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Biogeosciences
Discussions

Interactive comment on "Density and distribution of megafauna at the Håkon Mosby Mud Volcano (the Barents Sea) based on image analysis" *by* E. Rybakova (Goroslavskaya) et al.

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Specific comments

Referee 2: "The introduction is long; particularly the part related C8141 all the researches performed on the HMMV. Reference Decker and Olu 2010 is not appropriate at this state and should be removed (P 17479 L19)"

Authors: The introduction was shortened. Some of the information which is not of direct interest to the results presented was deleted. Reference Decker and Olu 2010 was removed.

Referee 2: "P 17481 L12-13: As the area of images varies a lot from 1 to 8 m2, the altitude should also vary from 1.5 m to several meters. It could be assume that the fauna visible and that can be identified vary a lot according to the altitude. If all images have been analyzed, independently of the altitude, this induced a bias in the analyses. This is a very important point that need to be clarified."

Authors: Not all images have been analyzed independently of the altitude! Clarifications are in the chapter 2.2 "Image analysis and identification: "In total 1,604 film images were examined using a stereo microscope. Of these, 1,045 images were used for statistical analyses. Images of not satisfactory quality (with sediment clouds, too strong or low illumination, large or small distance from the bottom) were excluded from the analysis".

Referee 2: "Table 2/Fig 5,6,9: I wonder how the small macrofauna:, amphipoda, isopoda, and Thyasiridae bivalves usually buried in the sediment is visible over an altitude of 1 m high. Even Pygnogonida could be very difficult to distinguish among siboglinids or within the microbial mats."

Authors: Yes these objects were visible on images. Images were examined using a zoom of stereo microscope. Isopods were up to 3 cm long. Amphipods were up to 1 cm and they have a specific shape and shade. Thyasiridae bivalves were more than 3.5 cm in size, usually buried in the sediment but with part of valves lying on the sediment surface. Also Thyasiridae leave a specific track on the sediment. Pygnogonids were about 2.5 cm in size and they were clearly distinguishable among siboglinids or on the microbial mats.

Referee 2: "Data analyses are confused. I suggest to redefine habitat categories mixing bacterial mats and siboglinid tubeworms in MDS and ANOSIM and to perform a single test with all habitat types. The result of the MDS (Fig3a) are not convincing."

Authors: ANOSIM and SIMPER analysis were performed for images from areas with different percent cover of bacterial mats and pogonophorans. We think it is important to

analyse separately bacterial mats and pogonophorans because there are lots of combinations of areas with bacterial mats and pogonophorans and their analysis becomes very difficult and shows little information. Nevertheless we added ANOSIM and SIMPER analysis for combinations of bacterial mats and pogonophorans to the chapter "3.1.4 Combination of areas with bacterial mats and pogonophorans". We used three variations of seafloor coverage both for bacterial mats and tubeworms: 0%, 0-50%, 50-100%. Each image was ascribed to one (and only one) habitat type. ANOSIM analysis was performed to assess the effect of a habitat type on megafaunal assemblages. SIMPER analysis also was performed. MDS (figure 3) results for separately bacterial mats and pogonophorans were deleted. One combined MDS for combinations was done performed (figure 4). The chapter 3.1.4 "Combination of areas with bacterial mats and pogonophorans" was added: "Three variations of seafloor coverage were considered both for bacterial mats and tubeworms: 0%, 0-50%, 50-100%. ANOSIM revealed significant differences in megafaunal composition and density of images with all combinations of areas with bacterial mats and pogonophorans except two combinations (1) bacterial mats 0-50%, pogonophorans 0-50% and bacterial mats 0-50%, pogonophorans 50-100%; (2) bacterial mats 0-50%, pogonophorans 0% and bacterial mats 50-100%, pogonophorans 0% (Global R=0.551, p=0.001). Figure 4 indicates two groups of images: 1) without bacterial mats and 2) with bacterial mats but without pogonophorans. Images with bacterial mats and pogonophorans fell out of revealed groupings. SIMPER revealed that five species contributed most to the separation of groupings of images with different combination of areas with bacterial mats and pogonophorans: O. gracilis, lysianassid amphipods, N. macronix, M. horrida and L. squamiventer (Fig. 3)." Figure 3 (MDS) was deleted. A new version of MDS was performed (figure 4). Figure 4. Similarity between images with combinations of different coverage by bacterial mats (BM) and pogonophorans (P) (MDS plot, transect I).

