

Reviewer 2 Eva Cuesta

Thank you for considering my comments. Luck!

Introduction

The introduction is short and concise and written in a clear, blunt manner. well Even so, it addresses the problem of the extraction of hydrocarbon resources and oil extraction in tropical forests, justifies the use of coprophagous beetles as indicators of the quality of the ecosystem and raises its hypotheses regarding the values of diversity, abundance and richness of species.

We added some examples of studies with coprophagous beetles as indicators of the quality of the ecosystem under different anthropogenic alterations performed under tropical conditions (Brazil, Colombia, México) (Lines 93-99).

I would suggest the authors add a paragraph in which they explain a little more what the main differences are in terms of the 4 types of habitats in which they sample: Agricultural soils and Sensitive ecosystems, and Natural forests and Palm plantations (beyond of remediated soil ecosystems vs. non-contaminated soils).

We deeply explain the differences between the different soil ecosystems (Lines 57-66)

I also suggest adding a paragraph that explains a little better the biology of dung beetles and their role in ecosystems.

Ecosystem services and functions were added in the paragraph (Lines 80-92).

Line 55: García-Villacís, 2021 is not in the bibliogrphy, ;maybe is: García-Villacís et al, 2021?

This reference was corrected (Line 70).

Thank you for considering the suggestions =).

Materials & Methods

Study area

I personally miss a deeper description of the sampling sites. In addition to temperature and rainfall, the type of vegetation, altitude, the extension area, how much did each sampling area measure, at what distance are they from each other approximately...

A deeper description of sampling sites was added (Lines 126-137). Figure 2 was added.

Figure 1 is not referenced in the text.

Figure 1 was cited (Line 116).

I think that the idea is that the reader should get an idea of what the sampling place is like through the description made in the article. It should not be assumed that any reader knows what the Amazonian forest environment is like.

A Figure was added that shows each of the sites evaluated, so that readers know what the environment of the Amazon jungle is like (Figure 2).

The climatic data of temperature, precipitation and humidity in table 1, have been measured by you using some thermo-hygrometer devices or are data from a meteorological station? That type of information should be reflected in the methodology.

Details were inserted in the methodology (Lines 121-123)

Selection of collection sites

Could you briefly explain how the soil samples were extracted to be later analyzed?

We added an explanation of the soil sampling procedure (Lines 138-139).

Sampling design

What is the reason for putting 50:50 alcohol water?

Before the beginning of the experiment, we tested the technique (pitfall traps). Ethyl alcohol (70 percent concentration) evaporated quickly. Thus, we decided to reduce the concentration to 50:50. However, as soon as possible, the specimens were cleaned and preserved in 70% alcohol (Lines 160-161).

I use water directly in the pitfall traps, with a drop of soap to break the surface tension so that the beetles cannot escape, and in case of frost forecast, I add salt. When I collect them I filter the contents of the trap and I already store it in alcohol. I'm only mentioning it in case in the future it helps you save alcohol, which, as you say, evaporates quickly. In traps that are going to stay set for a long time (months) we use propylene glycol.

I suppose that the traps are active for 120 hours straight, but they could also be on 5 different days throughout the month, could you specify it in the text?

We modified this phrase to indicate that the sampling was carried out for 120 consecutive hours (Lines 155-156).

Line 123: "Dung beetles were preserved in 70% ethanol, and some specimens were pinned and identified to species using dichotomous keys". As the sentence is

written, I understand that only some specimens were identified, but I think all the specimens have been specified, right? Maybe you wanted to say: "Dung beetles were preserved in 70% ethanol, and identified to species using dichotomous keys. Some specimens were pinned and deposited in the Museum of Zoological Researches".

We modified this phrase according to this recommendation (Lines 160-164).

Voucher specimens? I didn't know that expression, is it common??

Data analysis

Line 132: Could you briefly explain what the Clench method consists of? And same about the non-parametric estimator Chao1?

The explanation was added (Lines 168-173).

Line 136: When you say "were grouped", to what data do you refer specifically? Trap data by location? Ecosystem data? I think it would be nice to clarify these details (although they may seem obvious).

The data from each experimental unit were pooled to obtain a single piece of data for each variable per plot. The text was restructured.

Results

Perhaps it would help to have a better vision of the differences between ecosystems, not just talk about the general data, but also comment things like only 10 species were collected in agricultural soils, or the more relevant findings regarding differences between ecosystems.

Line 163: Cool! Congrats!

The specific differences requested are described in Lines 216-223.

Line 165: I think this sentence could be confused: "the accumulated richness of the dung beetle ??decreased???"... I think the cumulative values do not decrease, maybe what you mean is that the rate of increase of richness decreases.

The paragraph was rewritten (Lines 206-208).

Line 167: "the curves did not stabilize". Maybe sounds better "the slope did not reach values close to 0" ?

The sentence was corrected (Lines 206-208).

Line 171: maybe you could comment that all the differences between ecosystems have been significant. It is good that the text is self-explanatory, even if there is a table with the data. In general, I think it could help the understanding of the results if you explain them a bit more, not just redirect to the tables. For example, in line 170-171: "The average values of abundance, richness, and the Shannon

index differed between ecosystems within each month”, Ok, but how do they differ? I think that example can be applied throughout the text.

The suggested comments were added (Lines 195-228).

Delete the “.” in Clench., 1979 (line 170).

Thanks for the changes.

