

**Influence of Oxygen Minimum Zone on Macrobenthic Community Structure in the  
Northern Benguela Upwelling System; A Macro-Nematode Perspective**

**1. Reviewer 1**

<b>Serial No</b>	<b>Section</b>	<b>Reviewer 1 Corrections</b>	<b>Authors corrections</b>
<b>1.0</b>	<b>Introduction</b>	Reference required for hypoxia/SDG statement	References added.
		Line 46 - More detail on the study location required for reader unfamiliar with the Namibian coast and the BUS	Information added to read; The Benguela Upwelling System (BUS) is located off the southwest coast of Africa. It extends from Cape Frio in Angola to the southern tip of the continent in Cape Agulhas, South Africa.
		Line 62 – Location details required	Location details added; The general trend observed in most OMZs in global oceans namely, Walvis Bay, Namibia (the location of this study), California, USA, and the Oman margin (off the Arabian Peninsula).
		Line 74 – Kunene river location details required	Location details added; Sentence reads; In contrast the diversity increases significantly northwards off the Kunene River, which flows from the highlands of Angola, along the border with Namibia and into the Atlantic Ocean.
		Lines 85 and 86 – Reference to figure 1 map required	Reference to (Figure 1) inserted at end of sentence.
		Map needs annotation for readers unfamiliar with the area	New Map has been created and annotated.

		Map needs a color scale bar or key for depth	New Map has a color scale bar for depth with contours.
<b>2.1</b>	<b>Study Area</b>	Line 94 - Clarify whether 'high surface primary production' is mud surface or ocean surface	Clarified to specify ocean surface; Sentence reads; The benthic zone in the OMZ in Northern BUS is characterized by extensive areas of diatomaceous mud, which are associated with high primarily production at the ocean surface and low concentration of dissolved oxygen.
<b>2.2</b>	<b>Sample Collection</b>	Line 101 – Reference to Figure 1 required after...at 90nm	Reference to (Figure 1) inserted after 90nm.
		Line 103 – Reference to Figure 1 not required. Reference Table 1 instead	Reference changed to (Table 1) instead.
		Line 114 – 118; Provide details of the level of taxonomy for non-nematode macrofauna taxa	The taxonomical level of non-nematode fauna has been added
<b>2.3</b>	<b>Laboratory Analysis</b>	Line 119 - State that feeding types were ascribed to genera following Wieser (1953) and insert reference in ref list	Statement added to include this data; Now reads; The nematodes were then pin picked, fixed on permanent slides and identified to the genus level using the key from Platt & Warwick, 1988, and the feeding types were ascribed to those genera following the methodology of (Wieser, 1953)
<b>2.4</b>	<b>Data Analysis</b>	Line 130 – 134; It is not clear what level of taxonomic discrimination was used for statistical analysis.	Information on the taxonomic discrimination has been incorporated.
		Clarify line 130 – 144	Lines 130 – 144 have been altered and corrected. Paragraph now has 264 words.

		New paragraph starts after line 134	New paragraph starts after the end of this sentence.
		Line 142 - How were the various replicates considered as single samples?	This has been tackled in the revamped data analysis section.
		Line 147 – Suggest term inverse relationship in preference to opposite trend	Change implemented, now reads; Total Organic matter (%TOM) demonstrated an inverse relationship with depth, with higher organic matter values recorded in the shallower stations.
<b>3.1</b>	<b>Abiotic Variables</b>	Line 147 – 150 – Not easy to follow	Sentence structure altered for clarity; Collective word count is 61.
		Line 151 is not correct based on Table 1, needs clarifying or removing	Sentence not in line with Table 1 deleted.
		Line 158 – New paragraph after (Table 1)	New paragraph now starts after the reference to (Table 1)
		Line 171 – Reference error, correct	Reference corrected; now reads (Levin, 2003)
<b>3.2</b>	<b>Biotic Factors</b>	Line 162 is not clear	Paragraph from line 162 – 174 has been deleted. Information has been incorporated into Section 2.4; Data analysis.
<b>3.3</b>	<b>Macrobenthic Appendages</b>	Line 175 – 3.3 Macrobenthic assemblages. List the taxa in a table?	Taxa list added to supplementary material
		Line 176 – 183 – References to number of taxa removed from paragraph	All references to number of taxa have been deleted. Paragraph now focuses solely on densities; has 83 words.
		Line 215; Insert reference to Figure 3	Reference added, reads (See Figure 3)

