

Dear Christophe BARBRAUD,

Your preprint, entitled **Sexual segregation in a highly pagophilic and sexually dimorphic marine predator**, has now been reviewed. The referees' comments and the recommender's decision are shown below. As you can see, the recommender found your article very interesting, but suggests certain revisions.

We shall, in principle, be happy to recommend your article as soon as it has been revised in response to the points raised by the referees.

Dear Editors,

Thank you for considering our preprint submitted for publication in PCI Ecology. We appreciate the constructive comments made by the reviewers and editors and took them into account in a revised version. We indicate below in this letter how we responded point by point to the reviewers comments.

Sincerely,

Christophe Barbraud

## Round #1

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### Decision

*by Denis Réale, 2019-03-05 02:50*

Manuscript: <https://doi.org/10.1101/472431>

### Revision round#1

Dear Authors,

Thank you for submitting your preprint to PCI Ecology. Following the comments from two reviewers on your preprint, and after having read it myself I am not yet ready to recommend it for PCI ecology. The two reviewers, however, are positive, and agree to say that the study provides new insights on sexual segregation. In addition to the reviewers, I have two points that I would like to suggest you consider.

1) In its current form the abstract seems to be a bit contradictory: first, you summarise results showing an absence of sexual segregation in snow petrels. Second, you describe a few results showing foraging differences between the sexes. Third, you conclude that your study shows habitat segregation in snow petrels. I would recommend you provide a more balanced

interpretation of the elements supporting or rejecting the sexual segregation hypothesis, and clarify in which aspects the sexes differ and in which aspects they don't.

Authors response (AR): We modified the abstract by first providing the elements against the sexual segregation hypothesis, and then the elements that support the sexual segregation hypothesis, while presenting the main aspects the sexes differ and those for which they don't. We also added the notion of scale in sexual segregation to take into account a comment from the first reviewer.

2) You use a lot of comparative tests, and false discovery rate corrections may be necessary. FDR corrections may affect your main results and thus the conclusions of your study.

AR: Indeed, there are lots of comparative tests. We now use the Benjamini-Hochberg procedure to control for false discovery rate (Benjamini and Hochberg 1995). We chose this procedure rather than the Bonferroni approach because it incurs a less dramatic loss of statistical power. We chose a false discovery rate ( $q$ ) of 0.10 when applying the Benjamini-Hochberg procedure. This choice was motivated by the fact that this study was conducted on a single year and was exploratory. In such cases setting a FDR to an extremely low value results in decreasing the statistical power for detecting genuine effects and several authors recommend setting FDR to a relatively large value (Yoccoz 1991, Field et al. 2004, Roback and Askins 2005). After applying the Benjamini-Hochberg procedure, results remained unchanged. See lines 383-393 (line number refer to the TrackChange version of the revised manuscript, Tables 1, 3, 6, 7, 8 and Appendix I.

I would like to invite you to resubmit a new draught of the preprint before a decision can be made about a recommendation.

Sincerely, Denis Réale

## Reviews

*Reviewed by Dries Bonte, 2019-02-21 15:40*

The authors report on the sexual habitat and resource segregation in an Antarctic sea bird (snow petrel). They combined data on individual movements, body condition changes and stable isotopes to show the putative role of intraspecific competition resulting in a very specific habitat segregation in relation to sea ice cover. The study therefore adds new insights on the ecological correlates of sex-dimorphism in a vertebrate species; it especially adds evidence for such processes in polar species.

I found the study very well conducted and interesting, and have no substantial comments; nor did I detect methodological flaws or I have to say that I am not an expert in the used methodological approaches, so I cannot judge to which degree they are state of the art.

AR: Thank you for these comments.

I have some recommendations that might improve the paper:

1. General (including abstract): you make a distinction between habitat and spatial segregation. You need to make clear (somewhere, in the intro) how you interpret them as

different. Although I see the differences, habitat segregation is to my opinion always spatial process as well. So make clear that spatial segregation is a mechanism to avoid competing for the same habitat by choosing other foraging locations; while the latter is about selecting different resources at the same location ó so the distinction is scale-dependent. This is a nice example of putative fitness stabilising and equalising mechanisms (see Jeltsch et al. 2013 ó Movement Ecology) .

AR: We appreciate these comments that help to clarify the difference between habitat segregation and spatial segregation. We fully agree with the reviewer and added a couple of sentences in the Introduction to clarify this distinction. See Abstract and lines 74-79.

