

Interactive comment on “Microhabitat and shrimp abundance within a Norwegian cold-water coral ecosystem” by A. Purser et al.

A. Purser et al.

a.purser@jacobs-university.de

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Response to Reviewer#1 comments and suggestions

We the authors would like to thank referee #1 for their thorough assessment of the manuscript. They are obviously very knowledgeable on the subjects discussed within our paper, and their comments were taken carefully into consideration during preparation of our revised manuscript.

We would like to respond to each of their raised comments in turn, here below:

GENERAL COMMENTS ON THE TEXT:

REVIEW COMMENT: The use of the term “habitat” is used a bit sloppy in this MS. It

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is unclear whether a “live *Paragorgia arborea* habitat” is the habitat where *P. arborea* occur or it is the microhabitat of live *Paragorgia* as opposed to dead *Paragorgia*. This must be tightened up throughout the manuscript.

AUTHOR RESPONSE: This confusing term has been changed throughout, and throughout the manuscript the attempt has been made to more clearly define what is under discussion. We are discussing areas of seabed from which images are taken, and what features are in the images (i.e. live *Paragorgia*) NOT ecosystem areas where live *Paragorgia* can occur, for example.

REVIEW COMMENT: The use of references illustrates an incomplete knowledge to the topic. Below is a list of references that should be considered. Especially important are the papers documenting shrimp species that have been recorded on corals in the northeast Atlantic: Burdon-Jones & Tambs-Lyche (1960), Dons (1944), Jensen & Frederiksen (1992) (all summarised in: Mortensen & Fosså 2006) and Buhl-Mortensen & Mortensen (2005). The lack of knowledge is special evident on page 3368, line 24-26: “Shrimp species reported from Norwegian reefs include *Pandalus borealis*, *Pandalus montagui*, *Pandalus propinquus* and *Caridion gordonii* (Hopkins and Nilssen, 1990; Jonsson et al., 2004; Buhl-Mortensen and Mortensen, 2004b)The only original paper describing the associated fauna of *Lophelia* is Johnsen et al. (2004) where *Pandalid* shrimps are reported as three species, including the commercial shrimp *Pandalus borealis* lumped together as *Pandalus* spp. None of the thorough papers dealing with associated macrofauna of Norwegian *Lophelia* reefs are referred to (Burdon-Jones & Tambs-Lyche 1960, Dons 1944, Mortensen & Fosså 2006). To my knowledge Hopkins and Nilssen have not documented shrimps on corals. The shrimps that for sure have been documented on Norwegian reefs are: *Caridion gordonii*, *Pandalus propinquus*, *Eualus gaimardii*, *Eualus pusiolus*, *Lebbeus polaris*, *Pandalus montagui*, *Spirontocaris liljeborgii*. *Pandalus borealis* is a shrimp that inhabit muddy habitats. *Pandalus montagui* seems to have a broader habitat range including soft bottoms and *Sabellaria* reefs. None of the other six species support commercial fisheries.

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Discussion Paper

Interactive
Comment

AUTHOR RESPONSE: This is a stern assessment of this section of the manuscript, and one we have considered seriously when making our revisions. The older papers mentioned here we had not been able to read, and we generally tried to avoid in the initial draft, ‘as cited in...’ references. We have used the references listed above to base further work in developing this aspect of the introduction, and we hope the revised version will be far more acceptable.

REVIEW COMMENT: This is a wrong background, and the last sentence of the introduction (page3369, line 14-18) falls apart: “It has been hypothesised that CWC reef ecosystems are highly important refuges for some commercial juvenile fish species (Husebø et al., 2002; Ballion et al., 2012) and that these reefs could also play a role in the lifecycle of other mobile commercial fauna, such as some species of shrimp.” I don’t know any publications that suggest that the corals could be important for commercial shrimp.

AUTHOR RESPONSE: Here what we were trying to do (not very well I suppose) is just to raise the possibility that some shrimp species utilising the reefs (or other fauna other than fish), but to date not documented or quantified by abundance, may be of commercial use. In any case, this has been removed from the revised version of the manuscript.

REVIEW COMMENT: Read up on the topic and re-write the introduction, as well the rest of the manuscript, with respect to what is known about shrimp species and CWC.

AUTHOR RESPONSE: We have certainly taken this comment to hand, and tried hard to revise the introduction and particularly the discussion, in light of it.

REVIEW COMMENT: The aim of the study is summarized in two hypotheses that are very similar and not clear. If one hypothesis deals with spatial scale, and the other with habitat type, then state it clearer.

AUTHOR RESPONSE: The hypotheses have been revised and made more distinct.

