

Interactive comment on “Environmental factors influencing cold-water coral ecosystems in the oxygen minimum zones on the Angolan and Namibian margins” by Ulrike Hanz et al.

Anonymous Referee #2

Received and published: 24 July 2019

This paper, according to the title, is about environmental factors influencing cold-water coral ecosystems in the oxygen minimum zones on the Angolan and Namibian margins. It describes results from a cruise off the southwest coast of the continent of Africa carried out in 2016. Specifically the cruise targeted two areas where previous work has suggested the presence of cold-water coral reef structures, one off the coast of Namibia and one further north off the coast of Angola. At each of the 2 sites landers were deployed, and across each site transects of CTD casts were made. There are numerous problems with the manuscript as it is written, many of which could easily be rectified. The first is that the paper is not really about cold-water coral ecosystems. The structures sampled in the Namibian sector are home to a deep water assemblage

C1

which just happens to have grown on the relict remains of a cold-water reef that died thousands of years ago. It could just have easily grown on emerging bed-rock, an oil platform or a relatively recent wreck. While what was found may be informative about hard-substrate dwelling assemblages, it tells us nothing about cold-water corals. The findings from the Angolan sector, on the other hand, do contain information relevant to our knowledge about cold-water corals, specifically extending our knowledge about the environmental envelope within which reefs may be able to survive, with some limited evidence for mechanisms which may assist their survival. Overall the question that the manuscript raises is why there are no living corals off Namibia, given that the conditions off Angola are not highly different and all the factors that apparently mitigate low oxygen there, such as abundant high quality food and tidal excursions replenishing depleted oxygen, are also present off Namibia where they support a different assemblage. Much of the manuscript is unfocussed and over-detailed. It reads like a cruise report. A large proportion of the information given is presented in formats that are difficult to digest and are ultimately irrelevant in the context of the paper. We do not need to know that 2 landers were deployed but only the data from one is used here, for example. Samples for particulates and photo-pigments may have been collected from the CTDs, but there is no evidence analyses of these samples are used in the manuscript. And so on. Several pages of text could be replaced by a table and/or as supplementary material, allowing the reader to focus on the portions of the data and interpretation that are directly relevant to the subject of the paper, namely factors influencing deep-water hard-substratum assemblages and supporting their survival in zones of reduced oxygen availability.

Specific comments: P2 L35 Barotropic not barotrophic P2 L37-39 Dead coral mounds are not CWCs, so a complete rewrite with consistent nomenclature is recommended P2 L45 ‘Compensate’ should be followed by ‘for’ P3 L54 et seq. Spacing among references is needed P3 L72 If aragonite saturation is important why is it not mentioned in the rest of the manuscript, and why was it not measured in this study? P3 L77 If a specific density envelope is important why is it not mentioned in the rest of the manuscript,

C2

and why was it not measured? P5 L114-118 Are key parameters influencing CWC growth and therefore mound development really the focus of this investigation? What do the surveys from Namibia tell us about CWC growth? There are no living CWCs there. What are the new insights into susceptibility? P5 L127 All acronyms (here OMZ) should be defined on first occurrence in the manuscript. P6 L152-P7 L166 There were no CWCs at the Namibian site, only dead rubble with limited deep-water hard-bottom assemblages. P8 L180-190 Important records and details of the biological communities were recorded, begging the question why more was not made of this data in the paper. Many fish species were recorded in the Angolan reefs, which presumably aren't all OMZ specialists. P9 et seq. Methods and results. We do not need complete details of everything that was done on the cruise, the cruise report is already referenced, we only need the sampling and analysis details for the variables of relevance to this paper. Much could be done to condense text into a table or SI, to considerably shorten and focus the manuscript. P10 L240 Why was turbidity data only collected from Angola, and were the data used? P10 L274 What instrument was used to analyse the absorption spectrum etc? P11 L284-285 'unsinf' - ? Why were the data mean and trends removed? P12 L294 Why was 'SASSW' not discussed in the section describing water masses earlier? SCAW should presumably be SACW. The definition of SACW belongs in that section, not in the results. P12 L297 Temperature differences must not be confused with actual temperatures. The -1.3 and -0.2 here are differences but they are reported as a values. This is a problem throughout the manuscript. AAIW was not mentioned in the section on water masses, and should have been. P12 L305 et seq. Why DOconc and not simply DO, or even DO2? Abbreviations should be defined on first use. P13 L321 Table 1 is only metadata. A table of actual data would be helpful and reduce the need for a lot of text. P13 L324 et seq. Are the r values Spearman rank correlations? What is the justification for this approach? Are values truly independent? Would a more multivariate approach not have been more appropriate? Why do correlations between temperature and DO switch from negative to positive? P14 L331 It is unclear to this non-expert what several of the variables in Table 2 actually are/mean.