Referee 2: "Authors should perform Spearman correlation between diversity indices and the % of bacterial mats or siboglinid as in Bergquist et al. 2005."

Authors: Spearman correlation was performed. Table 5 was inserted. Text was added.

Table 5. Spearman's rank correlations between taxa richness, total megafaunal densities and diversity indices with coverage of bacterial mats or pogonophorans. *p<0.05.

"Total megafaunal densities were significantly and negatively correlated with coverage by bacterial mats (Table 5). Taxa richness was significantly and negatively correlated with coverage by bacterial mats (Table 5). Evenness and diversity were negatively correlated with coverage by bacterial mats (Table 5). Total megafaunal densities were slightly positively correlated with coverage by pogonophorans (Table 5). Taxa richness was slightly negatively correlated with coverage by pogonophorans (Table 5). Evenness and diversity were positively correlated with coverage by pogonophorans (Table 5)."

Referee 2: "Results should be more structured. P 17483 L22 to P 17490 L3: All this part should be included in a first paragraph dealing with HMMV and from P 17490 L5 to P 17490 L23 in a second paragraph on the comparison between HMMV and the background. P 17484 L 4-5: "Variations in the mean density of selected taxa, area coverage by bacterial mats and pogonophorans and the sediment colour are shown on Fig. 8". Fig 8 should be re-named Fig 3." and P17488. 3.2 "Comparison of megafauna from three zones inside the volcano caldera"

Authors: We do not think that part 3.2 should be included in the discussion. It presents results of present investigation. In our study three main habitats were distinguished based on the quantitative analysis of megafauna on images. Before our study habitat types were distinguished only visually. According to presented new data, the result section contains three parts: 3.1. Megafauna in areas with different seafloor coverage by bacterial mats and pogonophorans; 3.2. Comparison of megafauna from three zones inside the volcano caldera; 3.3 Comparison of the volcano caldera and the background area.

Technical comments

Referee 2: P 17484: "Figure 3a indicates two groups of images similar to groups revealed by ANOSIM.Some images with a coverage of 0–10% by bacterial mats fell out of revealed groupings." Grouping is not easily recognizable.

Authors: Figure 3 (MDS) was deleted. One combined MDS for combinations was performed (figure 4) (see above).

Referee 2: Table 2,3,4: Categories should be clarified for siboglinid: < 50% is from 10 to 50 % ?

Authors: Categories were clarified for siboglinid: <50% was change to 10-50%.

Referee 2: P17488 L2-3: 9, C8141–C8143, 2013 The mean density of selected taxa in areas with different combination of bacterial mats and tubeworms was evaluated based on the OFOS transect III." Why this comparison is done only on the transect III ?

Authors: It was error in the text. The phrase "based on the OFOS transect III" was deleted.

Referee 2: Figure 4 and 7: pictures could be in a larger format.

Authors: We think that the size of the manuscript is already large not allowing figures 4 and 7 in larger format

Referee 2: Figure 8: The color of the sediment does not seem to be an important parameter and should be removed from all analyses. This figure should be introduced at the beginning of the results, as present raw data ((except classification into three "zones") that quite clearly show differences among habitats.

Authors: The main idea of this figure is to show visually three zones within the caldera and variations in mean densities of selected taxa and area coverage of some biological objects between zones. It is not appropriate to show this figure as raw data without classification into three zone at the beginning of the results. We deleted reference to Figure 8 from the beginning (P 17484 L4-5) because there is no clear information for

the beginning on this image. So now we do not need to re-name the figures.