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REVIEW COMMENT: The discussion needs to be revised in accordance with the general comments given here.

AUTHOR RESPONSE: As noted above, we have tried to do this.

SPECIFIC COMMENTS ON THE TEXT BY THE REVIEWER:

REVIEW COMMENT: Introduce the abbreviation CVC in the first line in parentheses after “Cold-water coral”.

AUTHOR RESPONSE: Done.

REVIEW COMMENT: Lines 16-18: Skip the term “habitat” here,. It is sufficient to say “densities were observed in association with live Paragorgia arborea, live Primnoa resedaeformis and live Lophelia pertusa.

AUTHOR RESPONSE: Done

REVIEW COMMENTS: Page 3366, line 24-25: add more relevant references from Norway. Page 3367, line 17 and page 3379 line 23: Kreiger and Wing, 2002; should be Krieger and Wing, 2002. Page 3367, line 18: Add reference to Mortensen & Fosså (2006). Page 3367, line 26: Add reference to Mortensen et al (1995) for reference to these species in Norwegian waters. Page 3367, line 28: Change: “often comprising a number of branched arms draped across or close to the underlying substrate” to “often comprising a number of branches across or close to the underlying substrate”. Page 3368, line 5: Add reference to Mortensen et al. (2000) Page 3369, Line 21: “The Røst reef complex, Norway, one of the most extensive in Norwegian waters” This is actually the largest know reef complex in the world. Change!

AUTHOR RESPONSE: These change suggestions have all been made in the revised manuscript.

REVIEW COMMENT: Line 23 and 24: “Permission to conduct video surveys of the reef complex was granted by the Institute of Marine Research (IMR), Norway.” The IMR

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10, C2213–C2218, 2013

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does not grant permission. Change to “Permission to conduct video surveys of the reef complex was granted by Norwegian authorities”, or delete. I am not sure whether it is The Norwegian Fisheries Directorate or the Ministry of Fisheries and Coastal Affairs that formally give such permissions.

AUTHOR RESPONSE: We are checking with the cruise leader the situation with this, and when we upload the revised manuscript, the correct acknowledgement will be made.

REVIEW COMMENT: Page 3370, Line 9: “video-sled”: describe it briefly, or refer to a publication describing it.

AUTHOR RESPONSE: Description has been improved and previous use of the video sled cited.

REVIEW COMMENT: Some additional references to consider Buhl-Mortensen, L. & P.B. Mortensen 2005. Distribution and diversity of species associated with Deep-sea gorgonian corals off Atlantic Canada. Pp 849-879 in Freiwald A, Roberts JM (eds). Cold-water Corals and Ecosystems. Springer-Verlag Berlin Heidelberg, 1244pp. Burdon-Jones, C. & H. Tambs-Lyche 1960. Observations on the fauna of the North Brattholmen stone-coral reef near Bergen. - Årbok for Universitetet i Bergen, Matematisk-naturvitenskaplig Serie. 1960 (4):1-24. Dons, C. 1944. Norges korallrev. - Det Kongelige Norske Videnskabers Selskabs Forhandlinger 16:37-82. Jensen, A. & R. Frederiksen 1992. The fauna associated with the bank-forming deep-water coral *Lophelia pertusa* (Scleractinaria) on the Faroe shelf. - Sarsia 77:53-69. Mortensen, P.B., M. Hovland, T. Brattegard & R. Farestveit 1995. Deep water bioherms of the scleractinian coral *Lophelia pertusa* (L.) at 64 N on the Norwegian shelf: structure and associated megafauna. - Sarsia 80: 145-158. Mortensen P.B., J.M. Roberts & R.C. Sundt 2000. Video-assisted grabbing: a minimally destructive method of sampling azooxanthellate coral banks. - Journal of the Marine Biological Association of the UK 80: 365-366. Mortensen, P.B. & J.H. Fosså 2006. Species diversity and spatial

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distribution of invertebrates on Lophelia reefs in Norway. - Proceedings of the 10th International Coral Reef Symposium. Okinawa, Japan, pp 1849-1868.

AUTHOR RESPONSE: These references have been used to help revise the introduction and discussion.

REVIEW COMMENT: Interesting paper that should be published after changes as suggested here. The use of the image analysis techniques are novel and interesting, but the biological parts are in many cases too weak

AUTHOR RESPONSE: Again we thank the reviewer for taking the time to correct and direct aspects of the biology presented here in the paper. We hope that the revised version will be acceptable for publication and that the improved introduction and discussion sections more supportive of the core methodology and data analysis components of the paper.

Autun Purser (on behalf of co-authors).

Interactive comment on Biogeosciences Discuss., 10, 3365, 2013.

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