Biogeosciences Discuss., 10, C3079–C3085, 2013
www.biogeosciences-discuss.net/10/C3079/2013/
© Author(s) 2013. This work is distributed under
the Creative Commons Attribute 3.0 License.

Biogeosciences
Discussions
Open Access

Interactive comment on "Short-term post-mortality predation and scavenging and longer-term recovery after anoxia in the northern Adriatic Sea" *by* M. Blasnig et al.

M. Blasnig et al.

stachom5@univie.ac.at

Received and published: 28 June 2013

Authors' response to reviewer comments on Manuscript "Blasnig et al."

The authors would like to thank both reviewers for their basically positive evaluation of the manuscript ("interesting field experiment" / "very interesting natural history observations"). At the same time, both reviewers felt that the conclusions drawn were perhaps too far-reaching based on the scale of the experiments. We believe we can satisfactorily rectify this discrepancy and will therefore be submitting a revised version, as encouraged by reviewer 1, that incorporates all the reviewers' points.

Reviewer 1. Fundamental points (abbreviated reviewer comments in italics, response

in normal lettering)

(1) "scale of experiments small. . ." While 0.25m^2 per plot admittedly sounds small, the area enclosed actually measured 50 x 50 cm x 50 cm, which is the maximum size of any benthic chamber we are aware of. We would have been unable to handle a larger unit underwater. The size was also sufficient to encompass the characteristic bioherms that we focused on.

(2a) "only 2 plots. . ." Yes, we evaluated only 2 plots, but this perspective doesn't indicate the amount of data: 139 hours of autonomous recording on the sea floor yielding 2953 images, plus repeated photo documentations in the subsequent years.

(2b) "one plot near an anchor with mussels. . . therefore context dependent" This is a misunderstanding. Both the plots were within a "safety zone" of an oceanographic buoy, i.e. anchoring and trawling are forbidden. This is the sole possible area to conduct experiments with valuable instruments because the level of ship traffic, boating and fishing is extremely high here. Thus, both plots were subject to the same conditions. Directly under the buoy there is an accumulation of mussels that have fallen from the anchoring chain. This is associated with a higher density of gastropods, but our plots were well outside this immediate zone. Nonetheless, there may have been a larger and more immediate pool of gastropods available here. We will specify these two points more precisely in the revised manuscript.

(3/4) "natural history is a valuable contribution but conceptual content. . .hypotheses missing" We neglected to explicitly formulate our hypotheses, which was a mistake. We will be happy to restructure the paper to underline that these experiments do in fact fit into a conceptual framework and that we do address specific hypotheses.

(5) "mobile species interactions" We will expand our discussion of mobile species interactions. In principle the hermit crabs, gastropods and fish do not represent threats to each other, and avoidance is therefore probably not an issue. We will underline more clearly that the crabs and gastropods preferably scavenged different items (our Fig. 4),

perhaps pointing to a “partitioning” of some sort.

Reviewer 1: Detail points “Title: predation and scavenging” Originally, to counter the potential point that not all of the macrofauna may have been killed by anoxia, we included both terms, but we agree that it would be clearer and justified to delete the “predation and” from the title. It would now read “Short-term post mortality scavenging and longer-term recovery after anoxia in the Northern Adriatic Sea”.

“focus on 7 species. . .fraction of total number of species?” The 7 species we treat here are the only scavengers we observed in our images, so we consider that we have fully encompassed the actors that removed the biomass. This is supported by the fact that 6 of the 7 species were present in both experiments (the fish Pagellus erythrinus was present in only one plot).

“Give scavenger densities as function of prey items?” In our opinion, this would be unfeasible because the actual number of prey items is not determinable. Specifically, we are dealing with bioherms whose full composition cannot be quantified from the images. For example, some of the earliest scavengers may well have targeted the numerous small bioherm-associated/cryptic crustaceans and polychaetes that emerge during oxygen depletion, but that are not differentiable to the camera.

“Scavengers as disturbance agents?” We think the answer to this question, if we understand it correctly, is no. None of the 7 species noticeably dug, ploughed or otherwise altered the bottom. After most of the scavengers left the plots, the sediment surface was not visibly disturbed.

“What is known about post-anoxia scavenging in the Gulf of Mexico?” We thank the reviewer for this question because it is at the heart of our entire effort. The answer is, to our knowledge, nothing! While much has been written about the effects of anoxia on benthic organisms (including a contribution to this special Biogeosciences issue by Riedel et al.), the fundamental question of what happens after anoxia and how long recovery takes has rarely been directly addressed. This is one of our prime arguments

for the value of this contribution, and we will make a greater effort to underline this originality.

“Evidence of trawling at the study site?” Trawling plays no direct physically destructive role in the immediate vicinity of the plots because we positioned them within the safety zone of an oceanographic buoy (see also item (2b) above). Indirectly, commercial trawling probably plays a role by creating enormous amounts of suspended fine sediments that appear to be transported across large distances, including no doubt the area of the oceanographic buoy itself. In most of the remaining Gulf, however, intensive bottom trawling scars are visible everywhere.

