

Supplementary Materials for:

Native and introduced megafauna have convergent effects on animals and ecosystems

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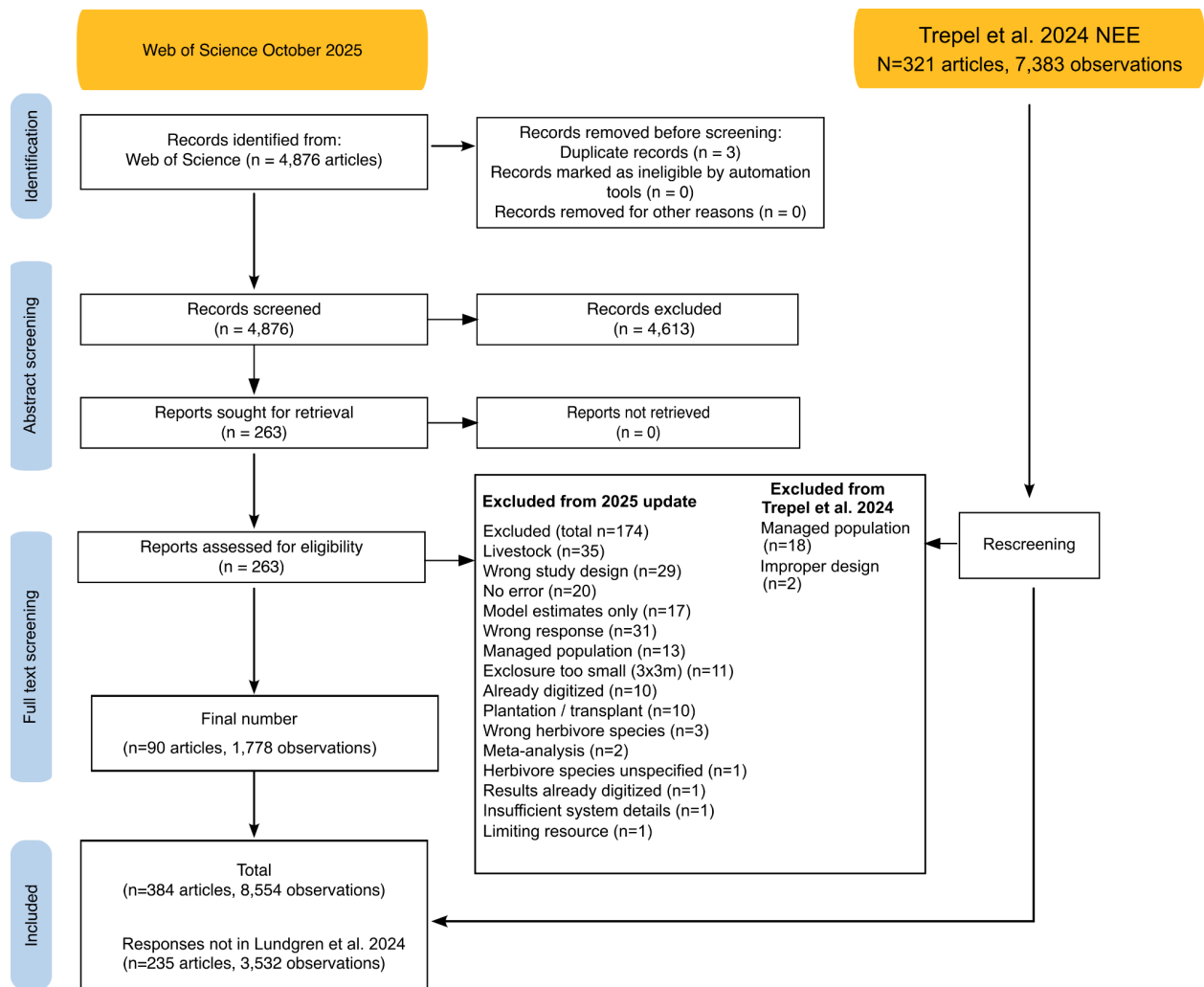


Figure S1. PRISMA diagram for meta-analysis update. This meta-analysis was based on the meta-analysis from ^{1,2}, which was based on a literature search conducted on February 19th 2021. This literature search was redone, with small modification, on October 9th, 2025, yielding an additional 90 articles and 1,778 effect sizes, leading to a total database size of 235 articles and 3,532 observations for responses not already analyzed by ².