Discussion

Line 186-188: 87% is richness or inventory completeness??

It is richness.

Line 192-194: I believe that the study of the diversity of dung beetles in disturbance soils is merely important, but I am not sure that the data discussed in this paragraph is why it is necessary.

The sentences were corrected

Dung beetle diversity

Line 203: Among other things, such as the alteration caused by the issue of soil remediation, and the degradation of the ecosystem in general I guess.

The suggested comments were added (Lines 253-256).

Line 206-209: I am not sure of the relevance of this data for this study.

These data are relevant because they explain the reasons why beetles cannot find their food sources in degraded sites (Lines 269-277).

Line 210: remove the dot before the citations.

The dot was removed

Line 211-213: There is no paper to be cited here?

No, it is our contribution.

Line 223: Perhaps you could also mention, not only agricultural management, but also the disturbances derived from livestock management. As ideas to talk about or study: Could you see different effects on diversity, richness and abundance depending on, for example, the functional group or the size of the species? Do they all decrease equally? Is there a group of species that seems especially sensitive?

Thanks, but the main objective of our research was to evaluate all dung beetle species in the community, so your concerns were not considered in our study. However, we could address your questions in a subsequent publication.

Temporal variation of dung beetle diversity

Line 230-231: And what do you think could be the cause of such a large phenological difference in the abundance peaks found? Are the same weather conditions? Same type of ecosystem? Could you discuss more about this aspect? What thing could condition the abundance to be high or low in the rainy season?

Other causes that explain differences in beetle abundance, richness, and diversity are explained in Lines 282-284.

Line 234-237: In your case, which of these aspects do you think may have affected your results to a greater extent and why?

We cannot state which of the indicated factors could have been the most relevant, so we describe the possible factors found in the literature.

Implications for the conservation

In general, throughout this section I miss bibliographical citations on dung beetles as bioindicators, other works in which dung beetles are used to establish conservation measures...

We do not use bibliographic references in this section since they are our personal contributions. And we cannot say which dung beetles are used to establish conservation measures. However, our results do allow us to affirm that the changes in abundance, richness and diversity of dung beetles are related to changes originated by ecosystem alterations.

Line 256-259: in what way? Are there any examples in the literature? You could discuss a bit about which ecosystem functions loss can be the one that has the most consequences for ecosystems? Can they exert enough pressure for biodiversity conservation measures to be taken?

This paragraph is our recommendation.

I personally put this section as conclusions.

Conclusions

I think that the conclusions could be strengthened more. Which functional group is more affected or more sensitive? Could disturbances make some species locally extinct? How strong must conservation plans be to be effective in disturbed areas?

The conclusions have been drawn up based on the results obtained in our study.

Figures

Figure 1. is not cited in the text. I think you should explain that each symbol corresponds to a sampling location, and that they correspond to Agricultural soil, sensitive ecosystem...

Figure 1 was cited. The symbols that represent each of the ecosystems have been colored.

Figure 2.

Although it may be obvious, I think that it should be specified at the foot of the figure to which type of ecosystem (remediated soil ecosystems and non-contaminated soil ecosystems) each of the four habitat categories belongs.

The explanation was added. Figure 2, is Figure 3 now.

Figure 3. I don't quite understand these graphs. What is N=44?? The number of specimens and the number of species do not correspond to those in table 3, so I understand that the data is treated in some way. I think it should be explained, both at the bottom of the figure, and in the results text.

The number 44 corresponds to the number of data used to estimate the mean values (four data from each ecosystem * 11 months of evaluation = 44 data). Table 3 shows the total number of individuals collected and not mean values. Explanations are included in the title and footer of Figure. Figure 3, is Figure 4 now. **FIGURE 5 NOW**

Perfect, but why not put it in the description of the figure to avoid possible confusion for readers?

I would not put negative values on the Y axis, I know it is because values close to 0 are better visualized, but it does not make sense to put negative abundances or richness.

The negative values have been removed.

Again, I'm not clear what N=4 is.

The number 4 corresponds to the number of data used to estimate the mean values (four data from each ecosystem).

Same as Fig. 5.

As in Fig 3. the number of specimens and the number of species do not correspond with table 3, so I understand that the data are treated. Please, explain what is abundance and richness exactly in the results and in the graph explanation.

Table 3 shows the total number of individuals collected and not mean values. Explanations are included in the title and footer of Figure. Figure 4, is Figure 6 now.

Figure 5. As in previous graphs, I think you should specify to which type of ecosystem (remediated soil ecosystems and non-contaminated soil ecosystems) belongs each of the four habitat categories.

The information was added. Figure 5, is Figure 4 now.

NEW FIGURE 2. Thanks for added!! You can merge both paragraphs:

Photos from Remediated soil ecosystems: (a) Sensitive ecosystem and (b) Agricultural soil; and noncontaminated soil ecosystems: (c) Natural forest and (d) Palm plantation.

Table 1. Which is the source of that data? Are yours or from some meteorological station?

Details were inserted in the methodology (Lines 121-123)

I think it would be nice to put that data also in the legend of the table to make it completely self-explanatory.

Table 2.

What is DAP?

Plot size = 1 ha is per site (I mean $1 \times 4 = 4$ Ha) or in total??

Adjustments were done to improve this table.

Table 3

***Canthidium aurifex* Bates, 1887 must be in italic.**

Canthidium aurifex now is in italic.