3.4	<b>Macro-nematodes density and diversity</b>	Line 216 – 219; List of data is unnecessary as % abundance data has already been quoted	List of unnecessary data deleted. Previous lines 216 to 219 are no longer present.
		Line 222 – Clarify what relative abundances you are talking about. State and reference Figure 6 at end of sentence.	Statement now reads, “exhibited their highest densities in dysoxic stations” for clarity.
		Line 226 – recorded significant abundance is ambiguous, use alternative term	Term ‘significant abundance’ has been altered to ‘high abundance’ to clearly refer to the total densities.
		Line 232 – use term low significance	‘Insignificant abundance’ replaced with the term ‘low significance’
		Lines 230 – 234; Sentence long and complicated. Needs clarifying and/or shortening.	Sentence clarified; Now reads; For the purposes of graphing the relative abundance, <i>Thoracostomopsis</i> , <i>Anticoma</i> , <i>Cephalanticoma</i> , <i>Trileptium</i> , <i>Mesacanthoides</i> , <i>Terschellingia</i> , and <i>Marylinnia</i> were grouped as ‘others’ as they recorded low abundances (<4%).
		Lines 235 – 237; For clarity include the feeding type code after the first mention of the feeding type	Feeding type codes have now been incorporated; Statement altered to; Epistratum feeders, classified as Type 2A, dominated the dysoxic zones with a proportion of 62%. They were followed by predators/omnivores, Type 2B, making up 28%. Lastly, selective deposit feeders, classified as Type 1A, constituted 10% of the population.

		Line 239; Clarify the feeding types, Desmolaimus and Halanonchus are incorrectly grouped	Corrected accordingly all through the manuscript
<b>4.0</b>	<b>Discussion</b>	Line 256; What had significant correlation with oxygen?	The sentence was structured based on the direction given by the co-reviewer.
		Line 257; Correct typographical error	Error corrected. Classification into zones based on oxygen levels now captured in new sentence.
		Line 237; For readers benefit, mention the three zones, preferably by inserting parentheses	The three zones of classification are reiterated, with their corresponding values in parentheses; The statement now reads as follows. We adapted Levin's grouping system (Levin, 2003), classifying the different stations into zones based on the oxygen levels recorded (microxic zone (<0.1 ml l <sup>-1</sup> ); dysoxic zone (0.1-1.0 ml l <sup>-1</sup> ); oxic zone (>1.0 ml l <sup>-1</sup> )).
		Line 262; Clarify what you mean by relative abundance, sentence is confusing	Some information has been added after line 262 to supplement this ambiguity. Relative abundance is described in line 263, reading; Here, relative abundance refers to the proportion of polychaetes to the total number of organisms in the same area. Therefore, even though polychaetes were numerically abundant, the diversity of other taxa present reduced their share of

			the total population, hence the low relative abundance.
		Line 265; Please define core OMZ – OMZ special center? Area of lowest DO?	To specify core OMZ to the area of lowest dissolved oxygen, sentence now reads; The presence of cumaceans in high abundance in the core OMZ (Area of lowest DO) has been reported by Zettler et al., (2013) and Eisenbarth & Zettler (2016)
		Line 273 – 275; Sentences unclear, how was the relative abundance of multiple sites calculated?	Entire paragraph has been amended to include information on how relative abundance is calculated. Paragraph has 143 words.
		Line 276; Paragraph needs review as the point is not clear, reads more like the results narrative than discussion	Entire paragraph revamped. Has 143 words.
		Line 269, 274, 275; Establish consistency in taxonomic names; Preference is polychaetes/nematodes when discussing the results unless referring specifically to the phylum or class, in which case ‘the Nematoda’ or ‘the Polychaeta’ is good	Taxonomic names now have a consistency in the entire manuscript
		Line 279; Use the term macro-nematoda or macro-nematodes throughout.	Changed from ‘Nematoda’ to macro-nematoda.
		Line 286 – Change sentence structure	Now reads; Apart from the increase in nematode size, OMZs also tend to enhance the regional dominance of tolerant organisms such as nematodes with high biomass

