

Biogeosciences Discuss., editor comment EC1
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Comment on bg-2021-313

Paul Stoy (Editor)

Editor comment on "Effect of the presence of plateau pikas on the ecosystem services of alpine meadows" by Yingying Chen et al., Biogeosciences Discuss.,
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I am in receipt of an additional review from an expert Referee, pasted below. When preparing a response, please include a response to these insightful comments, which follow.

Overall, I am very excited to see the authors addressing this topic in this system. I especially appreciated the authors integrating a number of measures into their suite of response variables; that should be done more frequently! On the other hand, some of the methods either need to be clarified or better justified, because the current description comes across as potentially biased. Furthermore, I don't understand why the authors make things (for me, at least) more complex and difficult to understand – instead of simply naming the particular response variable, they have created monikers such as "biodiversity conservation service" that obfuscate meaning and make reading harder. Also, as noted below, I'm not sure that I agree with the authors' assertion of a threshold, simply because a quadratic relationship exists. Isn't that the default assumption of niche dynamics and (more relatedly) the Intermediate Disturbance Hypothesis? I don't see where the bare vs. the vegetated plots in the pika-occupied areas is discussed in the main text. Also, some of the Discussion seems like a pretty strong over-simplification of how to contextualize the study's results with the broader literature. Also, given that all of the sampling occurred in 1 month of 1 year, and that **the entire** sampled area spanned 0.1225 km², it would seem appropriate for the authors to acknowledge with a caveat or two the limitations of this spatio-temporal domain. I realize that the sampling scales of biogeochemistry investigations are much more limited than that of animal ecologists, but note that you're investigating the dynamics of both soils and animal behaviors.

Larger, more-important topics that are of greatest concern to the robustness of the study and its conclusions:

Line 27 – If this is true, consider adding "linearly", immediately after "decrease". Later on in the sentence, note that nowhere in the abstract have you defined what "disturbance" or "disturbance intensity" is, specifically. This 2nd point remains true on line 54 through at

least 66, in the Introduction. It appears again on line 152. What is the “disturbance”? Needs to be defined.

Line 32-33 and 70-71 – It’s not clear what “provisioning, regulating, supporting” refer to: each needs to be in reference to something else. E.g., provisioning WHAT?, regulating WHAT?, supporting WHAT?

Line 49-51 – This sentence needs to be re-phrased; its meaning is not clear, and there are several studies (in just 1 species of pika [*Ochotona princeps*], alone) that show how American pikas are ecosystem engineers, alterers of vegetation composition, a keystone species, etc. These include Aho et al. (1998), several papers by Denise Dearing at the University of Utah (see her thesis: <https://www.proquest.com/docview/304226940?pq-origsite=gscholar&fromopenview=true>), Dearing (1996: *Oecologia*), Hall and Chalfoun (2019; *J. Animal Ecology*), Jakopak et al. (2017, *J. Mammalogy*), among others. Also, it would be important for the authors to cite one or more papers that have noted specifically that the plateau pika is a keystone species. This will help ensure the objectivity and lack of bias in the research, rather than it appearing that plateau pikas are nothing more than a “pest” (see N. Fan, W. Zhou, W. Wei, Q. Wang, and Y. Jiang. 1999. chapter 13. Rodent Pest Management in the Qinghai-Tibet Alpine Meadow Ecosystem. 20 pages.). This lack of clarity here is pivotal, because this is where you’re really setting up the goal of the manuscript and why it will be an important contribution.

Lines 85-93 – I very much like that you have laid out your hypotheses and cited one or more studies that found a certain result. However, unless the reader goes and reads all five of those papers, it’s not clear whatsoever why those predictions are being made, nor by which processes or mechanisms those results were created. It would be helpful if you provided concise descriptions of those.

Lines 103-105 – Excellent that you provide the reader some overview of conditions at the site. However, it would be much, much more informative, and relevant to your study objectives and interpretation of your results, if you were to provide understanding of how much of the annual precipitation falls as snow (either % or amount during the warm season, and % or amount as snow during cold season), and what the temperatures are in the warm and cold seasons. Pikas generally do not respond to any annual-average measure.

