

## ***Interactive comment on “Unveiling the Perth Canyon and its deep-water faunas” by Julie A. Trotter et al.***

**Julie A. Trotter et al.**

julie.trotter@uwa.edu.au

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Reviewer’s comment: The ms presented an excellent, one-of-the-kind data set including numerous ROV dives at 5 different sites and depths along the Perth canyon, and shipboard CTD casts (with water samples) collected from those sites that allowed a variety of physical, chemical, and isotope analyses of the entire water column. It is a rather comprehensive field report of very good quality, but unfortunately somewhat short to be considered a "research article" that this ms is intended to be. After double checking the scope of the journal and its requirement for a research article manuscript ("...on all aspects of the interactions between the biological, chemical, and physical processes ... to cut across the boundaries of established sciences and achieve an interdisciplinary view of these interactions"), I reluctantly had no choice but rejecting the

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current form of the ms.

Authors' response: This study is highly cross-disciplinary, consistent with the scope of Biogeosciences articles. There are various accounts of prior publications in this journal being significantly descriptive (and less diverse) where unique datasets are being reported for the first time. Given these are the first of such datasets of a previously unexplored canyon, it poses some constraints on the scope of the paper, as well as the extent we can reliably discuss the implications of, for example, brief snapshots of faunal discoveries from this large canyon system. We therefore feel that the reviewer is somewhat conservative in their interpretation of the journal scope. Nevertheless, we will modify the text to provide a more nuanced cross-disciplinary discussion of our observations, albeit qualified given the constraints of our study.

Manuscript changes: We will more clearly articulate the goals of this study and its significance, and revise the manuscript to enhance the discussion of cross-disciplinary relationships from our observations, while transferring some descriptive details to the supplementary file as requested. We believe that our revisions to the manuscript will address this reviewer's concerns, as detailed below.

Specific comments:

Reviewer's comment: I would recommend the author to think about, in their revising ms, what's the story in it? Namely what's the hypothesis or science questions the ms wants to address? What's the importance or relevance in solving those hypotheses or addressing the science questions.

Authors' response: We appreciate that the aims and significance of the study could be more explicitly described, and particularly more broadly in the context of canyon research undertaken elsewhere. The key aims of our study were primarily to: (i) explore the inhabitants of this canyon system, and whether cold water corals in particular are present. In this sense the study was literally a voyage of discovery being the first deep-water exploration of this canyon; and (ii) whether we can detect anthropogenic effects

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in these waters and discuss their implications. This required characterising the physical and chemical properties of seawaters, which also provide important environmental context for those inhabitants observed and collected as well as essential baseline information for subsequent studies. The intent of this paper is thus to provide an overview of the canyon environments and the inhabitants discovered, and to discuss any potential anthropogenic effects we measured.

Manuscript changes: Refocus the text to more explicitly state and address the key science questions that this study presents and can answer, and the significance of those outcomes (as above). This includes expansion of the discussion on anthropogenic impacts, such as the implications of  $\delta^{13}\text{C}$  and  $\Delta^{14}\text{C}$  data regarding anthropogenic carbon and the Suess effect. Additional text will also contrast the Perth Canyon with other canyon systems, to provide some context within broader submarine canyon research. We will also revise the conclusions to more succinctly summarise the outcomes and scientific significance of this study.

Reviewer's comment: The ms had in-depth descriptions of the CTD/water sample works with respect to the physical, chemical, and isotope analyses. Except for the isotope discussion related to LGM (very nicely done!), there was hardly discussions linking those properties of different disciplinarians.

Authors' response: Characterising the seawater compositions is important for understanding the environmental context of the canyon and its inhabitants, and for addressing the science question regarding the potential extent of anthropogenic impacts on the canyon waters, the latter having been discussed in section 3.4.3 and 3.5.

Manuscript changes: We will further clarify and expand our discussion of various seawater parameters, such as water masses, temperature, pH, saturation state, both in the context of seawater hydrography as well as the fauna observed at each dive site (and hence faunal depth distributions), and their broader implications. These revisions would better link our observations and measurements across the various disciplines.

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Reviewer's comment: One key difference between research articles and data reports is concise vs overdone details. There are just too many details in the ms that should go to a supplemental file.

Authors' response: We do recognise this issue raised. We are faced with the dilemma that the data sets from this study, being the first exploration of this canyon system, are not published in the scientific domain but need to be fully reported to support the outcomes and broader discussions of this and subsequent papers. We therefore believe that it is important to comprehensively present the data here, which will be an important reference for other researchers as well as underpin subsequent specialist papers from our group on this poorly studied region.

Manuscript changes: We will transfer details described in the methods, geology, and seawater descriptions, into the Supplementary file as suggested by the reviewer, and thus provide only a synopsis of the salient information for those sections in the main text. The main discussion would therefore focus on the canyon faunas and their environmental context together with inferences on the anthropogenic carbon detected from our seawater analyses.

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