			recorded in response to organic matter inputs.
		Line 289;	‘Coupled with release from predation’ replaced with ‘coupled with a reduction in predation’
		Line 296 – Reference should read Gutierrez et al. (2008)	Reference now reads Gutiérrez et al. (2008)
		Line 301 suggests a temporal data set that documented an increase in DO. Suggest; At dysoxic sites (DO 0.1 – 1 ml-1), other taxa	‘Once the DO levels rise to dysoxic levels’ replaced with ‘At dysoxic sites (DO 0.1 – 1 ml-1) to correct this.
		Line 304; Follow as suggested in line 301	‘When the DO levels increased to above 1.0 ml l <sup>-1</sup> replaced with ‘At dysoxic sites, where DO levels were above 1.0 ml l <sup>-1</sup> ).
		Line 308; Lowest densities, diversity, and species of macrofauna taxa or macro-nematodes or both? Clarify.	Reads; In the core (microxic) area, the macrofauna taxa showed the lowest density and diversity to specify that it is the general macrofauna taxa that is the subject of this information.
		Line 310 – Follow as with lines 301 and 304. Does this refer to your study or Zettler’s? Avoid ambiguity	Reference to this study mentioned in the sentence; In our study, we also observed an increase in the number of taxa recorded in sites with DO levels above 1 ml l <sup>-1</sup> to avoid ambiguity.
		Line 314 – 316; Meaning unclear, correct.	Unclear statement corrected as follows; Of this fauna, crustaceans were the most abundant. This conforms to the observations of Soto et al. (2017) at oxic sites in an upwelling system in Chile.

			Conversely, Zettler et al. (2009) recorded amphipod species in low oxygen areas. These contradictory results indicate that, at least amongst the Amphipoda, tolerance/intolerance to hypoxia is species specific.
		Line 357; Change sentence structure	Structure changed to; Tolerance to hypoxia is indicated by both the presence and absence of taxa.
		Line 361; Insert Wieser reference	Reference added; Wieser's feeding types, as outlined in his study (Wieser, 1953)
		Line 362 -363; Need consistence of terminology for feeding types in text and figure 7.	Consistency in feeding type terminology and code has been implemented throughout the manuscript.
		Line 363; Correct typographical errors	Corrected, Epistratum feeders now classified as type 2A, not type 1B
		Line 367; Alter sentence structure	Sentence altered; Now reads; These observations appear to be exceptions to the general rule that non-selective deposit feeders dominate substrates with a high abundance of organic matter.
		Line 375 – 376; Is it true that epistratum feeders (2A species) feed on diatomaceous mud? Needs reference.	Authors have changed the statement based on the feeding mode correction. Also the statement has been changed to diatoms and not diatomaceous mud.



		Line 377 – Below the OMZ...Does this mean offshore from the OMZ, in deeper water?	To clarify ‘below the OMZ’ means offshore from OMZ, sentence has been clarified to read; In regions offshore from the OMZ, where the OMZ is no longer in contact with the benthic zone, the production of diatoms is reduced.
<b>5.0</b>	<b>Conclusion</b>	Line 385 – Should this read Ostracoda and Bivalvia observed in limited number in the oxic zone...? (not anoxic?)	The word ‘oxic’ has been replaced with ‘anoxic’
		Line 380 – 391; The conclusion does not mention any thoughts on the macro nematodes despite the title stating “a macro-nematode perspective”	The conclusion has been restructured

## Reviewer 2

Serial No	Section	Reviewer 2 Suggestions	Authors corrections
	Abstract	Need to start with a sentence giving broader scientific context of your study	Statement providing broader scientific context of the study has been inserted at the start of the Abstract. Sentence has 42 words.
		Macrobenthic – Use a small ‘m’, not capital ‘M’ (many similar mistakes in MS with Macrofauna, Macro-nematoda, Dominance.	Capitalization of letters relating to macrofauna, macro-nematoda, dominance, anoxic, dysoxic and oxic has been addressed, apart from first mentions and those in the start of sentences.
		Instead of Macro-Nematoda, just use ‘nematodes’ once you have established that you are looking at macrofauna	Change has been implemented, macro-nematoda is used fewer times after first mention.
		Line 18 – not ‘recorded abundances’ throughout MS	The term ‘Recorded abundances’ has been removed and replaced with the term ‘were present’ This change has been implemented all through the manuscript
		Line 21 - ‘no abundance’ is incorrect	‘No abundance’ has been replaced with ‘absent’
		There is no concluding sentence at end of the Abstract.	Conclusive sentence added to the terminal end of the abstract. Reads; In conclusion, this study provides an overview on the distribution, diversity, and response to varying oxygen conditions of macrobenthic communities and their importance in marine ecosystems.
<b>1.0</b>	<b>Introduction</b>	Reverse order of 1 <sup>st</sup> and 2 <sup>nd</sup> sentence.	Sentence order reversed

