Biogeosciences Discuss., 7, C1385–C1390, 2010
www.biogeosciences-discuss.net/7/C1385/2010/

Biogeosciences Discussions

Interactive comment on "The trophic biology of the holothurian *Molpadia musculus* at 3500 m in the Nazaré Canyon (NE Atlantic)" *by* T. Amaro et al.

Anonymous Referee #1

Received and published: 15 June 2010

This is an interesting manuscript and a welcome addition to the literature, whilst being suitable for publication in BG. This manuscript deals mainly with the trophic biology of the deep-sea holothurian Molpadia muscuslus found in high abundances within the Nazare Canyon. The authors place their results in the context of organic matter cycling and biodiversity and ecosystem functioning. The manuscript is generally well written and easy to follow but I have some minor suggests and comments outlined below. I think the title could better reflect the results of this study. The authors have some exciting results and this should be mirrored in the title. Just an example, 'The trophic biology of the holothurian Molpadia musculus: implications for organic matter cycling and ecosystem functioning in a deep submarine canyon.' Abstract Line 1: change to. . .'a key role in ecosystem functioning of the deep-sea.' Line 2: insert 'water' before depth Line 3: change 'found' to 'observed' Line 5: change to. . .'using an ROV

and in situ experiments were conducted with incubation chambers.' Line 9: remove 'conversely' Line 10: remove 'and' replace with a comma so it reads. . .'compounds, decreasing significantly. . .' Line 11-12: Replace 'about' with 'approximately'. Remove 'already'. Replace 'final' with 'total' Line 14: insert 'the' before biopolymeric C Line 15-16: remove 'we also calculated' change to. . .'We estimate that the population of M. musculus could remove. . .' Replace 'about' with 'approximately' Line 17: remove 'the' before M. musculus Introduction Line 25: There are more appropriate references to cite here e.g. Page 3063 Line 1: too many references here, choose appropriate ones, maybe also include De Leo et al. (http://dx.doi.org/10.1098/rspb.2010.0462) Line 3: Change to . . .'Within canyons biodiversity is high, as a result of their. . .' Cite Vetter et al. 2010 (doi:10.1111/j.1439-0485.2009.00351.x) Line 5: I would rephrase to: 'The topographic complexity of canyons make them difficult ecosystems to investigate.' Line 6: Comment: The authors refer to ecological functioning and ecosystem functioning throughout the manuscript. These terms often mean different things to different people and to also across scientific disciplines. I would advise the authors to define what they mean when they use this term in the introduction. To me as a reviewer it is perfectly obvious that the authors are mostly referring to organic matter cycling but I think it for a wider audience it needs to be defined. Line 11: change to '(BPC) have been observed within the. . .' The authors should also cite Schmidt et al. here (Marine Geology, 2001, 173: 55-67). Line 12: change to 'this canyon may act. . .' Line 17: change to 'and increased metabolic. . .' Line 20: change to 'occurs in consistently high abundances. . .' Line 22: change to 'The reasons for such high abundances remain unknown.' Line 23: change to 'Food supply is. . .' Line 24: remove 'for example' Line 25: change to 'megafaunal abundance, in particular holothurians. . .at an abyssal site in the NE Pacific Ocean.' Line 26: change to 'have also been reported in the. . .(PAP, NE Atlantic).' Line 27: change to 'Food sources for. . .(including seagrass/algae debris. . .)...' The authors should include here some discussion of the POC flux and deposition of phytodetritus. . .this is worth mentioning, especially as the authors refer to this later. Page 3064 Line 2: change to 'determines the . . .' Lines 14-20: Comment: The au-

