

## ***Interactive comment on “Deep-sea scavenging amphipod assemblages from the submarine canyons of the Iberian Peninsula” by G. A. Duffy et al.***

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Response to 'RC for Duffy et al 2012', Anonymous Referee #1, 09 Jul 2012

Specific comments: 1) The abstract has been amended for clarity and to indicate the difficulty of identifying causes of differences between the abyssal plain and canyons. Unfortunately there are no data available on scavenging amphipods from the adjacent continental slope or shelf so further comparison was not possible.

2) The potential effects of these irregularities and their effect on community composition have been expanded upon.

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3/4) These indices were used due to their frequent use in other published studies, as noted by Anonymous Referee #2, allowing for direct comparisons to be made.

5) This sentence has now been moved to methods as suggested.

6) As with point 2, the discussion of these irregular deployments has now been expanded upon in results and discussion sections

7) An MDS plot is now included in the manuscript. The variables of TOC and temperature are taken from published literature and while they are indicative of the environments each sample is taken from, they cannot be viewed as specific enough to have confidence in the output of a BIOENV.

8) Depth undoubtedly plays an important role in canyon/plain differences. The discussion has been expanded to address this concern.

9) Within the confines of this study isolating the specific variables responsible for site differences is not possible with a satisfactory level of confidence.

10) This sentence was in reference to other environmental factors known to correlate with depth but that were not available for this study. This has now been clarified in the text.

11) This sentence has now been extended to include better detail of the findings of Brown & Thatje (2011).

12) Unfortunately estimates of surface productivity over each canyon could not be found in published literature to allow for direct comparison.

13) The presence of fisheries, in particular deep-sea trawling, is common knowledge (e.g. the town of Nazaré situated at the canyon head is a fishing-town). The few references available examining these fisheries have been included in the main text.

Technical corrections: 1) Suggested correction made.

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- 2) Opening of sentences changed to remove 'this'.
- 3) Line removed as suggested.
- 4) Suggested correction made.
- 5) Opening of sentence changed to remove 'this'.
- 6) References checked for formatting and technical errors and corrections made.
- 7) This is a matter of personal preference, in our opinion decimal degrees is an acceptable format for lat and long and is more compatible when working with various GIS software. As both decimal degrees and degrees, minutes, seconds are acceptable formats in published literature we have opted to keep the coordinate system as it is.
- 8) Suggested corrections made.
- 9) Suggested correction made.

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Response to 'Interactive comment on "Deep-sea scavenging amphipod assemblages from the submarine canyons of the Iberian Peninsula" authored by Duffy et al.', Anonymous Referee #2, 16 Aug 2012

- 1) Title has been changed to indicate exact study area.
- 2) Abstract amended to indicate abyssal plain data is from literature.
- 3) Conclusions amended for a more convincing, less ambiguous, final statement.
- 4) We agree that differences in sampling methodology are important however for the basic trap design (i.e. baited trap with funneled entrance to impede exit) does not differ between stations. While it is possible that the smoked mackerel has an effect on species composition, the MDS plot (now included as a figure) demonstrates that neither the smoked mackerel-baited or ROV-deployed traps sit with the 'normal' samples. For this reason we have decided that analysis including all samples is acceptable

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as only sample abundance appears changed. In an ideal situation we would be able to perform analyses on unstandardized data however even with the omission of the two aforementioned samples, analysis without standardization would be unwise. Many other factors (e.g. local currents, topography, natural food-falls) could potentially be affecting abundances; therefore catch size can only be used as a basic indicator of background population size.

5) This section has been reworded to clarify hypotheses tested and factors used for analysis.

6A) We agree that the number of replicates may restrict the statistical power of the ANOSIM test however we believe that its use is still pertinent. The relevant section of the manuscript has been amended to indicate that the lack of significant difference may be due to low number of replicates.

6B) The possible reasons for differences between the mid and lower canyon are discussed at length with the conclusion that depth is the major driving force for community change within canyons. This theory does not conflict with the statement regarding canyons not acting as barriers to amphipod distributions as depth is most likely the cause of species distribution limitations with the presence or absence of canyons being largely irrelevant.

6C) This has been corrected to acknowledge samples were collected using box and megacorers rather than a push corer. Information on depth and TOC groupings has been added to the text.

6D) For multivariate analyses all data were standardized, thereby negating the effect of different sample sizes between the canyons and abyssal plain. Abundances in traps can only be used as loose indicators of background population size. The issue of temporal variation is an interesting point that has been raised by the referee, this is now discussed in the main body of the text, however, temporal variation in community structure is not expected in either abyssal plain or canyon samples.

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While Klages et al. (2001) raises an interesting correlation between size and scavenging strategy, this relationship is highly speculative and based on limited data. *Paralicella tenuipes* and *P. caperesca* both sit in the smaller size classification and as such would be classified as facultative scavengers using this system of categorisation. However, morphological characteristics, such as gut distension and shearing mandibles, of *Paralicella* spp. place this genus firmly within the obligate scavenger guild. The categorisation of scavenging amphipods into facultative and obligate guilds is a contentious issue that is not being discussed in this paper.

The section discussing species richness has been rewritten to clarify that species richness does not differ significantly between canyon and plain samples and that Cunha et al. (2011) identified various patterns of biodiversity between canyons and other deep-sea habitats.

7) P7832L16-22: sentence edited to remove 'generalist' comment and refer solely to active submarine canyons acting as conduits to the deep sea.

P7835L21/7836L2: equations removed.

P7840L21-30: our interpretation of data presented in Cunha et al., 2011 is that TOC concentrations between mid-canyon and lower-canyon sites in Nazaré are mostly similar (NM05 = 16.4mg g<sup>-1</sup> (± 5.20), NM = 20.2mg g<sup>-1</sup> (± 0.65); NL05 = 17.3mg g<sup>-1</sup> (± 0.74), NL = 19.0mg g<sup>-1</sup> (± 1.45)). While lower Nazaré has a marginally higher C:N value, the high variance and low number of replicates make identification of a significant decrease in labile organic matter impossible. The abundance of xenophyophores on the terraces in this area are an indicator of high nutrient availability. Couple this with the fact that scavenging amphipods most probably are feeding on large-food falls and sediment TOC can only be used as an approximate indicator of food available for amphipods. We are not suggesting that the lower canyon has higher or lower levels of nutrient availability than the mid-canyon only that the lower canyon environment shows evidence of relatively high nutrient availability and that the topography of this

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area would facilitate food-fall settling. This is presented as a possible explanation for a particularly large scavenging amphipod catch from this area.

P7841L3-11: this sentence has been restructured to indicate that it is not known how far carcasses from bycatch penetrate into the deep sea. Naturally occurring food falls are rarely found, although it is presumed that large carcasses do reach abyssal depths regularly enough to support scavenging fauna.

Table 3/Fig 2: samples are ordered by increasing depth. In the authors' opinion this is a satisfactory order of presentation for clear representation of data.

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Response to 'Considerations for discussion of bathymetric patterns in scavenging amphipod assemblages', Alastair Brown, 26 Jul 2012

We would like to thank the authors of this comment for their input. The literature suggested for inclusion, while interesting, is not particularly relevant for this paper and has not been added.

Environmental data has now been added to table 1 to facilitate future discussion. The sentence discussing physiological limitations has been amended to state 'the physiological limits of the species in the current study remain unknown'.

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Interactive comment on Biogeosciences Discuss., 9, 7831, 2012.

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