Sediment colour was removed from all analyses.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/9/C8791/2013/bgd-9-C8791-2013-supplement.zip

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Interactive comment on Biogeosciences Discuss., 9, 17475, 2012.

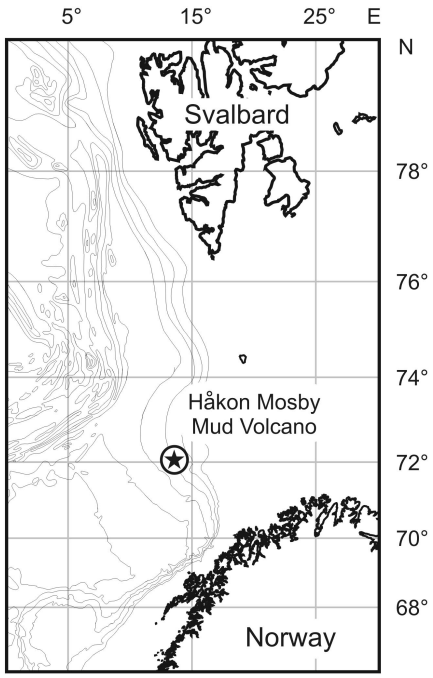
5°
15°
25°
E
N
Svalbard
78°
76°
74°
Håkon Mosby
Mud Volcano
72°
70°
68°
Norway

Fig. 1.

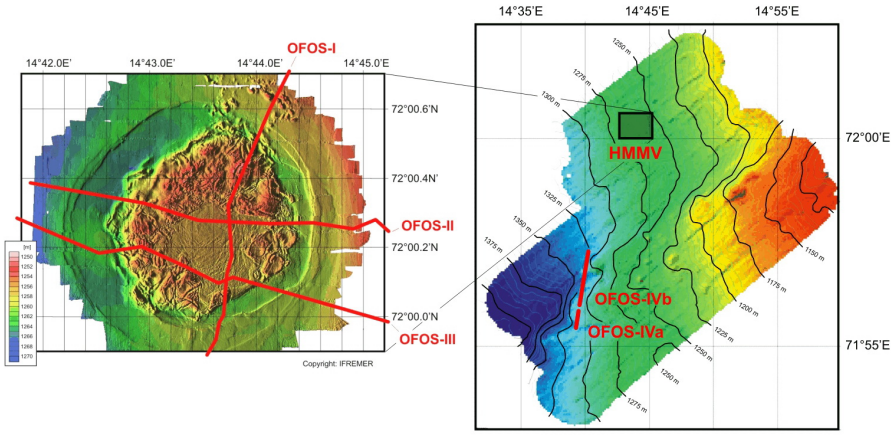
14°42.0E'
14°43.0E'
14°44.0E'
14°45.0'E
OFOS-I
72°00.6'N
72°00.4N'
OFOS-II
72°00.2'N
72°00.0'N
OFOS-III
Copyright: IFREMER
14°35'E
14°45'E
14°55'E
72°00'E
HMMV
OFOS-IVb
OFOS-IVa
71°55'E

Fig. 2.

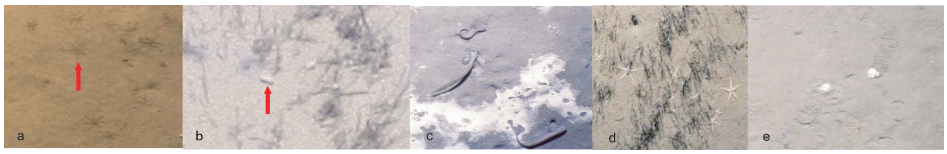

Fig. 3.

