

## Decision for round #2 : *Revision needed*

Dear authors,

thanks a lot for your revision. It looks like the paper is almost ready for recommendation as you have performed all revisions in response to referees' remarks (and I totally agree with them). As you will read, one of the referees has given some additional feedback for you to prepare the final version of your paper.

Personally, my only remark would be a suggestion to improve the quality (definition) of all figures -- the pdf generated by bioRxiv "pixelises" slightly here and there in the figures, and I guess you certainly have a better definition of these figures somewhere among your files.

Again, thank you for all the thorough work. I'm looking forward to having the final version of your paper to recommend.

Sincerely,

François Massol

by [François Massol](#), 16 Aug 2024 10:34

Manuscript: <https://doi.org/10.1101/2023.06.17.545310>

version: 3

Montpellier, 28 August 2024

Dear Dr. Massol,

Thank you for your positive feedback. We have taken into account all the latest minor comments from reviewer 2, as detailed in our response below, and have improved the definition of all the figures. We have also made additional minor corrections such as a few more typos, style and layout corrections (changing the position of some figures in the text). All these corrections are visible in the tracked-change version. We hope that our commentary is now ready for recommendation.

Best regards,

Laurence Gaume and Marion Desquilbet

### Review by Bradley Cardinale, 25 Jul 2024 15:10

In my first review of this paper, I wrote "... I recommend publication after minor revision." Given that, I do not feel that another round of review or revision is required, and the handling editor has all of the information needed from me to make a decision that considers my review.

For what it's worth, I have read the response from the authors and feel they did a good job of addressing my rather minor concerns from the original version of the paper. Therefore, I again recommend publication.

LG & MD : Thank you for your comment.

**Review by anonymous reviewer 2, 15 Aug 2024 09:27**

Dear authors,

first of all, thanks for your thorough work on the revision. I found the new manuscript version to be significantly improved. Figures are more intuitive, and most importantly, I believe the new analyses and information presented in the manuscript provide a more objective measure of the magnitude of the impact of errors and inconsistencies in InsectChange on the estimation of insects' temporal trends.

I went through the manuscript once again and annotated some minor points that, in my opinion, could be addressed to further improve clarity. As you will see, these are all minor comments.

LG & MD : We appreciate your positive assessment of our work on the revision and are responding to your further comments below.

Specific comments:

R2 : Table 1: second row, column 'Definition': a white space is missing between the words 'often' and 'macroinvertebrates'. Second row, column 'Consequences and risks': shouldn't it be "the consequence of which depends on the .."? Fourth row, column 'Definition': there is a period missing at the end of the sentence. You may want to double-check the table to fix these types of typos.

LG & MD : We made all these changes.

It looks like 'Inadequate geographic coordinates..' and 'Studies with internal drivers' were put together under the 'methodological issues' section. This is the only instance where two 'problem types' have been grouped together.

LG & MD : We have now added a separating line between the two problem types, which were previously separated by a page break. When we reformatted the article before submitting it, the two problem types appeared adjacent, and we did not notice the lack of a separating line.

Finally, I suggest to always indicate if a file/table/metadata belongs to the InsectChange paper or if it is supplementary material related to your manuscript. As an example, in the 'Definition' column under 'inconsistencies' and 'inadequate temporal resolution', you refer to the 'MetadataS1', but it is unclear whether this supplementary material belongs to your article or to the InsectChange paper. I am aware that at the bottom of the table, you mention that some 'files' are from InsectChange. However, this refers only to .csv files.

LG & MD : To remove any ambiguity, we have specified in the appropriate box of the table that the metadataS1 file was an InsectChange file. We did not do this for all the other files for the sake of brevity and because we have specified at the bottom of the table that "All the files listed in the 'Definition' column refer to InsectChange files"

Table 1: I apologise, but it is not entirely clear to me what is the difference between ‘Overlapping studies/plots’ and ‘Inflation of studies/plots’. The resulting consequences also appear very similar. Would it be possible to merge the two types for simplicity?

LG & MD : We have clarified the difference between these two types of problems. The first one is characterised by an overlap in data, with a double counting of insects. The second one is characterised by a split of one site into several smaller plots, or one study into several datasets each comprising different parts of the data, i.e., without overlaps, and therefore without double counting of the same insects, but this leads to overweight some time series in the statistical analyses and to ignore possible spatial correlation.