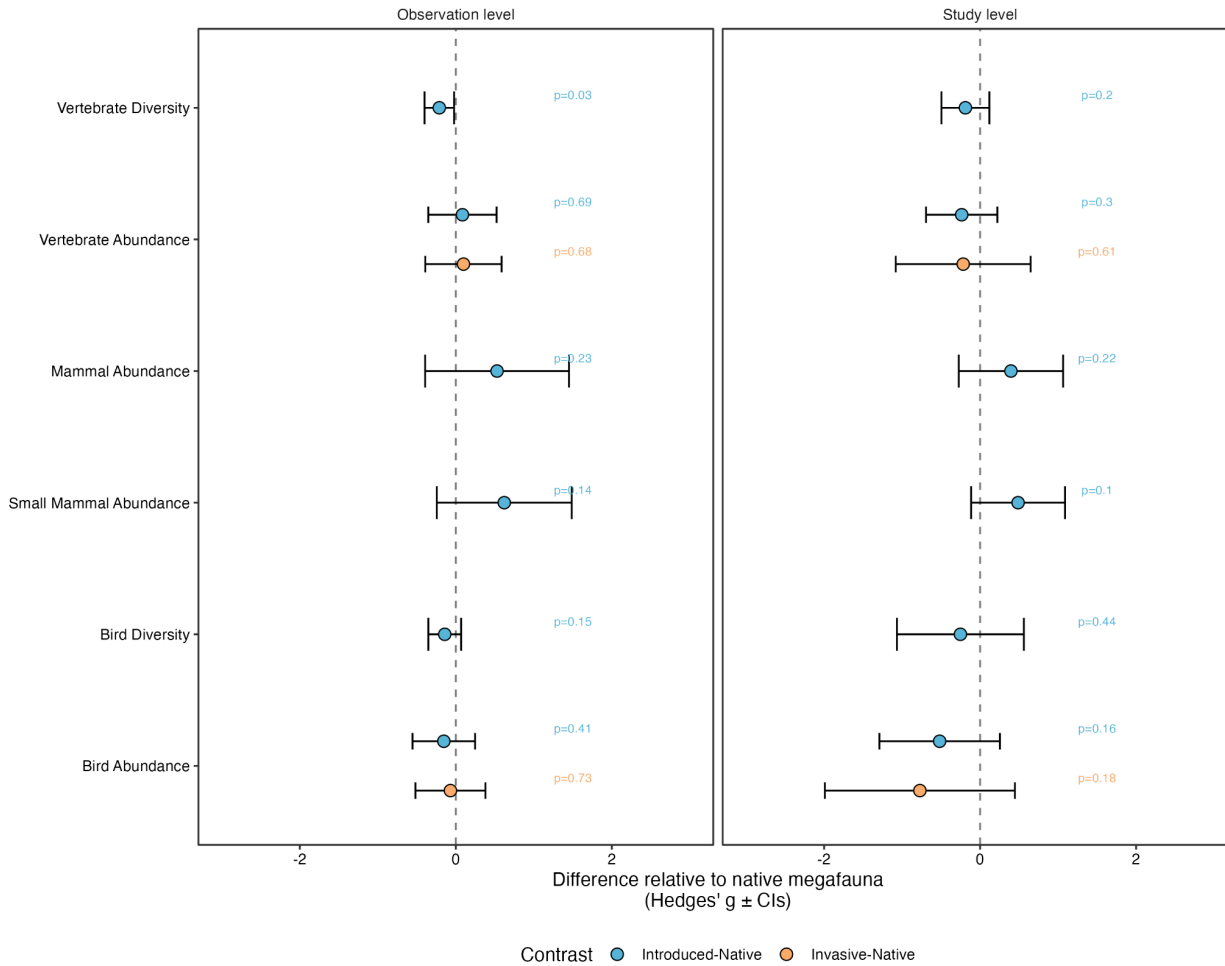


Figure S2. The difference in the effects of introduced and invasive megafauna relative to native megafauna on vertebrates after removing influential observations and articles.