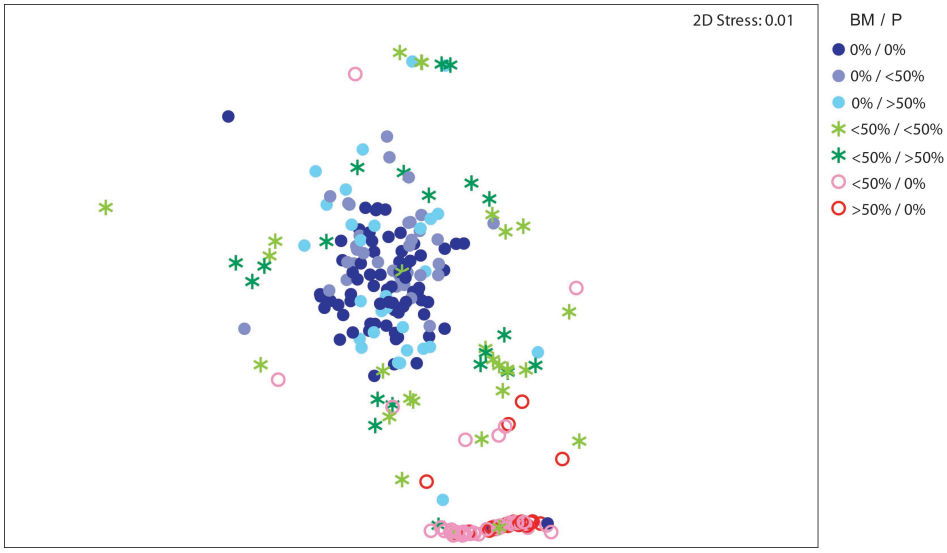

Fig. 4.

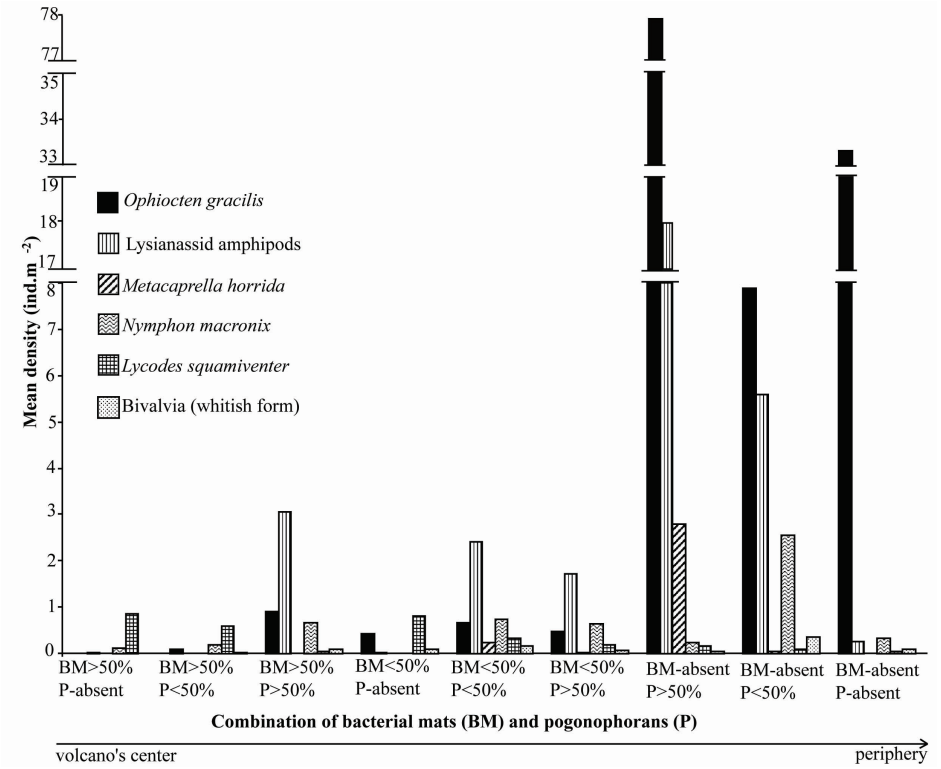
Mean density (ind.m -2)
Ophiocten gracilis
Lysianassid amphipods
Metacaprella horrida
Nymphon macronix
Lycodes squamiventer
Bivalvia (whitish form)
BM>50% P-absent
BM>50% P<50%
BM>50% P>50%
BM<50% P-absent
BM<50% P<50%
BM<50% P>50%
BM-absent P>50%
BM-absent P<50%
BM-absent P-absent
Combination of bacterial mats (BM) and pogonophorans (P)
volcano's center
periphery

Fig. 5.

