

Interactive comment on “Coral Patch seamount (NE Atlantic) – a sedimentological and macrofaunal reconnaissance based on video and hydroacoustic surveys” by C. Wienberg et al.

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We would like to thank reviewer #1 for taking the time to examine our manuscript. We are happy to make the adjustments this reviewer recommended, including the re-ordering of the figures, adding more recent references and doing some re-work in the "Discussion" chapter. We are also happy to revise our manuscript with respect to the following:

_Title: comment: I consider the word “megafaunal” more appropriate for this paper than “macrofaunal”, as most of the paper is based on video analyses; only megafaunal organisms (large animals visible to the naked eye) should be visible in most of the

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occasions

response: As suggested by reviewer #1, we will revise the title of the manuscript using the term megafauna instead of macrofauna as we agree with the reviewer's comment that the term macrofauna is restricted to organisms with a size smaller than 2cm, and thus difficult to determine by mainly visual video observation. In addition, we will replace the term macrofauna-/faunal by megafauna-/faunal throughout the text.

_P18709 and following: comment: Maybe it could be also mentioned its important role as “fish concentration points” as demonstrated by several authors (e.g. Koslow, Morato etc.)... _L 25 It would be nice to complete the reference list with some more recent works... _L10-15 there are some more recent references dealing with this thematic, it would be good to include some, (e.g. White et al. 2005). response: As suggested, we will add some more recent references to the “Introduction” on following aspects: (1) seamounts as “fish concentration points” (Koslow, 1997; Morato and Pauly, 2004; Pitcher et al., 2007; Morato et al., 2009; Morato et al., 2010); (2) dominance of suspension-feeding organisms on seamounts (Wilson and Kaufmann, 1987; Probert et al., 1997; Koslow et al., 2001; Stocks, 2004; Gage et al. 2005); (3) physical/hydrodynamic processes around seamounts (White et al., 2005; White et al., 2007).

_P18710 L5-10: comment: I would recommend to include the locations cited here also in the map (Fig. 1).

response: We will add a small overview map to Figure 1 to show the locations (e.g. Canary Islands, Azores) mentioned in the text.

_P18712 L5-10: comment: It would be important to mention that only two dredges have been analysed.

response: We will add following information to the Method chapter (but not to the Introduction chapter as suggested by the referee): faunal sampling is based on two grab samples and three ROV samples. We agree that this is an important information to

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estimate the reliability of the faunal content description. In addition, metadata (coordinates, water depth etc.) of the seabed samples will be added to Table 1, which gives already the metadata of the analysed video surveys.

Material & Methods: comment: To my opinion it would be better to organize Mat& Met (and hence Results) starting with the "large scale survey" (Hydroacoustic mapping, Backscatter) followed by the "smaller scale survey" (Video survey, Video analyses) and the last point the CTD. response: We disagree with the reviewer's opinion to reorder the sub-chapters of "Material and Methods" (and "Results"), starting with the description of the "large-scale surveys" (mapping, backscatter). The classification of the hydroacoustic data relies on the results of the video surveys/analyses as these are used to "groundtruth" the backscatter data. Therefore, in our opinion it's mandatory to describe the video observation/analyses first (in both Methods and Results chapters) before these findings can be used to describe how the MBES backscatter data was classified.

P18713 L10-15: comment: As already mentioned for the title, I consider more adequate "megafauna".

general response: As already mentioned above, we will replace the term macrofauna/-faunal by megafauna/-faunal throughout the text.

P18713 L25: comment: How did the authors calculate the scale of the images and the covered area of the transects? Laser pointers? Please add the used methods/tools to the Mat&Met chapter.

response: We will add the information that the ROV was equipped with lasers (laser scaling adjusted to 19.5 cm in horizontal and 12 cm in vertical direction) that were used to scale objects on the seafloor (for the videos and the still images; the latter shown in Figure 4 (Figure 5 in the revised manuscript)). The track lengths (which are more or less linear) are simply calculated by the lateral distance between the dive start and the dive end.