Influential observations and articles were determined by calculating Cook's distance and excluding data with Cook's distance greater than $4/N$. Sample sizes are available in Supplementary Data 2. The data and scripts used to produce the analyses are provided on Github⁷⁷

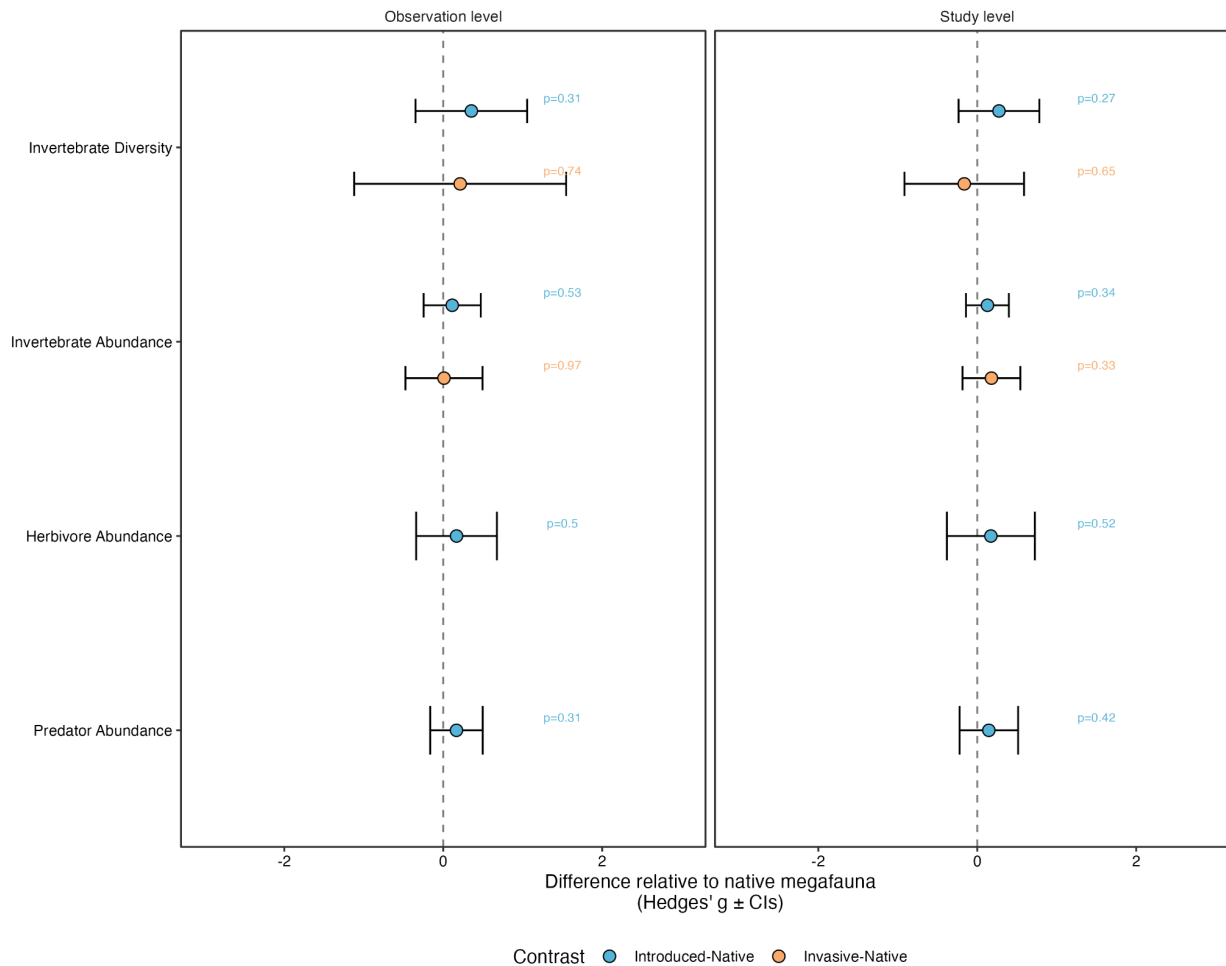


Figure S3. The difference in the effects of introduced and invasive megafauna relative to native megafauna on invertebrates after removing influential observations and articles. Influential observations and articles were determined by calculating Cook's distance and excluding data with a Cook's distance greater than $4/N$. Sample sizes are available in Supplementary Data 2. The data and scripts used to produce the analyses are provided on Github⁷⁷