2. Introduction ó you introduce all hypotheses that were developed to explain segregation between sexes. Some of them are not relevant (thermal hypothesis is actually also a resource-based hypothesis; the social segregation and the predation-hypothesis). You might consider shortening this paragraph in this respect.

AR: We kept the hypotheses but followed your suggestion by shortening this paragraph. See lines 80-106.

3. Line 75: incomplete sentence

AR: Sorry about that. The sentence was completed. See line 88.

4. Line 367: being structurally larger sounds awkward to me

AR: We deleted structurally. See line 396.

5. Line 660: this is clear interpretation (cfr. Point 1): Results indicate an absence of sexual segregation at a broad-spatial scale, but suggest that sexual segregation in snow petrels is mediated by habitat segregation at a microhabitat scale.

AR: Correct.

*Reviewed by anonymous reviewer, 2019-03-01 12:34*

Globally the manuscript is well written which allows a fluid and comprehensive reading. All sections have enough detail to be fully understandable and replicable. Above I highlight some major suggestions of changes and few minor ones, which I hope the authors find useful to improve their work.

Major comments .

L240 - Not sure if I understood well the method used to achieve the h-value. But for being able to compare the UD estimates of each individual like the authors later did, the h-value should be the same in all computed kernel UDs.

One possible way to do this would be if (1) you randomly select a few number of trips; (2) run the kernelUD function with the ad hoc method href; (3) check the h-value of such trips and compute the mean value; (4) use that value as a h-value, to then run the kernel.overlap function. Or was this more or less what you did?

AR: Yes, we proceeded in a similar way. We compared each female UD estimates with the female population UD estimates and did the same for males. For each comparison we calculated the h-value and the obtained the mean h-value for females (0.34) and males (0.36). We then use that mean h-value to run the kernel.overlap function.

L316 - Statistical analysis

Describe also in this section that you used Student's t-tests and Wilcoxon rank tests to test for differences (1) between sexes in the body measurements and foraging trip metrics; (2) between tissues on the stable isotopic data; Etc.

AR: Done. See lines 383-385.

L451 - Discussion

I found it strange to see several statistical results along the discussion. Please move them to the results section and then at discussion you interpret those findings at the light of ecological theories and debate if those findings are alike findings from other related species/ from similar environments on other regions of the world.

AR: We removed the statistical tests that were in the Discussion and inserted them in the Results section. See lines 460-461, 467-468, 471-473.

Minor comments

L65 - Maybe you wanted to say "social segregation"? It's true that under that proposed concept, single-sex groups tend to aggregate... Please confirm.

AR: Yes, we wanted to say social segregation. Corrected. See line 72.

L67-68 - Rewrite as "social and habitat segregations"

AR: Done. See line 72.

L75-76 - Rewrite and rewrite this phrase to make sense. It seems the beginning of it was deleted by mistake

AR: Yes, a term "forage-selection hypothesis" was missing. Corrected. See line 88.

L118 - Please add a question mark after "use"

AR: Done. See line 135.

L119 - Again, add a question mark after "sexes"

AR: Done. See line 136.

L134 - Remove the extra bracket

AR: Done. Line 151.

L197 - Rewrite as "consistency of their foraging niche over time"

AR: Done. Line 214.

L201-202 - Rewrite as "the average trip duration during incubation"

AR: Done. Line 219.

L243 - Rewrite as "40 min"

AR: Done. Line 261.

L348 - Replace "identify" by "identity"

AR: Done. Line 366.

L396 - Rewrite as "it increased"

AR: Done. Line 425.

L447-448 - Replace "P" by "P"

AR: Done. Lines 469, 471, 478, 480.

L468 - Replace "that present no" by "without an"

AR: Done. Line 499.

L520 - "females".

AR: Done. Line 551.

L535 - Substitute "with" by "which".

AR: Done. Line 566.

L565 - Replace by "Procellariiform"

AR: Done. Line 596.

L625 - "González-Solís".

AR: Done everywhere. Lines 543, 597, 656, 834..

L1015 - Table 4 legend, please start with "Generalized Mixed Additive Model (GAMM)". Also add to the legend a description of what "df" means.

AR: Done.

L1033 - Table 5 legend, please start with "General Additive Model (GAM)". Also add to the legend a description of what "df" means.

AR: Done.

Add to the legends of Tables 6-8 - The results of student t-tests are also shown, with significant differences in bold .

AR: Done.

Figure 1 - increase the size of the bathymetry legend .

AR: Done.

Figure 4 - increase the overall lettering size .

AR: Done.