

## ***Interactive comment on “What do we know about how the terrestrial multicellular soil fauna reacts to microplastic?” by Frederick Büks et al.***

### **Anonymous Referee #1**

Received and published: 16 March 2020

#### General comments:

In this manuscript, a systematic literature search was performed to review studies on interaction between edaphic organisms and plastic, from sub- $\mu$  to macro scale. This review is timely and of high relevance to the current discussion on plastic contamination in soils, its consequences for policy makers and for policy-informing research. The literature has been thoroughly and diligently screened and structured, so the reader gets a compact yet informative overview of the relevant metrics that help put the respective study into context. Also, the authors categorized the studies by taxa and grouped those according to phylogeny, providing a useful overview of the missing links of taxa not yet accounted for in research on uptake and adverse effects on soil organisms.

The manuscript is well written in a flow that makes even the somewhat dry summaries

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of findings in the different taxonomic ranks easy to read and follow. The synthesis is well structured and clearly states the relevant points of findings, limitations, and research gaps.

This review merits publication in Soil after a few minor revisions I will be specifying below, since – to my knowledge - it is the first systematic review focusing on uptake, ingestion, and effects of (micro)plastics in the whole spectrum of soil fauna. This manuscript exhibits a good balance between depth and thematic distinction that is needed in a review worthwhile reading.

#### Specific comments:

##### Abstract

Lines 20-21: “Most of the studies applied MP concentrations similar to amounts in slightly to very heavily polluted soils.” This sentence makes the reader expect that generally, the concentrations in the experimental environments are mostly the same as expected in the environment, but is this really the case? I would suggest showing the percentage of experiments with high microplastic exposure that is not representative of most soils.

##### Introduction

Line 53: Instead of “microbial decay”, I’d suggest “processing by soil organisms”, since this includes any process relevant for the generation of smaller plastic particles.

Line 61: I’d suggest changing the sentence to “intensive use of plastic mulching and sewage sludge”, for the former, Huang et al. (2020) show an increase in microplastic by approx. 1 order of magnitude between fields with 5 and 24 continuous years of plastic mulching.

Line 95: Suggest changing “feed on” to “inadvertently ingest”, otherwise it sounds like the organisms are actually able to metabolize the microplastics.

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## Search pattern

The cut-off dates (time period that was considered) of the search should be mentioned somewhere.

Figure 1: This figure shows the phylogenetic tree of edaphic fauna, rather than “edaphic tree of faunal life”.

## Data collection

Line 113-122: I've been having some difficulties understanding the search methodology and table 8 (table 8 should be moved at the appropriate place to become table 1). It would be great if the authors could re-word this, specifying:

- What does it mean that some combinations would have caused too much search effort?
- “Organism-plastic” is not a type-shape combination.
- What exactly does the number of studies in table 8 mean? The number of articles or single experiments (sometimes more than one taxon or plastic type is used in one article)?

Some articles are included that studied the uptake of macroplastics by organisms, mainly termites and ant species. It is reasonable to include these studies, but it should be mentioned more prominently, in the abstract and aims of the review, that macroplastics are included. Maybe also in the synthesis, a sentence about the proportions of experiments using macro-, micro-, and nanoplastic would be a helpful piece of information.

Tables 1-7: What does N/A mean in the tables? In some cases I assume “not analysed” (e.g., passive transport), but in other cases it should mean “not mentioned” (e.g., aging, coating, etc.) or “not observed” (e.g., measured adverse effects). I think this needs to be specified. Usually, N/A refers to “not applicable”, but this doesn't fit in the tables.

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## Synthesis

Lines 549-550: Could you cite the studies that imitated weathering in the described way?

Lines 555-557: This is true, but it should be acknowledged that these additives are mainly present in commercial plastics, and therefore, mentioning of additives is not expected for “clean” microbeads specifically synthesized for the experiments. Nevertheless, the disadvantages of using these microbeads has been clearly discussed earlier in this section.

## Conclusions

Line 620-621: I am a little concerned about describing the results as “alarming”. Is it really? The following sentences actually refute this rather strong statement.

Lines 624-629: I would suggest changing the sentence to: “To elucidate[...], the most exact reproduction of plastic concentrations and properties [...]”. However, the difficulty here is that very scarce data of limited quality is available on concentrations of microplastic in soils, so a range of concentrations need to be used for future experiments in order to match the “real world” concentrations in soil, while expecting a decrease in uncertainty in analytic results in the future. Especially in the lower size ranges (<100 $\mu$ m) quantification is currently challenging. Therefore, little is known about size distributions occurring in soils. It might be worth mentioning this dilemma in a sentence.

## Technical corrections:

The following suggestions and corrections concern wording or spelling issues:

Line 79: replace “reasonable” with “likely”?

Line 84: replace “should be tested” with “has yet to be tested”?

Line 103: “This analysis is aimed to help assessing the influence of MP on the ecosystem services provided by diverse soil organisms.”

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Line 123: replace “appeared” with “was conducted”?

Line 131: replace “his purpose” with “their purpose” for gender mainstreaming

Line 144: replace “fine” with “smaller”

Line 148: replace “dependend” with “dependent”

Line 170: replace “soletary” with “solitary”

Line 238: replace “exhibit” with “exhibits”

Line 251: replace “peeled off” with “cast off”?

Line 385: replace “5 g kg-1” with “5000 mg kg-1” for consistency

Line 481: replace “measured for” with “observed in”?

Line 486: consider deleting “understandably”, since the meaning of this word in this context is not clear to me.

Line 488: replace “checked” with “investigated”

Line 494: replace “concentration” with “concentrations”

Line 546: replace “remaines” with “remains”

Line 550: replace “therefor” with “therefore”

Line 660: replace “did not work with” with “did not use”

#### References

Huang, Y., Liu, Q., Jia, W., Yan, C. and Wang, J. (2020), “Agricultural plastic mulching as a source of microplastics in the terrestrial environment”, *Environmental pollution*, Vol. 260, p. 114096.

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