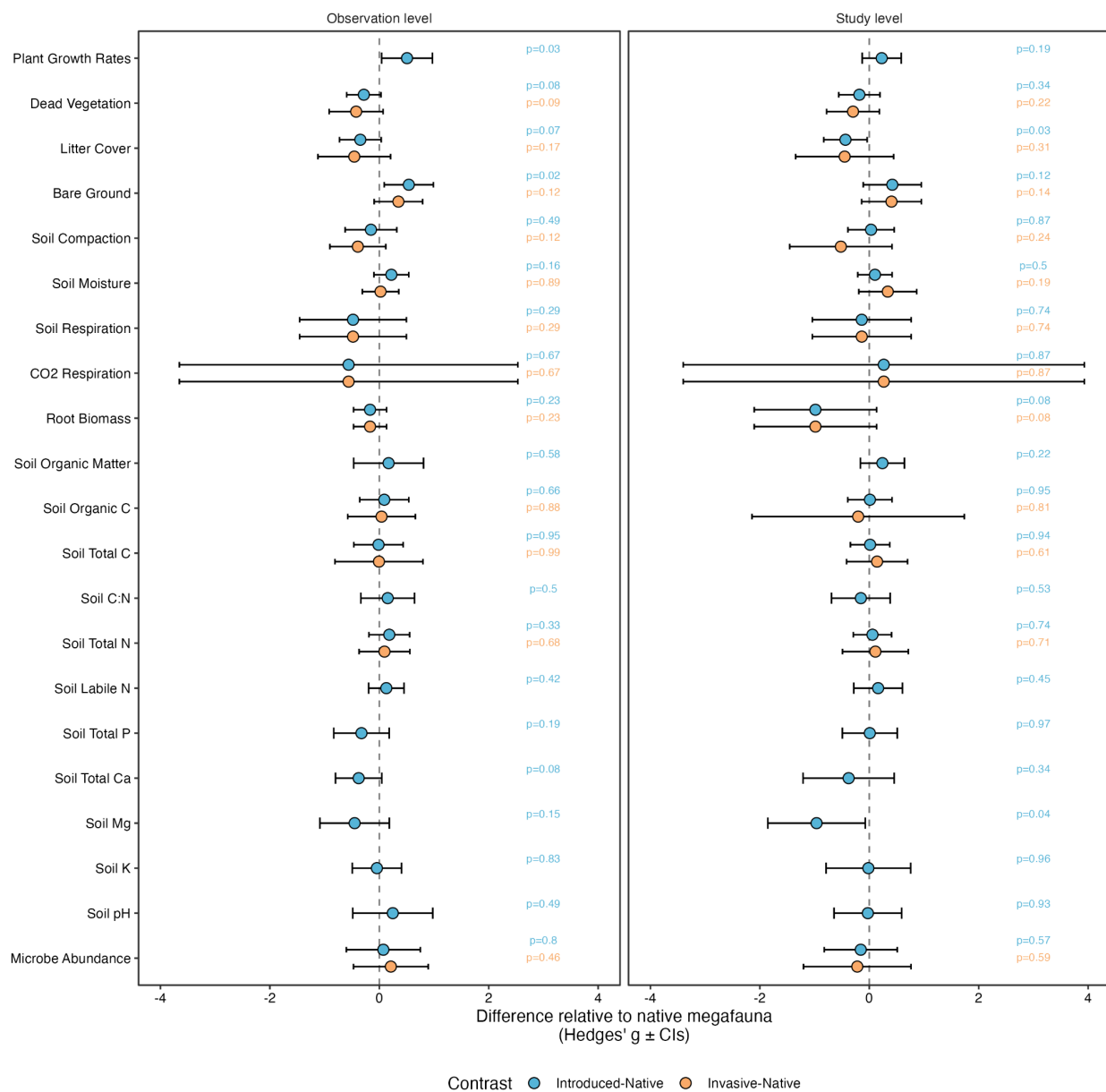


Figure S4. The difference in the effects of introduced and invasive megafauna relative to native megafauna on ecosystems and soils after removing influential observations and articles. Influential observations and articles were determined by calculating Cook's distance and excluding data with a Cook's distance greater than 4/N. Sample sizes are available in Supplementary Data 2. The data and scripts used to produce the analyses are provided on Github⁷⁷