“Summarize Table 1 in text” We will be happy to do this (but see also comment “Chi Square” of reviewer 2)

“Generate day-night statistics from Fig. 3” I guess we could, but we felt that the peak activities of the hermit crabs during the day and the marked drop at night were clear enough so that they did not have to be supported statistically.

Reviewer 2 1. “small scale and limited replication. . .” See responses to Reviewer 1 (items (1) and (2a) above). With regard to our conclusions, please see item 17 below.

2. ”First sentence Abstract unclear” We will rewrite and simplify this. (What we meant is that areas affected by anoxia all tend to be shallow, strongly stratified, with soft bottoms, often excessive phytoplankton blooms, etc.). It will now read something along the lines of “The Northern Adriatic Sea is one of nearly 500 areas worldwide suffering widespread mortalities due to anoxia”. We can, if the reviewer so wishes, also use the term “dead zones” in that sentence (“The Northern Adriatic Sea is one of nearly 500 anoxia-related “dead zones” worldwide”). Both variants will require modifying the subsequent sentence

3. line 4: “delete “here” Done (see preceding item 2)

4. line 19: change “took place” Done

5. Introduction too long It will be our pleasure to condense this chapter (and use it to better emphasize the conceptual framework and the hypotheses addressed, as requested by reviewer 1, thus also rectifying many of reviewer 2's answers under "manuscript evaluation criteria")

6. Methods: fishes Correct: we did not feel we could definitively identify the individual fishes, so the observed individuals could in fact be only 2 or 3 fish. We wrote on this issue "...refers to the number of individuals visible over the respective time period. This number clearly overestimates the actual number of different individuals present". We further addressed this by writing "... this does capture the role that an individual or individuals played because they were present and exerted a scavenging or predatory influence". We will, however, rewrite this to make it unambiguous and to more clearly underline that this approach nonetheless reflects the level of (scavenging) effect of the particular species as accurately as possible.

7. Chi Square This refers to our Table 1, and because reviewer 1 suggests deleting the Table (but including the values in the text), and reviewer 2 suggests the analysis is not needed at all, we will probably delete the analysis and refer to our Fig. 4 to show that the two species preferably scavenged different items (which is an interesting result).

8/9/10 delete and exchange words Done

11. Time of arrival of fishes We will incorporate the reviewer's (correct) additional interpretation of why fish might be the first to arrive and support it with our own observations.

12. scavenging on undisturbed bioherms Yes, it is clearly logical to compare scavenging levels before and after anoxia, and we can add this aspect to our discussion. Basically, we will be writing that there is no scavenging on healthy bioherms, i.e. the muricid snails and the hermit crabs are never (the former) or very rarely (the latter) found on bioherms – they clearly feed almost entirely while on the sediment. This changed quite drastically when the bioherms had died in our experiments!

13. delete sentence on size of Gulf dead zone Yes we will delete this sentence. We would, however, need to mention elsewhere the size range of anoxias/mortalities to better address one point that both reviewers made: the difference between the processes on the small- versus large-scale.

14. no recovery after 2 years This is one of our interesting results – which addresses one of the key questions we are always asked ("how long will recovery take"?). We plan to firmly embed this issue in a conceptual framework and hypotheses specified in the revised manuscript. To directly answer the reviewer: no, this result is definitely not a function of image resolution, but rather of available substrates for larval settlement. Since no substrates remained in our plots after the scavenging events, no recruitment of epizoic organisms could take place. Even if larvae do settle on small biogenic structures such as shells or sea urchin tests, the stability (orientation) of these structures and the sedimentation can hamper growth. Here, hermit crabs and their dense aggregations of symbionts play a role (the crabs deposit such shells when finding a new housing and the epigrowth can survive and continue to grow). We will be able to succinctly present this case in the revised manuscript.

15. bottom trawl effects This is a misunderstanding: we did not wish to imply that physical trawling damage affected our two plots. We will rewrite this more clearly (see also reviewer 1, "evidence of trawling at the study site")

16. delete Alaska reference and following sentence Done

17. small versus larger spatial scales This is an important issue raised by both reviewers. We will temper our urge to overdo conclusions in this respect. Nonetheless, the purpose of smaller field approaches and/or laboratory studies is to get insight into the larger picture. We can clearly condense and better explain this aspect. We can clarify reviewer 2's final thought about expecting no bioherms in areas impacted by hypoxia if our conclusions are correct. In a nutshell, he/she and we are both correct: there can be no bioherms unless hard shelly structures are available on the sediment surface

for larval settlement. And these structures must be there at the right time and for long enough. Otherwise only mobile fauna will be present. This is why – combined with ongoing disturbances such as fisheries pressures – the benthos of the wider Gulf of Trieste is in our opinion in an alarmingly poor state.

Finally, we wish to underline that the recovery aspect treated in this paper is an integral part of the overall Biogeosciences special issue strategy, i.e. the inclusion of macrofauna post-anoxia aspects complements the holistic concept of our approach (sediment chemistry: reactions/processes during and after hypoxia/anoxia; meiofauna: effects during perturbation plus recovery; macrofauna responses: during hypoxia/anoxia). We believe that this perspective, and in particular this manuscript, highlights what anoxia inflicts on the ecosystem.

Interactive comment on Biogeosciences Discuss., 10, 4367, 2013.