Lines 114-115 – I’m not sure what it means that “... many plant species are found until late summer.”

Line 116 – It’s not a “census”; it’s a “sample” or a “survey”.

Line 116-118 – Yak grazing appears that it could be a confounding influence, here. Given that effects in low-productivity systems such as this are likely to have ecological memory (or legacy effects), this sentence does not make sense logically to me.

- 119 – “only a small burrowing herbivore” ... what does this mean? It’s not important?

Section 2.2 – You might give just a little more background on the life-history strategy of plateau pikas here, as most readers of the journal will not know the relevant details. E.g., typical body mass, does sexual dimorphism exist?, are they generalist herbivores or if not, what do they eat?, are they burrowers themselves, or do they conscript burrows made by other species?, how deep do their burrows go?, do they hibernate?, etc. May only need to be an extra 2-4 sentences, but this will help the reader immensely.

- 123 – When you say “diffusion”, do you mean “dispersal”? If so, is this natal dispersal, or adult dispersal? If the process is gradual, does the ability to find reference (unused)

sites depend on the timing of your sampling?

- 133-134 – I don't understand this sentence at all; the text after the comma is exactly the same as the start of the sentence.
- 134-135 – To make the study repeatable, we need to know what that distance was specifically that you used.
- 152 – Depending on what "disturbance" means, this assumption may or may not hold true. I would be surprised if it did NOT hold for amount of biomass within a certain distance of the burrow entrance (if the species is a central-place forager), but as noted earlier in the MS, some ecosystem properties are not affected while others are even promoted by the presence of pikas.
- 156-160 – The reader does not have enough detail to know what you are doing, to assign causality by plateau pikas. Rather than assume that the reader will just trust your method, you need to provide clear information that both makes the method repeatable, and convinces the reader that you accounted for this in a robust, defensible manner.
- 163-164 – It seems that if you are only moving the quadrats slightly in the pika-occupied sites (but not in the non-pika-occupied sites), you are biasing the sampling and results. Either clarify or justify this approach. By not having any sites be randomly selected, it causes concern in the reader and in my mind as well. Furthermore, in reading the rest of the main body of the text, I'm not seeing any reference to the comparisons of bare vs. vegetated plots within the plateau pika area
- 164-165 – What is the purpose of the paired bare patch vs. the vegetated patch? The reader has no idea about why you are doing this?
- 172 – Species richness is simply a tally of the species present in a given area; you mention "their numbers", which leads me to think that you also measured abundance, so that you could quantify measures like evenness and Hill series.
- 173 – "palatable" and "unpalatable" to *which species*? Obviously, palatability depends upon the herbivore that one is considering.
- 192 – You need to connect this back to your sampling approach. Consider adding "Because pika-absent sites did not include sampling at bare areas, only" before the start of the "Five soil samples..." sentence.
- 200-201 – What does "artificially removed" mean? I think that you may mean "manually picked out"...
- 202-203 – This sentence is nonsensical, as written – passing soil through a sieve does not allow one to estimate any of these concentrations.
- 203-206 – Please specify which technique is associated with which concentration – e.g., Kjeldahl procedure measures total N concentration.
- 216-218 – Yes, but how do you measure the area of a shape that is irregular? Need more details on *how* you measured areal extent.
- 219-220 – How close to reality was this consideration? Depending on how far from actual truth it is, this assertion worries me.
- 225-229 – You cannot assume that your reader is going to read all 3 of these papers. You need to provide the key details, here, to convince the reader that you're doing this robustly.
- 241 – Is the presence vs. absence of plateau pikas considered your "fixed effect" ?
- 243 – This is a VERY long sentence. Consider ending the first sentence in the middle of line 247. Also, the phrase from middle of line 247 to 251 is not written correctly – you're not performing a regression analysis between (nor among) all of the response variables.
- 255 – Given the tens to hundreds of different analyses that you're performing across this study, please provide a justification of why you are not correcting for experiment-wise error rates (e.g., Bonferroni stepwise correction). That is, if you perform 100 tests, you will likely have 5 tests that will be "statistically significant", even when there is no pattern nor biological effect whatsoever, just by chance alone.
- 259-269 – Consider simply reporting the results of what you found, as opposed to giving everything another name for each predictor. However, what you've done makes

things more complicated, in my view, because you've lumped several response variables into *classes* of responses (such as "provisioning services").

