Peer Community In Ecology

Environmental heterogeneity drives phytoplankton community assembly patterns in a tropical riverine system

Cédric Hubas and Eric Goberville based on reviews by Eric Goberville and Dominique Lamy

A recommendation of:

Clumpy coexistence in phytoplankton: The role of functional similarity in community assembly

Caio Graco-Roza, Angel M. Segura, Carla Kruk, Patricia Domingos, Janne Soininen, Marcelo M. Marinho *(2021), bioRxiv, 869966, ver. 6 peer-reviewed and recommended by Peer community in Ecology* **10.1101/869966**

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Recommendation

What predisposes two individuals to form and maintain a relationship is a fundamental question. Using facial recognition to see whether couples' faces change over time to become more and more similar, psychology researchers have concluded that couples tend to be formed from the start between people whose faces are more similar than average [1]. As the saying goes, birds of a feather flock together.

And what about in nature? Are these rules of assembly valid for communities of different species?

In his seminal contribution, Robert MacArthur (1984) wrote 'To do science is to search for repeated patterns' [2]. Identifying the mechanisms that govern the arrangement of life is a hot research topic in the field of ecology for decades, and an absolutely essential prerequisite to answer the outstanding question of what shape ecological patterns in multi-species communities such as species-area relationships, relative species abundances, or spatial and temporal turnover of community composition; amid others [3]. To explain ecological patterns in nature, some rely on the concept that every species - through evolutionary processes and the acquisition of a unique set of traits that allow a species to be adapted to its abiotic and biotic environment - occupies a unique niche: Species coexistence comes as the result of niche differentiation [4,5]. Such a view has been challenged by the recognition of the key role of neutral processes [6], however, in which demographic stochasticity contributes to shape multi-species communities and to explain why congener species coexist much more frequently than expected by chance

[7,8]. While the niche-based and neutral theories appear seemingly opposed at first sight [9], the dichotomy may be more philosophical than empirical [4,5]. Many examples have come to support that both concepts are not incompatible as they together influence the structure, diversity and functioning of communities [10], and are simply extreme cases of a continuum [11]. From this perspective, extrinsic factors, i.e., environmental heterogeneity, may influence the location of a given community along the niche-neutrality continuum.

The walk of species in nature is therefore neither random nor ecologically predestined. In microbial assemblages, the co-existence of these two antagonistic mechanisms has been shown both theoretically and empirically. It has been shown that a combination of stabilising (niche) and equalising (neutral) mechanisms was responsible for the existence of groups of coexistent species (clumps) in a phytoplankton rich community [12]. Analysing interannual changes (2003-2009) in the weekly abundance of diatoms and dinoflagellates located in a temperate coastal ecosystem of the Western English Channel, Mutshinda et al. [13] found a mixture of biomass dynamics consistent with the neutrality-niche continuum hypothesis. While niche processes explained the dynamic of phytoplankton functional groups (i.e., diatoms vs. dinoflagellates) in terms of biomass, neutral processes mainly dominated - 50 to 75% of the time - the dynamics at the species level within functional groups [13]. From one endpoint to another, defining the location of a community along the continuum is all matter of scale [4,11].

In their study, testing predictions made by an emergent neutrality model, Graco-Roza et al. [14] provide empirical evidence that neutral and niche processes joined together to shape and drive planktonic communities in a riverine ecosystem. Body size - the 'master trait' - is used here as a discriminant ecological dimension along the niche axis. From their analysis, they not only show that the specific abundance is organised in clumps and gaps along the niche axis, but also reveal that different clumps exist along the river course. They identify two main clumps in body size - with species belonging to three different morphologically-based functional groups - and characterise that among-species differences in biovolume are driven by functional redundancy at the clump level; species functional distinctiveness being related to the relative biovolume of species. By grouping their variables according to seasons (cold-dry vs. warm-wet) or river elevation profile (upper, medium and lower course), they hereby highlight how environmental heterogeneity contributes to shape species assemblages and their dynamics and conclude that emergent neutrality models are a powerful approach to explain species coexistence; and therefore ecological patterns.

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Reviews

Toggle reviews

Revision round #3

2021-04-28

Author's Reply

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Decision round #3

Dear author,

Your article has been reviewed a third time. Following the second round of review, your manuscript has been sent to one of the two referees and your review work has been acknowledged. You will note that our reviewer has suggested some areas of improvement which I would ask you to follow in order to proceed with the recommendation of your article.

When submitting your revised manuscript please provide a point by point response to reviewers comments.

I would like to thank you for your work and your confidence, as well as the reviewers for their rigorous and helpful work.

Sincerely

Cédric Hubas

Preprint DOI: **https://doi.org/10.1101/869966**

Reviewed by Eric Goberville, 2021-04-19 14:46

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Revision round #2

2020-11-02

Author's Reply

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Decision round #2

Dear author,

Your article has been reviewed a second time. The reviewers acknowledged the effort made to improve the clarity of the document (more specifically concerning the statistical analysis) which led to a significant improvement of the whole manuscript.

However, there remain many areas for improvement. Both reviewers were very constructive and provided detailed comments. They still point out the lack of structuration and rigor in the presentation of results (a remark that was already raised in the first round of review). It is therefore absolutely essential to pay close attention to scientific accuracy and rigor. Otherwise, it will not be possible to recommend this article for publication. The authors must pay particular attention to improving fluency, eliminating typos and shortcomings, and homogenizing their document. In line with reviewer #1, I would suggest that the authors get editing help to improve and clarify their manuscript.

In addition, it seems that The use of 'functional traits' in the document is misleading and that the articulation between the RLQ analysis and fourth corner method needs further explanations.

For all these reasons, I do not consider this preprint suitable for publication in its present form and therefore, I do not recommend it. However, if you are able to amend it in the light of our reviewers' comments, we would be happy to consider it again. When submitting your revised manuscript please provide a point by point response to reviewers comments.

Yours sincerely

Cédric Hubas

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Reviewed by Eric Goberville, 2020-10-27 20:07

Download the review (PDF file)

Reviewed by Dominique Lamy, 2020-10-20 10:08

Download the review (PDF file)

Revision round #1

2020-03-06

Author's Reply

Download author's reply (PDF file)Download tracked changes file

Decision round #1

Dear author,

We have now in hand 2 independent reviews of your article “Clumpy coexistence in phytoplankton: the role of functional similarity in community assembly". While this paper has a potential to be accepted, some important shortcomings have been raised and must be clarified or fixed to make it suitable for publication. Reviewers raised a number of important issues and I am totally in line with their conclusions. Their reports are very constructive and both point out the lack of structuration and rigor in the presentation of results. Also, the statistical analysis is not clearly explained which is stressed as a major concern by one of the reviewers.

It is thus of uttermost importance to significantly improve the clarity/level of details of the analyses and on how the results are presented in their current form. The article has potential with interesting ideas but authors must bring new elements to their manuscript especially to the material and methods section. They must present their results in a much more exhaustive and readable way.

For all these reasons, I do not consider this preprint suitable for publication in its present form and therefore, I do not recommend it. However, if you are able to amend it in the light of our reviewers' comments, we would be happy to consider it again. When submitting your revised manuscript please provide a point by point response to reviewers comments.

Yours sincerely

Cédric Hubas

Preprint DOI: **https://doi.org/10.1101/869966**

Reviewed by Eric Goberville, 2020-02-27 23:19

Download the review (PDF file)

Reviewed by Dominique Lamy, 2020-03-02 11:11

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