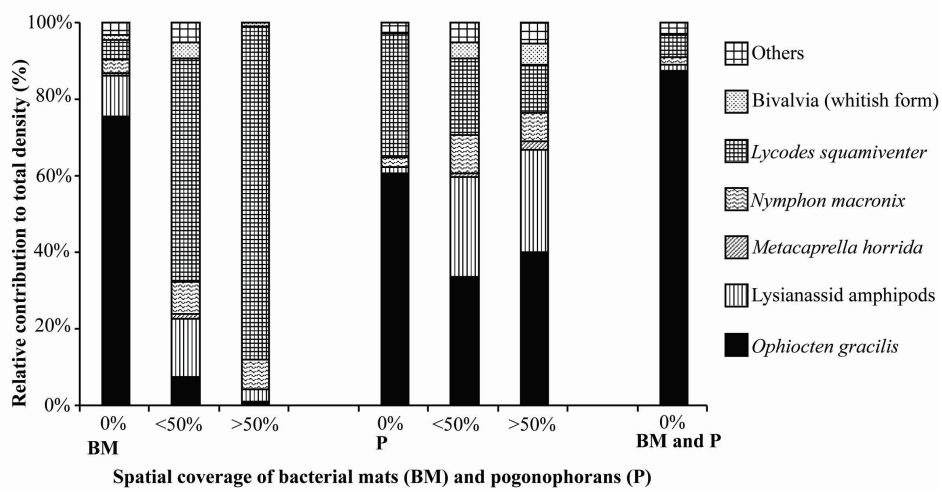
Relative contribution to total density (%)
Others
Bivalvia (whitish form)
Lycodes squamiventer
Nymphon macronix
Metacaprella horrida
Lysianassid amphipods
Ophiocten gracilis
0% <50% >50%
BM
0% <50% >50%
P
0%
BM and P
Spatial coverage of bacterial mats (BM) and pogonophorans (P)

Fig. 6.

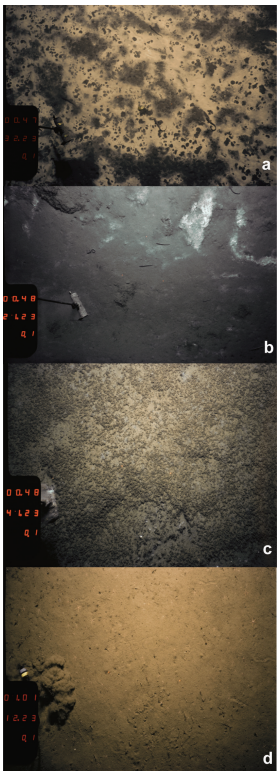
a
b
c
d

Fig. 7.