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P18714 L5-10: comment: There is a problem with the figure citation: here you refer Figs. 2, 5, but you need to change the number of the figures through the paper. Please use consecutive numbers for the figures. response: We agree with reviewer #1 that the numbering of the figures is a bit confusing, therefore we will change the numbering of the figures according to their occurrence in the text as follows: Figure 2 -> Figure 3, Figure 3 -> Figure 4, Figure 4 -> Figure 5, Figure 5 -> Figure 2.

P18714 L10-15: comment: I think it is better to use "qualitatively analysed" than "visually". response: As suggested we will replace "visually" by "qualitatively".

P18714 L15-20: comment: It would be important to define which is include in each category, for instance, Water column components include biotic and abiotic elements? Please specify.

response: The classification scheme used for the video analyses is built up of different groups of components comprising substrate components (SC), biotic components (BC), water column components (WC), and anthropogenic impact components (AIC) according to a newly developed Marine Ecological Classification Standard. What kind of elements (biotic vs. abiotic) are included in these groups/components are clearly described in the text (just two sentences after the introduction of the four groups!). Water column components solely describe fish, thus biotic elements. This is clearly stated in the text.

P18714 L20: comment: please define what you consider as "Biological characteristics" to make more clear what you mean.

response: The (commented) sentence will be completely revised to emphasise how we defined "biological characteristics". In addition, elements of the different defined component groups will be more thoroughly described in the following text. (new version: "... The defined BCs solely comprise the occurrence of scleractinian cold-water corals that varies from isolated live coral colonies to coral rubble (Fig. 3). The remaining benthic fauna (comprising sessile and mobile organisms) was not considered for

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classification due to its low occurrence. Fishes, occurring isolated or as schools, were treated as WCs. All identified organisms (scleractinian cold-water corals, other benthic megafauna, and fishes) were listed in Table 3. ...").

P18714 L25: comment: it would be helpful to describe a bit the aspects described in a "general manner". I think that in this context it would be better to use "occurrence" instead "abundance".

response: To avoid any confusion about the classification scheme used for the present study, the paragraph describing the elements of the different component groups will be completely revised (see also response to comment P18714 L20). The term "general manner" will be skipped from the text and the term "abundance" will be replaced by "occurrence" (see above).

P18717 L5: comment: "...to generate predictive habitat maps which can be applied. ..." This is true, but only if video surveys and/or biological sampling encompass the hydro acoustic surveys.

response: We agree with the reviewer that the generation of predictive habitat maps requires hydroacoustic data verified or ground-truthed by video observation and/or sampling. We stated this several times in the text (also just one paragraph after the reviewer's comment), and it is even one of our conclusions. In our opinion this is more than sufficient.

P18717 L20-25: comment: I wonder why just one CTD survey has been conducted. This offer very limited information on the description of the water column in the area. The potential variability could not be documented with only one CTD cast. Please justify why only one CTD has been conducted. response: We are aware that using just one single CTD cast to describe the physical water mass properties on a larger scale needs to be treated with care as no spatial or temporal variations can be resolved. However, during our cruise to the Coral Patch seamount we just conducted one CTD cast in close vicinity to Coral Patch seamount as the cruise to that area focussed on

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video surveys and sediment sampling. Nevertheless, we believe that even the data of one CTD cast contributes significant information, in particular as such data are rare for the studied area.

P18717: general response: Numbering of the figures will be changed (see response to former comment above).

P18719 L20-25: general response: As already mentioned above, we will replace the term macrofauna-/faunal by megafauna-/faunal throughout the text. We also changed the title of the sub-chapter 4.2 to "Environmental controls on the occurrence of benthic megafauna".

P18719 L25: comment: I would suggest to formulate in another manner this sentence, hence no biodiversity analyses have been conducted it is not possible to assert that the biodiversity is low. Same applies to abundance because no quantitative analysis of the video transects have been presented in the paper.

response: As suggested by the reviewer and as we agree that our study does not represent a quantitative analysis of the seamount's megafauna, the sentence (and the entire text) will be revised avoiding terms such as biodiversity and abundance.