thors discuss papers here that determine assimilation efficiencies of holothurians, they should point out that these holothurians employ different feeding strategies. Line 25: change to 'owing to the high abundances of this. . .' Materials and Methods Page 3065 Lines 8-9: change to 'The sediment is actively transported from the upper continental shelf to the canyon and abyssal plain by. . .' Lines 11-12: change to 'The currents flowing down the canyons lead to. . .' Line 15: change to 'whereas sand and even coarser. . .' Line 16: change to '(maximum current speeds of up to. . .)' Do the authors have a reference for this or did they measure these currents themselves? If they were measured please state how in the methods Line 17: remove comma after and Lines 20-25: Comment: I would describe this species as a head-down deposit feeder or a sub-surface deposit feeder. Surface burrowing deposit feeder is a little misleading. The authors may also like to note that it is a mound builder and conveyer belt feeder. Also it would be useful to state why the tail is in contact with the surface. . .I presume for bioirrigation, another very important process in terms of nutrient cycling. Page 3066 Line 2: change to 'Eight megacore deployments, fitted with x core tubes. . .' How many cores were placed on the megacorer? It would be useful to state what area of seafloor this is equivalent to. Line 5: remove holothurians. Line 9-12: change to 'Intact animals were collected using scoops. Undisturbed sediment samples were collected with push cores (n=3) fitted with. . ..' Line 13: change to 'upon recovery all cores were sliced at the following intervals. . .' Line 15: change 'about' to 'approximately' Line 17: change 'digged' to 'dug' Line 22: change to 'Molpadia musculus specimens were placed. . .' Line 26: the authors refer to a manuscript by Amaro et al 2009 for the dissection of the holothurians but I assume that the authors also followed the methods of Roberts et al. 1996 and Ginger et al. 2001. If so these authors should be cited here. Page 3067 Line 19: 'about' should be replaced with 'approximately' Page 3068 Data analyses: did the authors check for normal distribution and homogeneity of variance within the data set before performing ANOVAs? If so how? Maybe the authors could place the results of these tests in table 2 or in the methods section. Results Page 3069 Section 3.1: Comment: It might be useful for the authors to (a) give abundances as per m3, given

that the multiple cores are 3-dimensional and also to state the average depth within the sediment that M. musculus was found. Section 3.2. The authors might like to include a section in the results to discuss the potential contamination problems of lysis of gut wall cells on the death of the organisms and the associated problems of dissecting and sampling these animals' guts. FitzGeorge Balfour et al. (2010) discuss this, see Deep-Sea Research II 57: 1418-1428. However, I do not believe that cell lysis has had an effect on these results, as the biochemistry of the gut contents closely reflects that of the sediments. Discussion Page 3071 Line 1: change 'about' to 'approximately', also in lines 2 and 3. Line 11: remove 'The' and change to 'Permanova revealed that. . .' Page 3072 Line 1: change to 'such an increase in holothurian abunance. . .' Line 7: De Leo et al (refered to above) also found extremely high abundances of the same species in a canyon in the Kaikoura canyon, New Zealand. Comment: The authors discuss the presence of high proteins here and suggest that it is labile or relatively fresh OM. It would be interesting to see this data in conjunction with basic sediment chemistry i.e. TN, TOC and C/N ratios. Do the authors have this information? If so I think it should be presented and discussed in this manuscript. Also do the authors have any idea about other biomarkers present within the sediments e.g. lipids which might give further information on organic matter sources? Page 3073 Line 1: The authors should also cite Schmidt et al. here. Line 11: replace 'like' with 'e.g.' Line 18: The authors regularly cite manuscripts referring to meiofauna, while there is nothing wrong with this per se, I do feel that the authors could also cite some of the literature relevant to their topic i.e. megafauna. Line 20: remove 'sort of' replace with 'synonymous with a bioreactor' Page 3074 Line 4: Remove since, start sentence with and change to. . .This enzyme is responsible for the hydrolysis of proteins, breaking them down into oligomers, which are more easily assimilated by the animal (Roberts et al. 2001). We believe that the mid gut is the portion of the holothurians gut. . . Line 17: change to. . .(Roberts et al. 2001). Therefore, holothurians could also play an important role in Phosphorus cycling in deep-sea sediments. Line 28: change to. . .food-rich particles during ingestion. . . Page 3075 Line 1: change to 'organism preferentially assimilates specific molecules

