Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-241-RC1, 2019

Biogeosciences
Discussions

Interactive comment on "Effects of the arrival of fresh organic matter on eroded and nutrient-depleted trawling grounds (Gulf of Castellammare, SW Mediterranean)" *by* Sarah Paradis et al.

Sebastiaan van de Velde (Referee)

sebastiv@ucr.edu

Received and published: 5 July 2019

Paradis and coworkers describe the impact of bottom trawling on the organic matter content and quality in marine sediments. They do this by measuring the organic carbon quantity, as well as proxies for organic matter quality (like pigments, proteins, lipids . . .) in sediment cores collected at two sites with a different trawling intensity. They show that both sites experienced different intensities of trawling by measuring measuring radionuclides (210Pb, 137Cs and 234Th).

This paper discusses an important topic about which very little is currently known. Bottom trawling fishing represents likely one of the dominant anthropogenic impacts on coastal and shelf sediments, and is rapidly expanding in deeper waters. This represents a potential (and largely unknown) threat for the marine environment, which is already under a lot of pressure. This study has been well designed and executed, and the data presented is of high quality and will be of interest to many readers, and possibly also to the general public. I read it with great interest and offer only a few comments/suggestions for consideration along with some minor editorial suggestions.

Comments:

1. I feel that the title does not really reflect the contents. Most of the paper deals with the impact of bottom trawling fishing on the sedimentary organic matter dynamics, of which the arrival of fresh organic matter is part. Perhaps something like 'the impact of trawling on organic matter dynamics in sediments of the Gulf of Castellammare (SW Mediterranean)' would be more appropriate.

2. I like that the paper is written very concise and to the point. I do however feel that the abstract is a bit out of balance with the rest of the paper. If possible, I would try to shorten it somewhat.

3. Introduction: It might be relevant to mention the common depth range of the sediment that is resuspended after trawling, as it might be important when considering the impact of changing the frequency of trawling. For example, if your site has a sedimentation rate of 0.15 yr-1, and you decrease trawling frequency to once every 10 years, and the trawl resuspends the upper 15 cm of sediment, the impact is still considerable.

4. P10L14: Would you expect coarser sediment to be washed away following trawling induced resuspension? I would assume the inverse happens, that the finer-grained, OM rich material gets washed away, and the coarser material remains behind. Also, the grain size of the trawled site has near-identical values for its grain size. Unless you mean that the finest material does not settle as fast as the intermediate grain sizes (but

that should then be explained a bit clearer).

5. P10L22-26: Another explanation could be that the resuspension and mixing stimulates the breakdown of organic matter that is already present, thus leading to lower concentrations. This is also what you allude to in P11L15-23, an increase in mineralization rates due to the mixing of refractory and fresh compounds. If it is noticeable after the deposition of fresh material, I assume it will play a role over the longer term too. Most likely the truth exists somewhere in the middle, and the impact of bottom trawling induced resuspension events is likely very dependent on the exact grain size. For example, we found recently that this mixing stimulates organic matter breakdown in a fine grained (63% clay) sediment in the North Sea (van de Velde et al., 2018, Scientific Reports), whereas Tiano et al. (2019, ICES Journal of Marine Science) found that sediment metabolism actually went down after trawling. The North Sea site of Tiano et al. (which is a reference you should include) was much however much sandier (30% silt, 40% fine sand). Maybe it would be worth expanding the discussion a bit, and considering both end-member scenarios.

6. P11L29: this is a nice section to end the discussion, maybe it would be worth expanding this a bit, maybe by being a bit more concrete in the potential mitigation effects? This could be related to my comment about the depth of the bottom trawling, how long would temporary need to be to really mitigate the effect?

Minor editorial suggestions:

As a more general remark, you say you sliced cores in triplicate, but I only see one profile per figure and per site (and the captions says that the error bars represent the analytical error). What happened to the other 2 cores that were sliced?

P4L13-15: 'concentrations of sedimentary organic matter in superficial sediments tend to increase' and later 'stimulate mineralization of buried and refractory organic matter' This seems contradictory to me, as stimulating mineralization would decrease organic matter.

P3L17: move 'are' between 'sedimentary organic matter' and 'by'

P4L13: you mention that you slice cores on deck, up to 9cm depth, but later you show figures with date up to 20 cm depth? (e.g. Fig.2)

P5L11: why did you limit measurements to the upper 5 cm? I assume that is because activities dropped below the detection limit, but it might be nice to mention that here.

P8L8: Maybe it is not relevant for this paper, but why would the CaCO3 contents differ?

P11L18: Aller (1994) is not an appropriate reference, this paper deals with bioturbation an redox oscillations, not self-priming.

Figs 2 and 3 could be combined into 1

Refs:

van de Velde S., Van Lancker V., Hidalgo-Martinez S., Berelson W.M. and Meysman F.J.R. (2018) Anthopogenic disturbance keeps the coastal seafloor biogeochemistry in a transient state. Scientific Reports. DOI:10.1038/s41598-018-23925-y

Tiano J.C., Witbaard R., Bergman M.J.N., van Rijswijk P., Tramper A., van Oevelen D. and Soetaert K. (2019) Acute impacts of bottom trawl gears on benthic metabolism and nutrient cycling. ICES Journal of Marine Science. DOI:10.1093/icesjms/fsz060

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