		Line 56 needs more details on OMZ communities and their function.	More details on OMZ communities have been added. The supplementary statements have 74 words.
		Line 57 – 61 are too basic. Define macrofauna by short sentence when first mentioning it.	Lines 57 – 61 have been deleted and in their stead, the term macrofauna is explained by a short statement in parentheses in line 65.
		Line 67 needs a reference.	Reference added
		Nematodes are barely mentioned in the introduction but are the main taxon of interest. More information on nematodes is needed, and OMZs.	More information on nematodes and OMZs and their communities has been added to the introduction section.
		Specify the location of Walvis Bay	The location of Walvis Bay had been supplemented. Walvis Bay, a city located on the Western coast of Namibia is the new descriptive addition.
		Line 77 needs a referenced	Reference added
		Are there any other studies that can be cited in context of the Namibian shelf	Reference added
		There is no focus on nematodes in line 82	More focus has been put on nematodes and OMZs, new supplementary statement has 78 words.
		How low are the oxygen concentrations in line 95?	Information on Oxygen concentrations has been added, referenced to Levin et al. (2009)
		Table 1 needs number of replicates for macrofaunal samples at each station	Information on replication added
		Why was 0.45 mm chosen as the mesh size? Usually, it is 500 or 300 microns.	Information on reason for the use of 0.45 mm sieves and the validity of

		Not ideal to use 0.45 when comparing with other studies.	the results has been added in parentheses in line 127
<b>2.1</b>	<b>Data analysis</b>	Information on line 130 needs to be in Table 1	Information on replication added
		Lines 130 – 134 are not easy to understand.	The entire paragraph has been altered to cater for this confusion. Paragraph has 264 words.
<b>2.4</b>	<b>Data analysis</b>	Line 138 needs details of data treatment, it is much too brief.	No data treatment was used.
		List the predictor variables in a text or table. What is BUS? and what selection criterion did you use?	Predictor values are added on the supplementary file. 'BUS' replaced with 'Benguela Upwelling System'
		Lines 142 – 144 are confusing; did you match biotic and abiotic data at scale of site for the correlation analysis?	Lines 142 – 144 have been corrected as part of previous suggestion and are no longer confusing.
<b>3.1</b>	<b>Abiotic variables</b>	These are huge TOM values is line 149	Yes, these were the observed TOM values from the study site
<b>3.2</b>	<b>Biotic factors</b>	Move lines 169 – 174 from results to methods	Lines 169 – 174 have been moved to data analysis methods under the second paragraph of the section.
		Add R2 values and P values in your text in line 167	Added in line 224
<b>3.3</b>	<b>Macrobenthic assemblages</b>	Before giving results of correlation analysis, describe the macrobenthic assemblages first (section 3.3 before 3.2)	Entire section 3.2 has been deleted to avoid the trip up in the flow of information. (Section 3.3 Macrobenthic assemblages) is now Section 3.2
		Reorganize section 3.3 to describe each group of stations – one paragraph per group	Section 3. 3 reorganized with each paragraph focusing on the different stations namely; microxic, oxic and dysoxic.

