A workflow of open-source tools for drone-based photogrammetry of megafauna (#114760)

Detailed Review of the Document

By: de Oliveira, Lucas Lima

BASIC REPORTING

Language and Clarity: The document is written in clear, professional, and unambiguous English, meeting PeerJ standards.

Figures and Images: The figures are relevant, high quality, with detailed labels, and all figures (Figures 1-6) are properly referenced throughout the document and effectively illustrate the workflow, tools, and outputs of the analysis.

Raw Data: The manuscript provides links to raw data and supplementary materials, all of them are working properly, ensuring transparency and reproducibility. The tools provided by the workflow, like Xcertainty, MorphoMetriX, CollatriX, DeteX and XtraX are open-source, further supporting data accessibility.

EXPERIMENTAL DESIGN

Original Research: The manuscript presents original research within the journal's scope, focusing on a novel workflow for drone-based aerial photogrammetry of marine megafauna.

Research Question: The research question is well-defined, addressing the need for standardized workflows in drone-based photogrammetry. The study fills a clear knowledge gap by providing a detailed, open-source workflow.

Technical and Ethical Standards: The investigation is rigorous, with detailed protocols for data collection, post-processing, and analysis. Ethical considerations, such as minimizing drone-induced disturbance, are briefly mentioned but could be expanded.

Conclusions: The conclusions are well-stated and linked to the research question, emphasizing the workflow's adaptability and inclusivity.

VALIDITY OF THE FINDINGS

Data Robustness: The manuscript provides robust data and tools, such as Xcertainty, to quantify and incorporate uncertainty. The use of Bayesian models

enhances the statistical presentation of the findings and are well detailed in this manuscript.

Replication: The workflow is designed to be replicable, with detailed methods and friendly-user open-source tools to provide an easy-way to collect e replicates the data.

The proposed workflow is likely to have significant implications for ecological and wildlife research.

General Comments

The paper presents a comprehensive workflow for conducting aerial photogrammetric analyses using drone-based images to estimate the morphometric measurements of marine megafauna, with a focus on cetaceans. The introduction underscores the importance of drones in gathering morphological data and the necessity for standardized workflows to ensure accurate data comparison. The proposed workflow is inclusive and replicable, utilizing open-source tools and methods that accommodate various research budgets and drone types.

A significant advancement is the introduction of the R package Xcertainty, which quantifies and incorporates photogrammetric uncertainty, allowing analyses to be adapted to different equipment and collection conditions more straightforwardly compared to other Bayesian modeling tools. The automation tools, DeteX and XtraX, are innovative as they streamline the most time-consuming stages of the analysis, the selection of frames and the collection of morphometric measurements of the animals.

The paper provides detailed examples and code to facilitate adaptation by other researchers, with well-described manuals and the inclusion of audiovisual media explaining the use of certain tools.

Specific Suggestions

The manuscript is well-written and presents a substantial contribution to aerial photogrammetry studies based on drone images. I commend the authors on developing high-quality open-source tools that facilitate and optimize the analyses.

I have a few small suggestions. Since this is a workflow, I believe a more detailed explanation or example of image classification would be beneficial. Christiansen et al., 2018, describe the protocol well in their supplementary

material, but an example of image classification as supplementary material would enrich the manuscript.

Additionally, the workflow does not mention recommendations for flight altitude or precautions when determining flight altitude. Different drone models emit different noise intensities in the marine, and different species may respond differently to these noises. For example, *Tursiops truncatus* tend to exhibit behavioral responses when the drone is at altitudes below 25 meters, whereas *Eubalaena borealis* do not seem disturbed by. Generally, odontocetes and mysticetes respond differently to drone presence, and this behavior could be addressed in the manuscript.

Finally, I would like to discuss small cetaceans, particularly the behavior of the DeteX algorithm with images of small cetaceans. The authors mention that the algorithm was trained with images of *Eschrichtius robustus*, which measures about 12 meters as an adult, and that the algorithm can be trained with other data. However, is DeteX suitable for detecting frames of small cetaceans in its current form? If so, are there any additional considerations? I believe these points could be better addressed in the manuscript.

Minor issues:

The phrase "Add your results here" in line 202 appears to be out of context, a possible typing error.

In figure 5, in frame B, the forms used to discriminate the Inspire 2b drone and the Phantom 4 Pro are very similar, which can cause confusion when visualizing the variation in the equipment.