Dung Beetles Diversity to Remediated Soils Ecosystems in the Ecuadorian Amazon (78673v1)

Eva Cuesta Revision

1. Basic reporting

The manuscript entitled "*Dung Beetles Diversity to Remediated Soils Ecosystems in the Ecuadorian Amazon*" compares the diversity, richness and abundance of dung beetles in four types of ecosystems: Agricultural soils and Sensitive ecosystems (as remediated soils ecosystems) and Natural forest and Palm plantations (as non contaminated soils ecosystem). The number of species and the number of individuals collected is relevant, and the authors find large differences in these values between the natural forest and the rest of the ecosystems. In addition, with their data they provide five new provincial records, and a new species record for Ecuador.

All the literature references are relevant, and correctly listed.

The structure of the article conforms to the suggested format of PeerJ.

The data on which the conclusions are based are provided in the Supplementary Material section.

I think English is well written and is understandable.

2. Experimental design

The sampling has been carried out for practically almost one year, having collected a very high and representative number of individuals and species of the study area. I think that the sampling sites are well chosen and the sampling methodology is adequate.

In the statistical part I miss a little a better justification and explanation of the analyzes carried out.

3. Validity of the findings

The data from this work leave no doubt about the great impact that anthropic practices have on ecosystems for dung beetles.

Taking into account that dung beetles are considered bioindicator species due to their sensitivity to changes in the environment, this paper could be useful for decision-making about biodiversity conservation programs.

In addition, it updates the inventory of species in the sampled areas.

4. Additional comments

The article is interesting and I think the data obtained is relevant, although in general I think there is a little lack of detail describing some things about the material and methods or results. I also encourage the authors to discuss their findings more specifically.

Below, I write some comments with the intention of contributing ideas that can help the authors to include some aspects. Of course, this is my opinion and all of it is debatable.

Abstract

I have no comment.

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.

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).

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

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

Materials & Methods

Ethics statement

The samplings have the required permissions from the Ministry of the Environment of Ecuador.

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... Figure 1 is not referenced in the text.

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.

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.

Selection of collection sites

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

Sampling design

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

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?

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*".

Data analysis

In general, I would appreciate the methodology being a little more developed.

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

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).

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!

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.

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

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.

Discussion

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

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.

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.

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

Line 210: remove the dot before the citations.

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

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?

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?

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

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...

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?

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?

References

I think that all the bibliography is correct.

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 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.

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.

Figure 4.

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.

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

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.

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.

Table 1.

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

Table 2.

What is DAP?

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

Table 3

Canthidium aurifex Bates, 1887 must be in italic.