

Biogeosciences Discuss., referee comment RC2  
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## Comment on bg-2022-23

Anonymous Referee #2

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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-RC2>, 2022

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### General comments

This contribution presents results from an intense in situ experiment, investigating into trawling effects inflicted by different trawling gears on a shallow, 10 m water depth, sandy sediment inhabited by the polychaete *Lanice conchilega*, which locally forms dense tube "lawns", here termed biogenetic "reefs". The investigation encompasses physical impact on sediment structure, biological and biogeochemical effects thereof. It is well conducted and the data are by enlarge well interpreted; thus, this study is an important contribution to literature. The shallow water setting in particular, the different disciplines involved as well as a substantial data set on biogeochemical aspects of the impact, will make it a valuable publication.

It will contribute both to publications in Biogeosciences and in other journals on this growing body of evidence. I recommend the manuscript for publication subject to minor revisions.

### Major points

- Bioturbation results ...  
Did you average  $D_B$  from different models? This would involve averaging  $D_B$  representative of different portions of the overall particle transport ( $D_B$  represents all of transport in model 2, however only parts of the overall transport in higher models)  
Please comment on this and add information. This becomes particularly important in the context of results discussed in line 296, i.e. "physical trawling enhances  $D_B$ ".

- SCOC ...  
Could you please comment on the unusually high absolute values (see also recent database by Stratmann et al. 2022)?  
SCOC of  $>400 \text{ mmol m}^{-2} \text{ d}^{-1}$  at  $\sim 500 \text{ g WW m}^{-2}$  *conchilega* or  $\sim 700 \text{ mmol m}^{-2} \text{ d}^{-1}$  at  $\sim 1400 \text{ g WW m}^{-2}$  seem at least questionable! My reasoning is as follows. The later biomass could be responsible for around  $100 \text{ mmol oxygen m}^{-2} \text{ d}^{-1}$ , if biomass-specific respiration is around  $2.5 \text{ mg O}_2 \text{ g}^{-1} \text{ h}^{-1}$  as for smaller sized polychaetes (e.g. Bennett and Rakocinski 2020). However, who or which additional process in a lawn of *Lanice conchilega* could respire an additional  $600 \text{ mmol m}^{-2} \text{ d}^{-1}$ ?
- The reference stations are not ideal in that they represent extremes in some measures and do not represent an expected average background (high oxygen demand, high faunal density, intense bioturbation). It is necessary to address this issue for it obviously raises the questions if the trawling effects can be and are at all compared to the references, or if they are only compared between T0 and T1 on trawling plots. Does the statistical analyses take care of this? It is hard to see this easily.

### Specific comments

L 41: "maximize" does not seem the right word here. Alterations of sediment structure implies changes of (possibly steady-state) diagenetic conditions. "Impairing biogeochemical processes"?

L 61: the sentence would be more straightforward if it read: "With respect to sensitivity to direct impact and recovery potential, coarse sediment ecosystems characterized by high levels of natural disturbance typically display more resistance and resilience to bottom fishing ..."

Fig 1: The insert dimensions are MUCH smaller ( $\sim 1.8 \text{ km}$  wide) than the square indicating the location on the left map in Figure 1 ( $\sim 20 \text{ km}$  wide). This is a bit misleading and could be changed by reducing the square's size.

Tab 1: This table could easily move to supplements. It contains only background information that is not necessary for understanding the main text.

L 125: "wide" should be "width"

L 154: The total number of 69 box cores cannot be understood without the information that at R3 only T1 was sampled! A total would be 72 (2 times 3 replicates at 9+3 plots/reference station, i.e.  $6 \times 12=72$ ). Not sampling R3 for T0 reduces this number by 3. Right? Reword to include that R3 only T1 was sampled.

L 171-177: Following these details describing the model "family" there is no information in lines 193 and thereafter as to why only  $D_B$  is reported. Was there no non-local effect visible in the modeling results? Maybe report (some) of these results as well in the supplement. And consider the information in  $D_B$  as mentioned in the major points above.

L 187: incubation on board or at land, how much time to settle after coring impact?

2.7.3. (SPI and benthic sample analysis) after reading this and not acquainted with the specific analyses, my impression is that this allows to separate effects of T0 or T1 and temperature at the same station for the mentioned parameters? Add some information explaining what the described procedure yields, please.

Tables S1 and S2 have much too little information their respective legends. Please add.

L 268-270: if all these statistical results are provided with reference to Figure 3, they should be shown there. I cannot find that statistical information in Fig 3!

L 280 and thereafter: Some of the results reported here are somewhat superfluous for they display commonly known relations of sediment grain size and other sediment related parameters (coarser grain size is associated with less fines, more fine material usually correlates with more chlorophyll). Thus the passage could be a bit shorter.

Figures 6 and 7: why is SCOC (fig.7) called oxygen consumption in Fig 6? Are those not the same values as in Fig 7?

L 348: the passage "to physical, biogeochemical, and ecological characteristics" is again mentioned in line 357 as "simultaneously investigates acute beam trawl impacts on biological (Rabaut et al., 2008), physical (Depestele et al., 2016) and biogeochemical dynamics". I suggest removing it in line 348.

L 375 and thereafter: This is a lot of text for little change seen or measured! Can it be reduced?

L 396: Did  $D_B$  really increase? It may well be so, however, an increased burial with more random mixing of sediments is not always the case. Increased mineralization of labile material may counteract overall burial. A more cautious wording, such as "it may result in altered OM diagenesis and nutrient cycling", is warranted.

L 406: this is an unnecessary repetition of the bathymetry discussion above

L 420: Lanice additionally extends its tubes up to 20 cm below the surface. Therefore the subsequent sentence (line 22) sentence should state "... to organisms without pronounced protruding sediment surface structures."

L 464: This is a bit of discussion and maybe should not be in conclusions.

L 479: "removal of sedimentary carbon"; this is why above there should be no statement of enhanced  $D'B'$  increasing burial!

### **Technical corrections**

L 525 "(Blackburn 1988)" does not belong in this Breakman et al. 2010 citation

### **Literatur**

Bennett AD and Rakocinski CF (2020) Respiration by the Opportunistic Spionid Polychaete *Streblospio gynobranchiata* during Adjustment to and Recovery from Moderate Hypoxia. *Diversity*, 12, 73; doi:10.3390/d12020073