

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2022-23

Anonymous Referee #1

Referee comment on "Trawling effects on biogeochemical processes are mediated by fauna in high-energy biogenic-reef-inhabited coastal sediments" by Justin C. Tiano et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-23-RC1>, 2022

General comments

This manuscript reports results from a comprehensive experimental investigation into the effects from two trawling gear types on *Lanice conchilega* habitats in the Vlakte van de Raan (Netherlands). Physical, biological and biogeochemical effects are well investigated and this work contributes significantly to the current evidence base, particularly regarding biochemical impacts from different gear types under varying environmental settings.

This paper matches well with the brief of the Biogeosciences journal, with other recent papers published in this journal on similar topics (e.g. Paradis, Pusceddu et al. (2019), De Borger, Tiano et al. (2021)). I would recommend the paper for publication after minor revisions.

General concerns:

- Reference sites: Reference site 2 seems to have significantly different grain size (Fig S1). Reference sites also have large variation in O₂ consumption and species densities (Fig 6), as well as higher mean mixing rates (Table 2) and generally higher species densities when compared to treatment sites (Fig 6). Are these sites definitely representative of treatment sites? Information should be provided in the methods on how it was assured that all treatment sites and reference sites were generally environmentally representative of each other.
- Methods: It is not always clear how data analyses were undertaken e.g. Were the non-parametric tests undertaken in R and with what packages. How were the biological mixing models on bioturbation analysed, and with what software? Make sure sufficient detail is provided throughout the methods where necessary.
- Results: Some of the results seem superfluous. e.g SMP POC and TN; and backscatter

testing between all pairwise combinations and factors. Throughout the manuscript, results should only be reported where they contribute to the narrative of the paper and are mentioned within the discussion. I realise it is tempting to report all results which were produced within the investigation but, results should be removed where they are superfluous to the narrative, discussions or conclusions.

Specific comments

L16: To add context it should be noted within the abstract that this is looking at “acute impacts by experimental disturbance from representative fishing gears”; or other similar phrasing conveying the same message.

L23: Taxon densities and species richness of what?

L35-36: It seems contradictory to say *L. conchilega* habitats are under “considerable threat” from bottom trawling, and then state that they have “biological resilience to bottom trawl impacts”.

L40: Alter to state “Bottom fishing affects carbon cycling on the seafloor” or “in seabed sediments”.

L42-43: again add “reduced mineralization of organic carbon in seabed sediments”.

L91: State the minimum distance experimental areas were separated by.

L92-93/Fig 1: It would be clearer if these three sampling stations (western, middle and eastern) were shown within the figure. E.g. with lined boxes.

L94: What was the size of the reference areas? How close were they to treatment areas?

L94: It would be good to give some descriptive information on how the different treatment and reference areas were determined to have similar/same environmental and biological settings.

L102: It would be clearer to move Table 1 to the supplementary material as it is overly detailed - simply put a descriptive sentence here (L102). E.g. that samples were collected between x-x hours before trawling and x-x hours after.

L156-59: Here, and in other places within the methods (e.g. L141-146), you do not need to repeat the dates of sample collection if they are already reported in Table 1. If you want to add a brief descriptor in terms of time before/after trawling then try to be more general as suggested above (with reference to Table 1 for more detail).

L161: I think it would be clearer if this simply said "Two out of the three box cores were subsampled for sediment parameters from each treatment and reference station".

L163: Did all of the sediment pass through 1mm? If not, was this fraction considered?

L179: Should be simplified to state "Pore water was collected from the same box cores as used for sediment parameter sampling".

L293-295: The details of the results from all the different bio-mixing models do not seem to be reported. They should be present in a Supplementary table with the AIC scores for each model and the selected optimal model highlighted.

L230: LMMs were used to investigate what about the stated responses variables? Significant differences between T0 and T1 for each treatment separately? This needs to be explained better.

L250-253: There is no use/discussion of SPM POC and TN in the discussion. Remove from results as the information seems to be superfluous.

L269-270: Backscatter results seem overly explorative as much of the reported differences (or lack of differences) are not mentioned in the discussion. E.g. Why are you testing for differences between sites separate from the consideration of trawling impact?

L265: It is not clear where these statistical tests have been reported. The legends of Table S1 and Table S2 should be expanded so it is clear how statistical significance was determined.

L268-269: Again Fig 3 does not report the statistical tests. Where are these reported?

L270: Again, where are these p-values and pairwise differences reported? They are not shown in Fig. 3

L284-287: It is not clear what this adds to the story of the paper. Remove to aid clarity.

L287: In the methods "Robust regression analysis" is only discussed in relation to Section 2.7.4 (Impact of *Lanice conchilega*). It is not clear why/how it is used here.

L288-290: Add "between T0 and T1" to the end of this sentence to aid clarity.

L299-303: There is a lot in the results, to keep the focus of the reader I would remove this more descriptive information if it is not used later in this paper. Its presence in the supplementary is sufficient.

L311: Restructure sentence so it starts "For all fishing treatments....". Just so it is clear you are no longer talking about just Tickler.

L343: It is not clear why Fig 3 is specifically referenced here.

L347-349: Remove this sentence. There is no need to introduce the discussion by saying you are going to "discuss".

L360-369: Is it not also possible that increased current speeds would transport trawl-induced resuspended sediment away from potential sampling equipment more quickly, therefore reducing likely SPM effect? Or is it considered that the sampling equipment were too close to the trawl disturbance for this to be an influencing factor?

L376: Remove statement about variation between northern and southern plots. It does not add anything to the messaging of the paper.

L389: Some mention should be made into the significant difference in anoxic sediment in the reference sites between T0 and T1, and how this may influence results of treatment

sites.

L394: Remove discussion of reference sites – again it is not clear how this contributes to the discussion and messaging of the paper in general.

L396: I think it is important to reiterate here that it was not statistically significant.

L406-407: This is already mentioned in Section 4.2; no need to repeat here.

L408: Change to “Despite the lower impact of Chl a”

L471-472: Rephrase, to remove “environmental benefit”. Fishing cannot really be said to have environmental benefit. Perhaps change to say “there is potential for reduced environmental impact from pulse trawls due to its higher catch efficiency.....”.

L745: Alter to state “Example sediment profile imagery...”

Tables: Table 2 and Table 3 should be combined. This would aid clarity and there is no need for them to be separated.

Technical corrections

L134: I assume this is meant to state T1 rather than T2.

References mentioned

De Borger, E., et al. (2021). "Impact of bottom trawling on sediment biogeochemistry: a modelling approach." *Biogeosciences* **18**: 2539–2557.

Paradis, S., et al. (2019). "Organic matter contents and degradation in a highly trawled area during fresh particle inputs (Gulf of Castellammare, southwestern Mediterranean)." *Biogeosciences* **16**(21): 4307-4320.