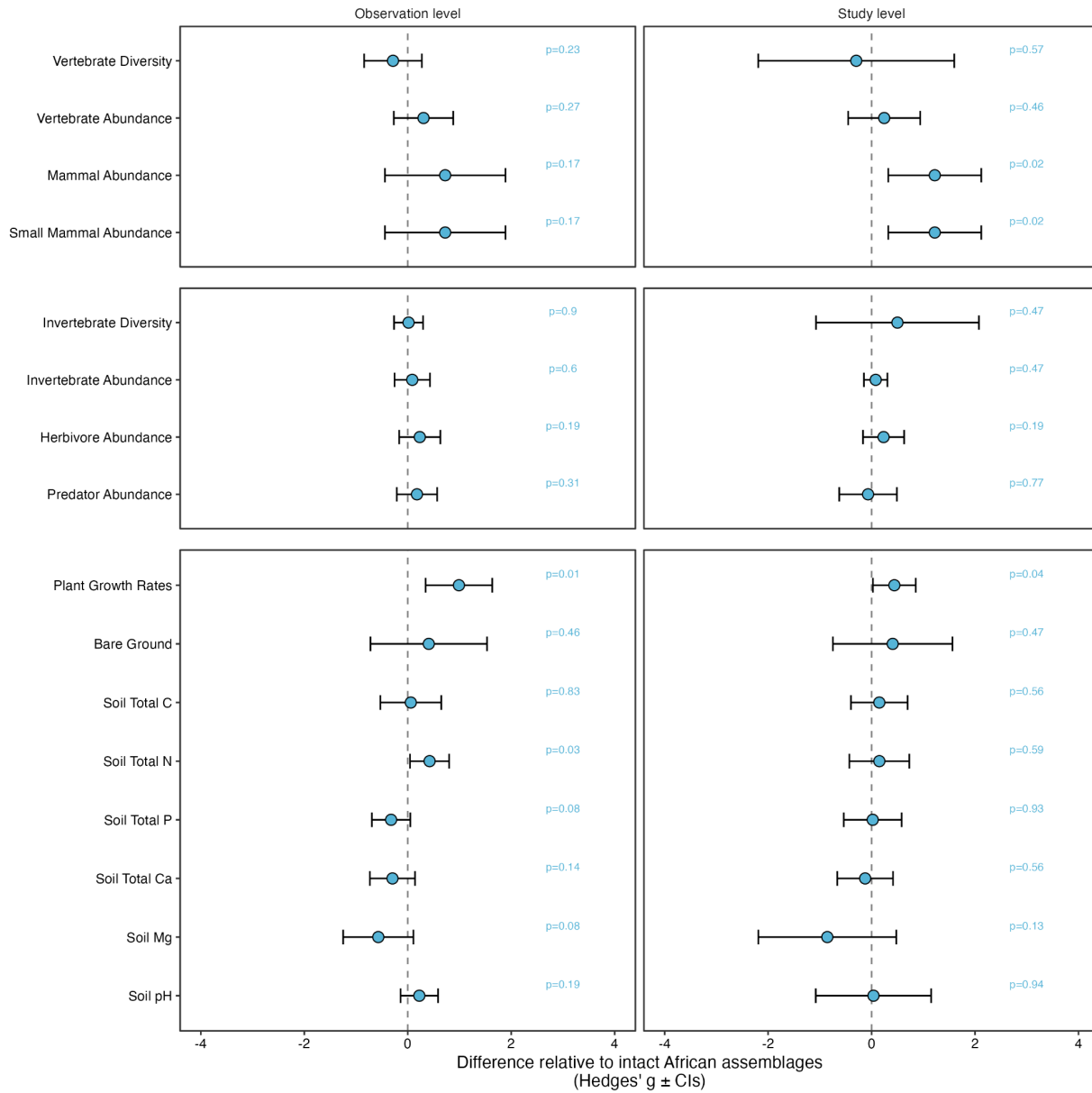


Figure S5. The difference in the effects of introduced megafauna relative to intact African megafauna assemblages after removing influential observations and articles. Influential observations and articles were determined by calculating Cook's distance and excluding data with a Cook's distance greater than $4/N$. Sample sizes are available in Supplementary Data 2. The data and scripts used to produce the analyses are provided on Github⁷⁷