P18720 L5-10: comment: how did you estimate the colony sizes? Please define "polyp generations".

response: The size of the coral colonies was estimated by using the laser scaling. The information that the ROV cameras are equipped with laser (laser scaling adjusted to 19.5 cm in horizontal and 12 cm in vertical direction) will be added to the Method chapter. A "polyp generation" is defined as "the successive sequence of asexually-produced polyps along a colony branch"; also this information will be added to the text.

P18720 L20: comment: how did you collect the samples? With a core? Please specify this part of the sampling in the Mat & Met section. If the work has been con-

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ducted with a core and you have been able to analyse the 0.5 mm fraction, the term "macrofauna" would be correct.

response: Sampling during the ROV dive was not conducted with a core. Two samples were directly sampled with the hydraulically operated manipulator of the ROV and one with a sampling net (mesh size: 1 mm) that was connected to the ROV's manipulator. This information will be added to the Methods chapter to avoid any misunderstanding. In addition, metadata of the ROV samples (coordinates, water depth etc.) will be added to Table 1 (also showing the metadata of the video surveys). In this context, we recognised an editorial mistake in our text (Chapter 3.1.2). The ROV net sample was qualitatively analysed for its finer fraction which is >1 mm and not <0.5 mm. We will revise this typo.

_P18720 L25: comment: I would suggest to include this information explaining where the Victor Hensen Grabs have been collected in the Mat & Met section.

response: As suggested, all sampling details about the Victor Hensen grab samples will be removed from the Results chapter to the Method chapter. In addition, metadata (position, water depth etc.) of these samples will be added to Table 1.

_P18723 L0-5: comment: it would be good to add percentages in order to have a more clear idea about the dominances of the different classes.

response: As information on the substrate types (defined as 4 textural classes), and thus potential habitats for the megafauna colonising the seamount, are more important for the present study than morphological features (defined as 9 zonal classes) occurring on Coral Patch seamount, we will add the percentages of the four textural classes (instead of the zonal classes) to the text, showing the clear dominance of hard substrates on top of the seamount.

_P18724 L5-10: comment: "to be dominated be exposed bedrock" do you mean "by"? It is interesting the information you offer for the suitable habitat for CWCs. It would be

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good to have the information for this kind of "relation" between substrate and fauna for the different substrate categories as well as faunal groups.

response: Typo will be corrected. We presented a relation between substrate type and cold-water corals occurrence, and the reviewer suggested to do the same for other faunal groups. The authors are aware that this would be a nice additional contribution to understand the biology of the studied seamount, however, due to the overall low number of organisms observed during the video surveys and as a reliable identification of organisms is just possible based on the high-resolution photographs which are solely available for the ROV dive, this is not realisable.

_P18724 L10-15: comment: I think it is important to mention that due to the limited CTD sampling (just one cast) the information offered here should be consider with caution, hence there is not information on the variability (nor temporal, nor spatial).

response: As suggested, it has been added to the text (once in the "Method" chapter describing the CTD cast, and once again in the "Discussion" chapter) that physical water mass properties derived from only one single CTD cast needs to be considered with caution as no temporal or spatial variability can be resolved. However, considering the limited availability of such data for remote areas such as the Coral Patch seamount, we believe it's worth to present the data derived from just one CTD cast.

_P18725 L20-25: comment: did you recorded current velocities? Please support this assertion with data or references.

response: Unfortunately, no current velocities were recorded during the cruise. We added following references to support our assumption: Sanchez et al. 2008 who assume similar mechanisms for the Le Danois Bank and Duineveld et al. 2004 (Galicia Bank).

_P18726 L10: comment: if necessary replace "macrofaunal" by "megafaunal". I would suggest changing the name of this chapter by "Macrofaunal/Megafaunal description".

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response: As suggested we changed the title of the sub-chapter 4.2 from "Macrofaunal abundance and diversity" to "Benthic megafauna".

P18726 L15: comment: As before mentioned, due to the lack of abundance and diversity studies in this work, I would suggest to avoid the use of both concepts.

response: As suggested by the reviewer, we revised "low abundance and diversity" to "scarce occurrence" (see also responses to former comments).