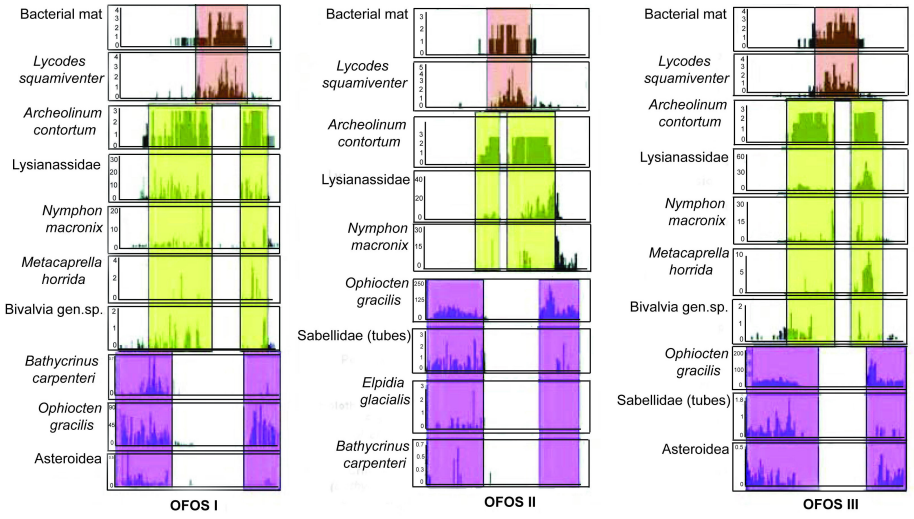
Bacterial mat
Lycodes squamiventer
Archeolinum contortum
Lysianassidae
Nymphon macronix
Metacaprella horrida
Bivalvia gen.sp.
Bathycrinus carpenteri
Ophiocten gracilis
Asteroidea
OFOS I
Bacterial mat
Lycodes squamiventer
Archeolinum contortum
Lysianassidae
Nymphon macronix
Ophiocten gracilis
Sabellidae (tubes)
Elpidia glacialis
Bathycrinus carpenteri
OFOS II
Bacterial mat
Lycodes squamiventer
Archeolinum contortum
Lysianassidae
Nymphon macronix
Metacaprella horrida
Bivalvia gen.sp.
Ophiocten gracilis
Sabellidae (tubes)
Asteroidea
OFOS III

Fig. 8.

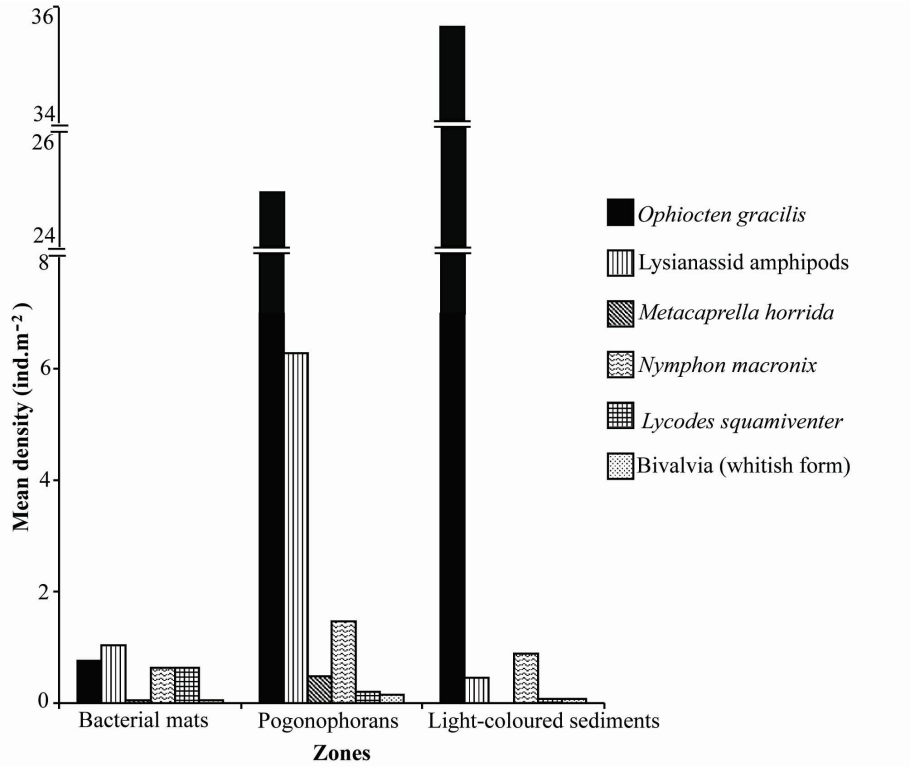
36
34
26
24
8
6
4
2
0
Mean density (ind.m-2)
Bacterial mats
Pogonophorans
Light-coloured sediments
Zones
Ophiocten gracilis
Lysianassid amphipods
Metacaprella horrida
Nymphon macronix
Lycodes squamiventer
Bivalvia (whitish form)

Fig. 9.