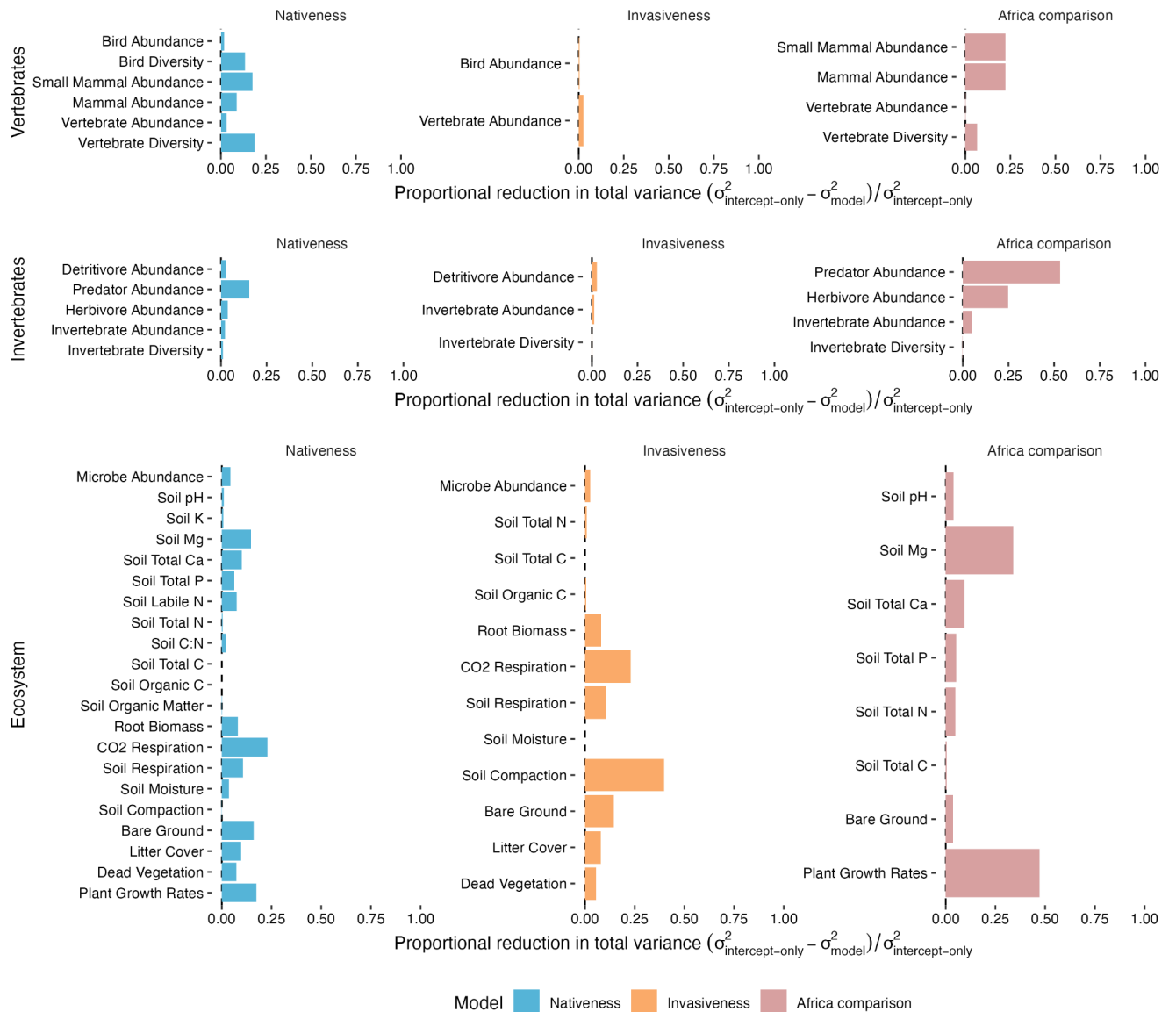


Figure S6. Proportional reduction in total variance was calculated by subtracting total model variance (the sum of σ^2) from the model variance of the intercept-only null model, and then dividing this by the variance of the intercept-only null models. This gives an estimate of how much variance was explained by nativeness or invasiveness. The data and scripts used to produce the analyses are provided on Github⁷⁷