P18726 L15-20: comment: This is one of the aspects which should be re-worked in the discussion because it is contradictory: on one side you offer arguments (e.g. geographic isolation, unfavourable environmental conditions which reduce recruitment, oligotrophic conditions. . .) to explain the scarce occurrence of macrofaunal/megafaunal organisms. On the other side you mentioned later in the discussion the large amounts of long lines which are related to intensive fisheries pressure. If fish is abundant in the seamount are, they would be attracted by food which consequently would be results of high primary productivity levels. Please re-work this part of the discussion.

response: The reviewer stated that oligotrophic conditions used to explain the scarce occurrence of benthic megafauna are contradictory to the high abundance of fish. We do not agree with this opinion as evidence for a relation between enhanced primary production and concentrations of fish over seamounts is sparse (see Rogers et al., 1994 *Adv. Mar. Biol.* 30). In addition, a seamount ecosystem model from the NE Atlantic presented by Morato et al. (2009) revealed that local primary productivity enhancement cannot sustain large aggregations of seamount fishes! In addition, the model support the "feed-rest" hypothesis, introduced by Tseytlin (1985) and reviewed by Genin (2004), which proposes that the rugged topography of a seamount provides ample shelter for fish, while the fishes only emerge from shelter to feed quickly somewhere around the seamount, and then retreat back to rest. This aspect will be discussed in more detail in the revised version of the "Discussion" chapter.

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P18727 L0-10: comment: Even if as you mentioned, knowledge of environmental limits is still incomplete, in the last 10 years, several paper have been published offering results on the ecophysiology of CWC species, which supply with information on, for instance temperature tolerance etc. Please add these references here (e.g. Dodds, Oreja, van Oevelen, Naumann. . .).

response: The reviewer suggested to add more references and information on the ecophysiology of cold-water corals. However, we do not agree with the reviewer's opinion that there are "several" studies about the ecophysiology of different cold-water coral species. All available studies concentrate on one species, namely *Lophelia pertusa*. Dodds et al. (2007) present a laboratory study of the respiratory physiology of *Lophelia* and the effects of altered temperature and oxygen level experiments, and their results substantiate field data for temperature and oxygen limits (see Davies et al., 2008). This reference has been added as suggested. Orejas et al. (2011) studied growth rates under laboratory conditions for *Lophelia* and *Madrepora*, this publication is mentioned and discussed later in the text where the authors discuss the consequences of the slow growth rates of cold-water corals. Van Oevelen et al. 2009 presented a food web analysis of a *Lophelia* reef. Food availability aspects are discussed later in the text where the study of van Oevelen et al. (2009) as well as studies of Duineveld et al. (2004, 2007) and Kiriakoulakis et al. (2005) were added to the text/references. Naumann et al. (2010, 2012) present food web analyses of tropical corals, which is not relevant for our study area. Finally, to avoid any misunderstanding, we emphasised that we discuss (in the commented paragraph) physico-chemical boundary conditions (for *Lophelia*), whereas food availability/supply is discussed in the following paragraph.

P18727 L10: comment: what about the density envelope? (Dullo et al.).

response: The reference of Dullo et al. (2008) emphasising the importance of density for cold-water coral occurrence (although solely proven for the Nordic and Celtic Seas) will be added.

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P18727 L15: comment: not only linked to primary production, also to for example, resuspension mechanisms.

response: Hydrodynamic mechanisms (including internal waves, resuspension, lateral transport of particles) that may transport food particles to sessile benthic organisms in intermediate to deep water depths will be described in more detail in the revised manuscript. In addition we will add following studies to support this part of the discussion: Davies et al., 2009; White et al. 2005; Duineveld et al. 2007.

P18728 L10: comment: how is this situation in other seamounts which elongated summit, for instance Le Danois?

response: As suggested by the reviewer, another example for an elongated seamount, namely the well-studied Le Danois bank in the Bay of Biscay, will be compared to the Coral Patch seamount with respect to its sediment cover, biology and trophic conditions. Following references will be added to support this comparison: Cartes et al., 2007a; Cartes et al., 2007b; Sánchez et al., 2008; González-Pola et al., 2012; Sorbe, 1999; Canals et al., 2006.