To this aim, we have renamed the problem category ‘Overlapping studies/plots’ as ‘Overlapping data’. This problem category is now defined in Table 1 as: *“Finally, some datasets or plots had overlapping data for all or part of the time periods (13 datasets), resulting in double counting, either because different datasets included the same plots or because a plot in a given dataset was actually a pooling of others from the same dataset. This leads to overweighting some insect populations in the global analysis. In 9 datasets, the exact same insects were counted twice. For example, InsectChange Study 1452, which is illustrated in Figure 2g, examined the change in biomass of the invertebrate assemblage after the creation of the Kama Reservoir in Russia. InsectChange Plots 456, 457 and 458 corresponding to the upper, central and dam sections of the reservoir, respectively, include data from 2003 to 2015 mainly for insects, and Plot 455, corresponding to the average sampling in the three sections of the reservoir, includes data from 1955 to 2013 on the entire zoobenthic assemblage. From 2003 to 2013, insect data from Plot 455 therefore overlap with invertebrate data from Plots 456, 457 and 458, with the same insects counted twice. In two other InsectChange datasets, data overlapped because one study reported the abundance dynamics of ant nests and the other, centred on the same ants, reported the abundance dynamics of the ants themselves. The last two datasets included the dynamics of grasshoppers in the soil stratum of the same three sites, obtained by visual counting for one dataset and collection in pitfall traps for the other. These different cases of overlapping data may affect the analysis of overall insect trends.”*

In addition, we have specified in the text that the problem category ‘inflation of studies/plots’ did not involve overlapping data, as follows: *“Finally, another methodological issue is the inflation of datasets and/or sites (without overlapping data) compared with the original studies (6 datasets). For example, site inflation may result from splitting some sites of the original datasets into several InsectChange plots separated by only a few metres. This leads to overweighting of these datasets in the statistical analyses. This may also lead uninformed users to carry out statistical analyses without accounting for possible spatial correlation.”* We have also specified this in the ‘definition’ column of Table 1 as follows *“Some time series (without overlapping data) included in different studies instead of different plots in the same study and/or split between several plots instead of compiled in a single plot, inconsistently with the methodology used for others”*, and we also added the risk of *“Non-consideration of possible spatial correlation in the data”*, which is specific to this type of problem.

Lines 148-151: the parenthesis at line 148 is never closed.

LG & MD : We corrected this.

Lines 190-192: why not include the ‘unstandardized abundance measures’ among the problem types listed in Table 1. Especially if this issue affects the whole dataset.

LG & MD : As suggested, we have introduced this problem type in Table 1, in the beginning of the methodological issues. The problem type is named “*Disparate and often non-standardised units of measurement of insect densities across datasets*”. It is defined as: “- *The metrics, sampling methods, spatial scales and units of measurement in the table SampleData.csv vary between datasets and the data in the table InsectAbundanceBiomass.csv are not harmonised.*”. The consequences and risks are defined as: “- *Temporal slopes between datasets not directly comparable due to data heterogeneity, and not comparable in the case of a  $\log_{10}(x+1)$ -transformation of the dependent variable. - Compromised estimation of the overall insect trend.*”. We have clarified this problem by rewriting the beginning of the corresponding paragraph in the text as follows: “*In addition, a major methodological issue affecting the whole database is that the comparability of temporal trends between datasets is compromised by the heterogeneity of insect measurements, contrary to what is stated in InsectChange (e.g., p. 24 of MetaDataS1 file). Harmonisation of measurements was either not possible, due to variations in metrics (abundance/biomass), sampling methods and spatial scales between datasets, or was possible for a given metric and sampling method, but was not achieved.*”

Line 262: ‘Italia’ -> ‘Italy’.

LG & MD : We corrected this.

Lines 469-472: I might be missing something here, but 486 + 496 is not equal to 985.

LG & MD : Thank you, there was a typo. This has been corrected to: “*Most plots assessed as having no surrounding crops were well assessed (455 of 486 plots), whereas most plots assessed as having surrounding crops suffered from an overestimation of the cropland cover (353 of 499 plots)*”, with 499 instead of 496. The correct numbers were used to build Figure 7a1, which has been left unchanged.

As a side note: I apologise as I probably did not express myself correctly in my first comment letter to your manuscript. I never intended to say that improving InsectChange was your task. Rather, I meant that your work provided an invaluable source of information to enable the original creators of InsectChange to improve the database.

LG & MD : Thank you for your further helpful comments.