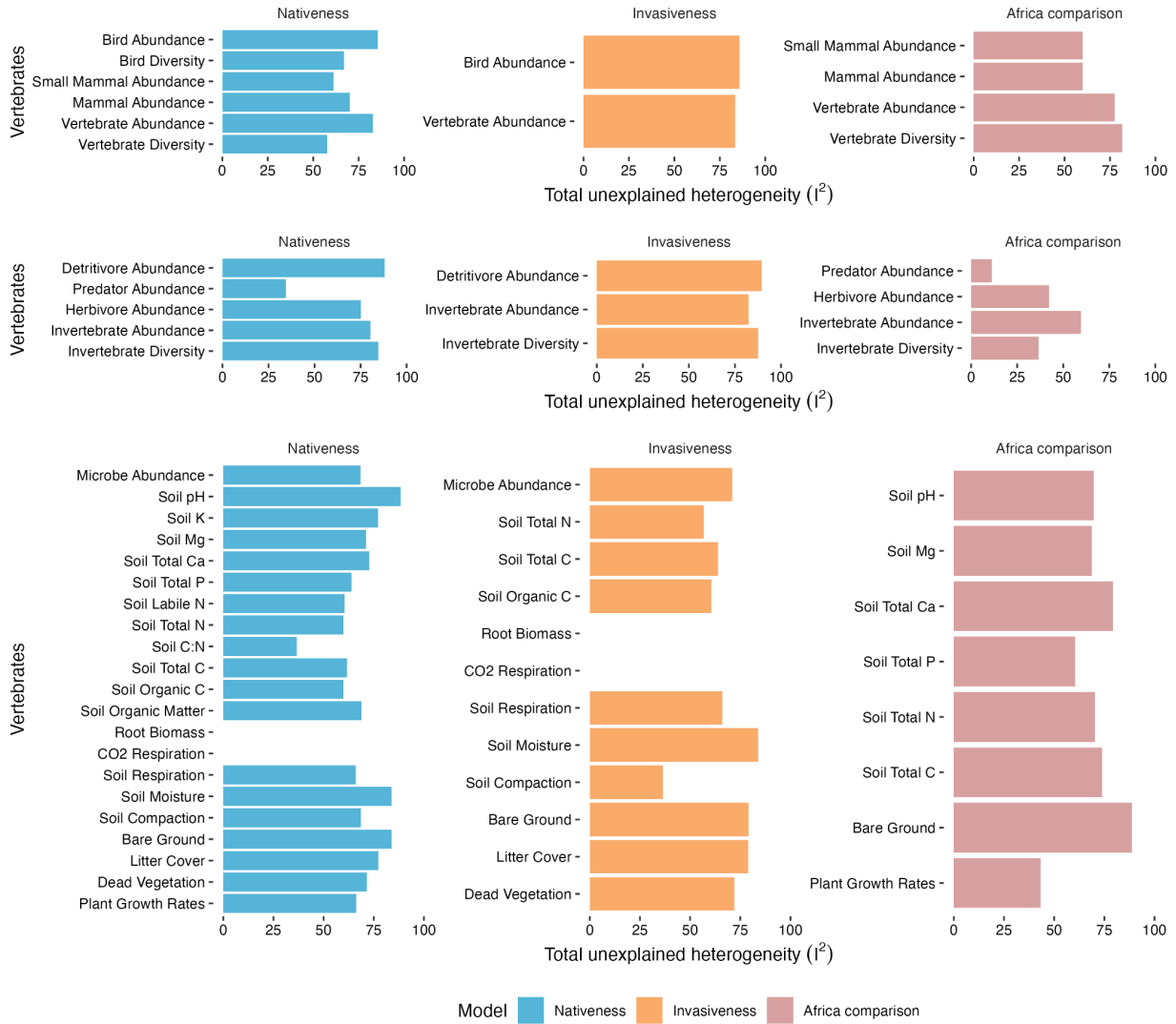


Figure S7. Total unexplained heterogeneity (I^2) was high except in two responses (root biomass and CO₂ respiration), which had almost 0 heterogeneity. The data and scripts used to produce the analyses are provided on Github⁷⁷

