Notes on "Community size affects the signals of selection and ecological drift on biodiversity" by Tadeu Siqueira et al., https://doi.org/10.1101/515098

Eric Harvey (for PCI ECOLOGY)

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General comments

Dear Dr. Siqueira

Thank you very much for submitting your manuscript **Community size affects the signals of selection and ecological drift on biodiversity** for recommendation at PCI Ecology. The reviewers and I appreciate the work you have accomplished. Based on the reviews, we will not be able to recommend this manuscript at this point, but will be happy to consider a revised version.

Both reviewers and I agree that this manuscript tackles a topic relevant to researchers interested in stream ecology as well as, more broadly, to community ecologists. In particular, I think that the contrast between boreal and tropical systems is very interesting as it provides potential explanations for the idiosyncrasies observed in the many studies addressing this issue at different specific locations.

However, both reviewers raise concerns, mainly about some of the assumptions behind the approach, and the interpretations. Those issues of interpretations should be addressed clearly in the manuscript. I also agree with one reviewer that the fact that the data is only described in Heino et al., 2018 leads to some unclarity in the Methods section that should be addressed. Both reviewers and myself found that the approach used to define community size need to be clarified. Another important issue is with expectations of the slope of the relationship between beta-deviation (and beta-diversity) and community size. The authors state clearly predictions for a beta-deviation of 0 versus 1 or -1 but they do not provide clear interpretations for the slope itself (positive versus negative). This would greatly improve the clarity since they found that with one metric the slope is positive and with the other one the slope is positive. Finally

both reviewers suggest complementary analyses that could easily be added to clarify those issues.

Should you decide to revise the manuscript for further consideration here, your revisions should address the specific points made by myself (attached here) and each reviewer. Please include a cover letter indicating your responses to the review comments and the changes you have made in the manuscript. If you disagree with a reviewer's point, explain why. Also, please add line numbering to the manuscript so that it is easier to refer to specific lines.

Sincerely,

Dr. Eric Harvey Recommender, PCI Ecology

Minor comments

Introduction

Recommender's annotations on the introduction "Demographic stochasticity can override ecological selection in small populations leading to the coexistence of strong and weak competitors.

Importance of deterministic vs. stochastic processes on beta-diversity -> Environmentally similar local communities may differ in species composition due to distinct legacies of demographic stochasticities —> human perturbations reduce size of communities and thus might increase the effect of demographic stochasticity (and influence beta-diversity in a predictive way)."

Comments. I really appreciate the introduction and the general context of the study. I think that it is very clearly laid out with appropriate literature cited.

MAIN OBJECTIVES:

"In this study, we tested the hypothesis that ecological drift is a major process causing variation among small communities. We expected that ecological drift would play a smaller role in large communities where deterministic niche selection should drive spatial variation in community structure."

Predictions

"we expected that beta diversity would be high and beta deviations would be close to zero in watersheds with the smallest communities (some watersheds in Brazil only)."

"Second, we expected that watersheds with larger communities in Brazil would have lower values of beta diversity compared to smaller communities, but high positive values of beta deviation."

"Together, these two predictions would lead to a negative relationship between beta diversity (before controlling for sampling effects) and community size, but a positive relationship between beta deviation and community size."

"Finally, because the smallest boreal stream communities are as large as the largest tropical communities (Heino et al. 2018), we expected that boreal communities would show a weak or lack of relationship between (positive) values of beta deviation and community size."

Comments. The tropical vs. boreal contrast is very interesting. Suggest that there are large-scale latitudinal gradient in the relative importance of stochastic and demographic processes.

Methods

"...and estimated local community size as the mean number of individuals sampled in a watershed. Because streams within and among regions differ in width and this could be viewed as measure of habitat size, we multiplied local community size by stream width, averaged it within watersheds, and defined it as an alternative measure of community size."

Comments. I am confused: if community size is a property of the watershed how can it be multiplied by each within watershed locality stream width?

Comments. Also, each watershed is considered a metacommunity, right? Here my understanding is that local community size is averaged across the whole meta community?

Comments. Are different stream orders equally represented in each watershed, or did you only sample a certain range of steam orders, or was it at random?

Comments. for the median size approach; do you mean median community size rather than median population size?

"Fitted models provided similar results with all measures of community size and, thus, we show here results based on the former measure. We repeated the procedures described above but changing the definition of species pool to the watershed scale (not the entire region; step (ii)). "

Comments. IF all values are averaged at the watershed/metacommunity scale it's unclear how beta-deviations can be measured at the within watershed scale?

Comments. The description of the PERMDISP suggests that the analysis was performed within watersheds. This is confusing with the information provided before stating that beta-diversity metrics were averaged at the watershed scale.

Figures and information in the results section suggest that the PERMDISP was not performed at the same scale as the information in the figures, is that correct?

RESULTS

Comments. Figure 1. - very interesting! So analysis are done among watersheds and not within watersheds?

DISCUSSION

"Mechanistic explanations for the major role of ecological drift in small communities involve the alteration of competitive outcomes of species with different fitness "

Comments. This is a consequence but not a cause of the importance of ecological drift, right? The sentence is unclear.

Comments. The results suggest that smaller communities should have higher beta-diversity but also higher local richness compared to larger communities dominated by a few species. I apologize for the self-advertisement (I generally avoid to do this), but in that case I feel like this recent study would be very relevant to cite: "Harvey Eric, Gounand Isabelle, Fronhofer Emanuel A., and Altermatt Florian. 2018. Disturbance reverses classic biodiversity predictions in river-like landscapes. Proceedings of the Royal Society B: Biological Sciences 285:20182441." - but I will leave this at the authors discretion (this is only a suggestion)

Comments. So if I understand well, you observed a saturation along the latitudinal gradient for species occurence but not for species relative abundance, correct? This might indicate that variations in relative abundances are intrinsically more stochastic?