		Not 'taxa counts', just 'taxa' in line 197	'Taxa counts' has been replaced with 'taxa'
		Line 202 is vague, needs clarifying	Information added to cater for vagueness; the sentence now reads; All the oxygen zones were dissimilar to one another based on multivariate community analysis using Bray-Curtis's analysis of dissimilarity.
<b>3.4</b>	<b>Macro-nematodes density and diversity</b>	Lines 216 – 219 are confusing. Delete	Lines 216 – 219 have been deleted from the manuscript
		Line 234 shows need to do multivariate community structure analyses as per the macrofauna taxa data	For clarity purposes, the Multivariate analysis results were not included to maintain focus on dissolved oxygen (DO). However, the authors are open to incorporating the multivariate analysis if the reviewer suggests it.
		There is nothing about feeding guilds in the methods or introduction	Feeding guilds were added to the methods.
<b>4.0</b>	<b>Discussion</b>	Clarify where the groupings come from in line 257, did you use a previously published scheme?	Reference to Levin's grouping system based on the levels of oxygen recorded has been added to line 257 to point out where the groupings came from; Sentence reads; "We adapted Levin's grouping system (Levin, 2003), classifying the different stations into three zones"
		Line 264 - Quantities is not the correct term, use abundance.	'Quantities' has been replaced with 'abundance'

		Information in lines 273 – 275 is not understood well.	New information has been added to clarify the subject in lines 273 - 275
		Lines 275 – 278 are confusing.	Sentence structure and new information have been added to avoid this confusion.
		Vanreusel et al. makes no such statement, indicate where in the paper they say this?	Vanreussel does make this statement. Reference to page 3, paragraph 2: “Increased standing stock is not only explained by increased densities. Some studies [37,44] found that longer nematodes dominate in cold seep and hydrothermal sediments, compared to oxic neighboring sites. In [37], nematodes present in the hydrothermal vent are on average twice as large (800 µm long, 20 µm width), as those in the reference sediment (480 µm long, 15 µm width).”
		Insert reference at the end of line 299	Reference added.
		Sentence following line 299 is vague. Why does patchiness call for more study?	‘It is not clearly understood then whether the high abundance of macro nematodes in one of the stations is characteristic of the study site or just congregation to a food source’ has been added to precede line 299, hence justifying the reason for more study.
		‘meager’ is not the correct tern	‘meager’ replaced with ‘low’
		Families are not italicized	Italics removed from the family name.

		Line 309's "1234 ind. m-2 per core" makes no sense.	To correct this, sentence has been changed to; "Each square meter of core area contained 1243 individuals."
		Line 317; delete brackets and text within. The whole paragraph is repeating whats already been mentioned.	Entire paragraph has been deleted from the manuscript.
		Line 329 cites a review paper, need to cite papers providing actual data.	Reference added
		Line 331 is unlikely, nematodes may be larger because of the species, not because of the conditions.	Statement 'ability to grow to large sizes' has been removed.
		Why would meiofaunal nematodes differ from macrofaunal nematodes?	Macrofauna and meiofauna are mainly separated based on size, as most meiofauna taxa are also found in the macrofauna component. As our study was mainly based on macrofauna, the presence of nematodes (whereby in most cases dominate the meiofauna component) were large and dominant in the dysoxic area.
		Line 339 - Families are not italicized	Italics have been removed.
		Line 342 needs reference	Reference added
		Line 343 is incorrect, nematodes do not swim!	Regarding the ability of nematodes to swim. The sentence was extracted from Moens et al., (2013) page 126, paragraph 1: "Nematodes can actively emerge into and swim in the water column (Jensen 1981). After suspension in the water column, some nematode

			species ( Theristus, Chromadorita, and Cobbia ) are able to actively choose and swim toward sediment spots where suitable food is available (Ullberg & Olafsson 2003). Large-bodied nematodes of the family Oncholaimidae rapidly colonize carcasses of fish and macrofauna, probably at least in part by active swimming (Lorenzen et al. 1987).”
		Line 360; Provide recordings of Anticoma in your samples.	Anticoma was not recorded in the study.
		Typographical error in name Weiser in line 361	‘Weiser’ changed to ‘Wieser’
		Rewrite the entire of paragraph beginning at line 367	Paragraph has been rewritten to clarify information
		Delete line 381	Line 381 is no longer part of the manuscript.
<b>5.0</b>	<b>Conclusion</b>	In line 387, state whether you identified species or just genera, clarify whether you are talking of nematodes.	‘species’ has been changed to ‘taxa’ for specificity.
		Are there any differences in your findings or are they in confirmation of data already known?	The differences and similarities have been mentioned in the discussion.