C3

P14 L333 'whereafter', not 'where after' P14 L327-341 Does this section not simply describe what is well known about the forces (e.g. along-shore winds) driving upwelling along this coast? Why is what is known not reviewed or discussed in more detail in this manuscript? P14 L342-347 Isn't this the key (and only really relevant) result? More should be made of it. Is the method appropriate for calculating such incursions? P16 L356-372 Was CTD data not used? P16 L374 The figure encapsulates all that we need to know about POM inputs, so the text should describe what it shows and the authors are encouraged to leave out much of the irrelevant details elsewhere in the manuscript. The figure also combines details from both sites. The authors could shorten the manuscript by producing combined sections comparing and contrasting the sites, rather than describing the 2 sites separately. P16 L386 What is this surface water layer – a river plume? Should it not be described in the section about hydrography? P18 L408 Should this not read 'from the shallowest to the deepest'? Some of this section is confusing. P19 L425 What does 'p<0.01, deep' mean? P19 L427-430 This is the result of relevance and should be focused on. P21 L438 Would lower TOC and N in deeper waters not be expected? Could some of this text not be replaced with a figure, or is it repeating what is already in the figure? P21 L454 I do not accept that what was observed off Namibia can be regarded as a CWC. P21 L461 Who says seasonality has a major impact? Reference(s)? A better review and incorporation of what is known about this coast needs to be included in the manuscript. P21 L465 If the measurements made in this study are not the relevant ones, what is the point of the whole manuscript? P22 L468 What is ESACW? This wasn't mentioned before. P22 L470 'a temporal' not 'an temporal' P22 L472-477 References are needed for all the statements in this paragraph (and espewhere in the manuscript). P22 L484 Some of this paragraph belongs in the results. P22 L495 How can the authors, based on limited cruise data, possibly determine what determines the absence of living CWCs from the Namibian margin? P23 L517 'Namibian' not 'Angolan'? P23 L518 DO is an input to habitat suitability modelling, not an output, surely? P23 L524 Not 'limits3' P24 L530-539 The conclusion appears to be drawn that increased food availability compensates

C4

for decreased oxygen or higher temperature. Is it not the case that increased food in the water column is actually one of the main causes of decreased oxygen availability in these regions? This doesn't seem to be mentioned anywhere. P24 L551 What does 'loss of energy which and associated increased energy demand like' mean? P24 L555 'an' before 'energy (food) availability' unnecessary. P25 L563 If high quality food is available off Namibia but there are no living corals how can it be concluded that the presence of the SPOM promotes and/or supports coral growth? P25 L579 'leading to' not 'leads to' P25 L581-584 Some of this information belongs in the results section. P25 L585 Why does terrestrial POM constitute a less suitable food source, and who says so (references)? P25 L589 Delivery rates of SPOM were not measured, only the presence of POM with speculation as to its source(s). P26 L592 What is the source of this fresh POM? P26 L595 'fact that' not 'fact, that's' P26 L603 How are these currents likely to be responsible for the delivery of fresh SPOM from the surface productive zone? P26 L610 I do not understand how the nepheloid layer is formed by bottom erosion due to the intensification of near-bottom water movements, which is indicated by maxima of the buoyancy frequency N_2 in 225 and 300 m depth. Explain and provide evidence. P27 L622 et seq. The examples of ecological roles of CWCs are not applicable in OMZs. P27 L626-627 CWCs are sometimes able to cope with low oxygen levels (there are none off Namibia).

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-52>, 2019.