

Line 337: Do you have information about why the 2011 hypoxia was so severe compared to the 2012 one?

Line 339: I know that this study only focus on living fauna, but it would have been interesting to check the dead fauna further down in the cores, to see if standing stocks were indeed higher before the 2011 severe hypoxia.

Line 345: Could you explain how you deduced these “6 months” of recovery? As the hypoxia event was much more severe in 2011, how could we know if the H₂S stayed longer in the upper sediment compared to 2012, and thus how long it affected the fauna? Please explain.

Line 366: Please remove “(i.e. like station 1)”.

Line 365: This paragraph and the following one are very similar. I suggest to merge them.

Line 379: We cannot be sure about that, as there are no available data. Please modify this statement.

Line 386: Remove “(in contrast to station 2)”.

Line 387: “by the nearby sites”, I thought the water circulation was weak in the lake? Is transportation then possible? Please check.

Lines 395-396: This sentence belongs to the results section, please remove.

Line 437: But no diatoms?

Line 438: Which *Elphidium*? Elphidiids?

Line 440-441: Remove this sentence, it is confusing there, and you talk about this aspect just after.

Line 470: What about *T. inflata*?

Lines 476-479: This part should be developed. See also my general comments.

Conclusion

I would add a short introductory sentence or add details to the first sentence, to quickly remind the reader what you did.

References

Biogeosciences is very careful with bibliography details. Please go through your references list: ~10 papers miss doi, some miss page range, etc.

Figures

Table 1: You say in the text that the sampling happened every month, but that you only analyzed specific months. Thus, is the title correct here?

Figure 1: In the caption, remove “This figure shows” in the first sentence, and add somewhere “for size measurement” as well as “ImageJ software”.

Figure 2: I don’t think “Total living assemblage” is necessary below Station 1 and Station 2. Instead, it would be better to have this as the vertical axis title, with the unit (ind. 10 cm⁻³) into brackets. In the caption, replace “for which” by “where” to be consistent with other captions.

Figure 4: Vertical axis title?

Figure 5: Vertical axis title? Also, I guess you mean “station 1” in the last sentence. Please check the months in bold.

Figure 9: Vertical axis title? It would be informative to have the percentage of encrusted specimens on top of each bar.

Figure 11: You use the word “suboxic” in the caption, it’s not coherent with the rest of the paper. Please check the months in bold.

Figure 12: “Figure 12”.

I hope my comments will be taken by the authors in a spirit of constructive criticism with only intention to further improve their manuscript.

Sincerely, Laurie M. Charrieau