P18728 L15-20: comment: please replace "pelagic tunas" by "tunas" Please add to Clark et al. 2010, Morato et al. response: The term "pelagic tunas" was revised to "tunas". Following references were added to support the relation between seamounts and large aggregation of fish: Morato and Pauly, 2004; Pitcher et al., 2007; Morato et al., 2010.

P187728 L20-25: comment: This argument seems contradictory to me, with the ones used to explain the scarce macro/megafauna. Please, re-work this part of the text too.

general response: See response to comment "P18726 L15-20".

P18729 L15-20: comment: it would be good to complete this with some more examples, showing that this is not an isolated case.

response: More examples for studies showing the impact of fishing on benthic commu-

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nities were added to the text (e.g., Le Danois Bank).

P18731 L0-5: comment: you give here the area of the video surveys. How did you calculate it? Please add in the Mat & Met section.

response: The area covered by video surveys had been roughly estimated by treating the start and ending points of the three diving tracks as the boundaries of a (hypothetical) box. However, the survey tracks are lines (sum of the length of all three dive tracks: ~4km) and the sled and ROV illuminate a seabed area of approx. 5m. The roughly estimated video survey area mentioned in the text was just used to give an impression about the ("size") differences between video-surveyed area and MBES-mapped area. However, the estimated video survey area will be removed from the text to avoid any misunderstanding, instead the total length of all dive tracks will be given in the revised text.

P18731 L10-15: comment: contradictory with the information on high abundance of fishes. Please re-work.

general response: See response to comment "P18726 L15-20".

Figure 1: comment: as already mentioned in the comments to the text it would be good to have the locations cited in the text also in the figure, as for instance, Canary Islands.

response: We will add a small overview map showing the locations mentioned in the text.

Figures 3-5: general comment: please change Fig. sequence following the needed changes in the figure citation in the text.

general response: We will change the numbering of the figures. (old) Figure 2 -> (new) 3, Figure 3 -> 4, Figure 4 -> 5, Figure 5 -> 2, according to their occurrence in the text.

Table 1: comment: if you have the information on the covered areas by each video

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surveys, please add this to the table.

response: See response to comment "P18731 0-5". As the video surveys are linear tracks, it is not possible to give an area for each dive track.

Table 3: comment: think this table should be extremely shortened keeping just the categories which have been clearly recognized in the video images and/or dredges. All information like "unident. Pinnate hydroid" should be removed, hence each of them could include several species, the same happen with "unident. yellowish incrusting sponge" which could refer to several species. Please keep in this table just the species and genus identifications and keep all other uncertainties just as "porifera" in the case of the sponges and apply the same criteria for the rest of the groups.

response: The table will be shortened as suggested. Solely the organisms clearly identified in the two grab samples, the ROV samples, and the ROV still images will be displayed.

Table 4: comment: Please define the meaning of the used values in the table legend or in the text (which is the meaning for 100 or -100 or for 5 and 45).

response: The values displayed in Table 4 are standardised BPI data (given as grid units) and slope values (given as degrees). The BPI data were standardised by subtracting the mean value of the BPI data from each BPI data point and dividing by the standard deviation; in this way the BPI data point had a value of 0 and the standard deviation had a value of -1/+1. The standardised value of each data point was then multiplied by 100. The slope values are given in degrees (5° and 45°) as a cut-off level for different declination ranges (see also Erdey-Heydorn, 2008; Micallef et al., 2012). This will be explained in the table caption of the revised version.

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We would like to thank the reviewer again for making these recommendations, we will ensure they are considered in a revised manuscript if the editor makes this recommen-

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dation.

Sincerely,

Claudia Wienberg, Paul Wintersteller, Lydia Beuck and Dierk Hebbeln.

Interactive comment on Biogeosciences Discuss., 9, 18707, 2012.

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