- 280-283 – I think that it would be preferable to comment on the fit of the linear vs. the quadratic relationship to the data. Also, does a bell-shaped curve unequivocally indicate a "clear threshold for disturbance"? I'm not sure that it does ... what about the Intermediate Disturbance Hypothesis as an alternative explanation for the pattern?
- 322 – Although I appreciate the desire to connect plateau pika activity to positive provision of ecosystem services, using terms like "in relation to the forage availability service of grassland ecosystems" makes it confusing for the reader to understand what is really going on in the text. Also, the logic of lines 321-325 is not at all clear to me ... what are you saying is the mechanism causing this context-dependence?, i.e., why are the responses different in the two classes of regions?
- 326-335 – I am very impressed that you are trying to contextualize your results amidst some studies from the existing literature, but you are really undercutting the value of these comparisons by virtue of how high-level, superficial, or simplistic that they are. E.g., *why* are the results consistent with the one study, but not the other? What are the magnitudes of the effects?
- 349-350 – This sentence makes no sense, given that you define "biodiversity conservation [service]" as species richness of plants.
- 364-365 – I am not demanding that you do that for this study, but quite a lot of your interpretation (e.g., see lines 394-397) rests on the assumption that number of active burrows serves as an accurate index for disturbance intensity. It sure would be nice (and, for me, more empirically compelling) to correlate number of active burrows with number of pika-hours spent foraging aboveground, on one or a small number of days throughout the season. The latter would be a much more direct measurement of one process (i.e., forage consumption) that can lead to some of the changes that you are suggesting are imposed by pikas.

Lines 389-394 – As mentioned above, this sentence feels like a pretty strong over-simplification of the dynamics of herbivory, given how few studies the authors are citing across the paper, compared to the plethora of studies on the topics listed in this sentence that exist. None of the numerous review articles published over several decades is cited, and the authors are reporting nothing more than directionality.

Lines 407-409 – The existence of a quadratic relationship to disturbance intensity does not necessarily indicate an existence of a threshold. Much previous ecological literature has been produced on the topic of thresholds; consider consulting it.

Issues that compromise the clarity, readability, and breadth of audience of the article:

Line 15 – "pika" is singular; either say "pikas" or "the plateau pika" (**also on line 52, 53, 62, 151, etc.**). Also, "an example" of *what*? Maybe instead say "a model organism" or "a focal organism".

Line 17 – "forage availability": does this mean forage available to pikas, livestock, or other herbivores?

Throughout Abstract and entire MS – Using three or more nouns in a row is called "freight-train wording". Its usage makes it very difficult for the reader to divine which noun(s) are acting as adjectives, and which one(s) are acting as a noun. For greater clarity, you need to either 1) hyphenate the nouns that are acting as adjectives, or, preferably, 2) use prepositions to clarify the relationships among the nouns. For example, at this point in the MS, I have no idea what "soil nutrient maintenance services", "soil potassium

maintenance service", or "forage availability service" (line 44) is. I recommend the authors implement these clarifying changes, throughout the MS.

Line 23 – Change ", whereas it ..." to ". In contrast, it ..."

Line 30 – "richen" should be "richening", to be parallel with "influencing"; I will stop identifying this type of grammatical error here. The MS will be markedly improved and clearer, when all such issues are resolved.

Line 80 – "land-use" should be "patterns of habitat use" or simply "habitat use"; the former refers most commonly to how humans use landscapes for anthropogenic activities. Not sure what "the scales" means, on line 81.