during digestion of food through its gut. . .' Line 6: change to 'However, this concentration factor may vary depending on season (Billett et al. 1998).' Line 7: change to 'Radiocarbon data (a proxy for labile OM) suggest that M. musculus has a low particle selection index and high digestive selection index (McClintic et al. 2008, Puriton et al. 2008). This observation is in agreement with (Miller et al. 2000), who found labile material in the guts of molpadiids using the tracer 234Th. These authors conclude that molpadiids either feed on very rich subsurface sediments or are able cache labile surface sediments down into their burrows.' Comment: Rhoads and Young found M. oolitica to be actively selecting for certain particle sizes. . .do the authors have any granulometry data from the sediment cores which may determine if M. musculus in the Nazare canyon is selecting for certain particle sizes? If these data are available it would be obviously more useful if they are samples from the same cores as the animals, although I realize this may be technically challenging to achieve. Line 15: replace 'like' with 'e.g.' and 'from the surface' to 'on labile surficial sediments'. The remainder of this sentence does not make sense so I would leave it out. Line 17: replace 'like' with 'similar to' and 'by' to 'with an optimal. . .' Line 22: change to 'individuals m2' (be consistent with units, so throughout the ms you should use individuals m2, we already know you are referring to M. musculus). Line 23-24: change to 'Canyon could remove xxx C and xxx N from the sediment.' Line 28: change to 'surface deposit feeder that could be responsible for exploiting food-rich particles from surficial sediments and may have a higher particle selectivity than M. musculus.' Page 3076 Lines 1-2: change to 'These two deposit-feeding holothurians may therefore impact the remaining benthic community through the depletion of available food sources to other organisms while influencing the trophic strategy of one other.' Comment: maybe there should be a sentence here on the differences in differing trophic strategies if known. . .allowing coexistence of these two species at such high densities, or is it simply a question of an excess of food availability? There is some stable isotope data available for both species in Mincks et al. (2008) DSR II 55:2502-2514. Comment I think you should bring the work of Smallwood, Ginger and Witbaard here instead of on line 11. Lines 3-4: change

to 'Deep-sea megafauna are the primary consumers for fresh food and phytodetritus and may have a competitive advantage when foraging for it (Billett et al. 2010).' Line 6: change to 'very active when. . .' Line 8: Comment: The authors discuss the impact of these two holothurian species on the biodiversity of macrofauna, they might also like to look at a recent paper by McClain and Barry (2010) Ecology 91: 964-976. Also Rhoads & Young and Young & Rhoads, discuss the spatial heterogeneity created by the faecal cones and on top of the mounds of M. oolitica with tubiculous polychaetes and associated suspension feeders e.g. amphipods and thyasirid bivalves. They contrast this with the pits next to the faecal cones. Did the authors or Cunha et al observe this? Was sampling for macrofauna done in such a way to compare mound with pit? Line 13: change to 'We conclude that. . .redistribution at the seafloor. . .within the. . .' Line 17: change to 'value may be. . .' Line 19: change to 'note that faeces may be important in the redistribution of OM.' Lines 22-25: change to 'They substantially modify the structure, geochemistry, mineralisation of the sediments and may be key components influencing ecosystem structure and function within submarine canyons.' Note on the literature cited, the authors cite several papers that have been submitted to a DSR special volume, in the reference list they are listed as 'submitted' but in the text they are given a year 2010. What is the status of these manuscripts are they simply submitted, or under review or in press? If so please cite appropriately and consistently. Tables and figures Table 1 change 'concerning' to 'outlining' Table 2 Define SNK Table 3 What does (oesophagus = End gut) refer to? And what does 'others' refer to? Figure 2 Maybe the photograph could be labeled for non-biologists e.g. mouth, tail. . . the name should be in italics Figures 3-6 Please indicate number of samples analysed in the legend e.g. n=3

End of Review

Interactive comment on Biogeosciences Discuss., 7, 3061, 2010.