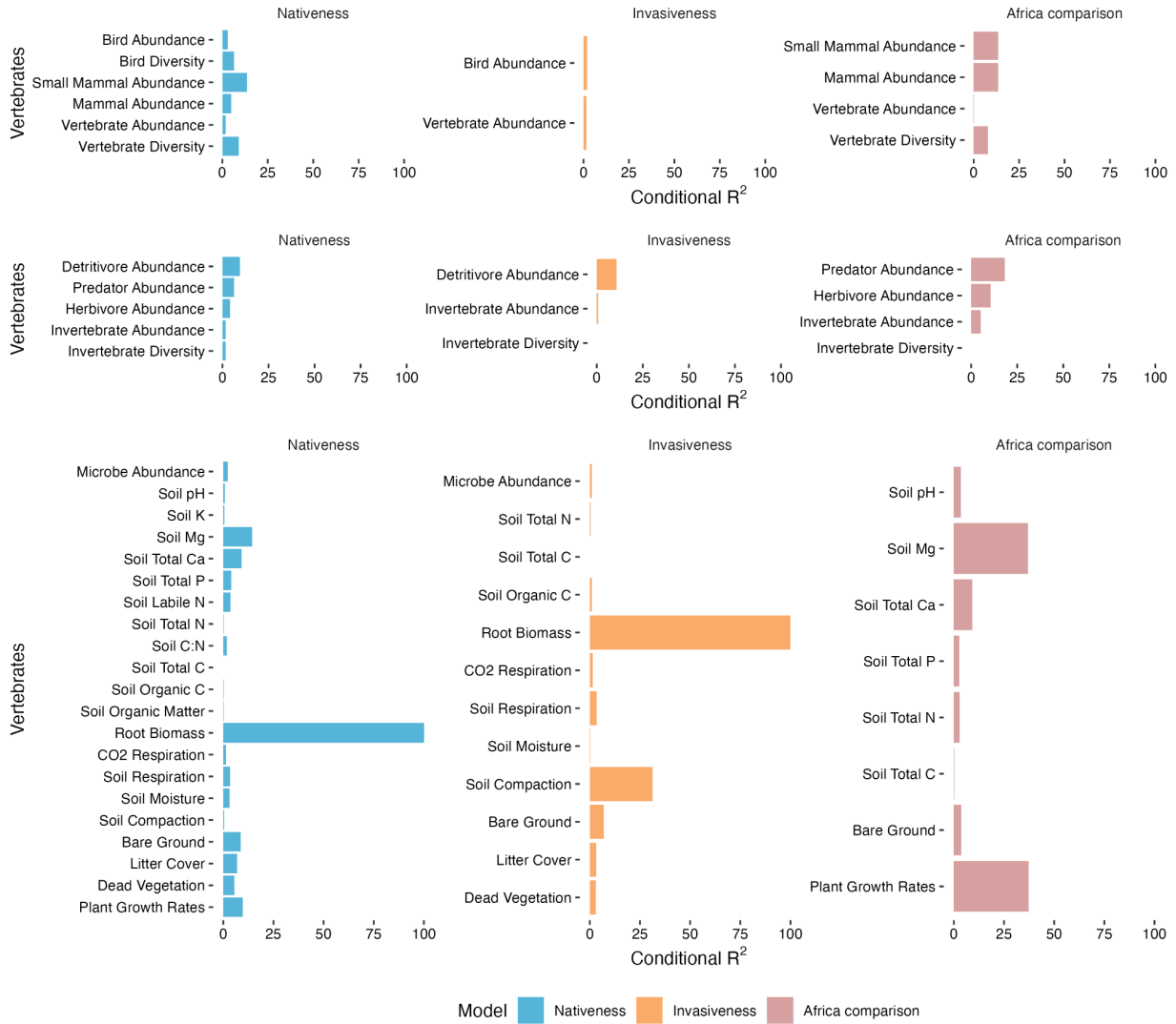


Figure S8. Conditional R^2 , or the proportion of total variance explained by the nativeness or invasiveness predictors. In cases with extremely low I^2 , this approached 100% due to a near absence of heterogeneity in the dataset. The data and scripts used to produce the analyses are provided on Github⁷⁷

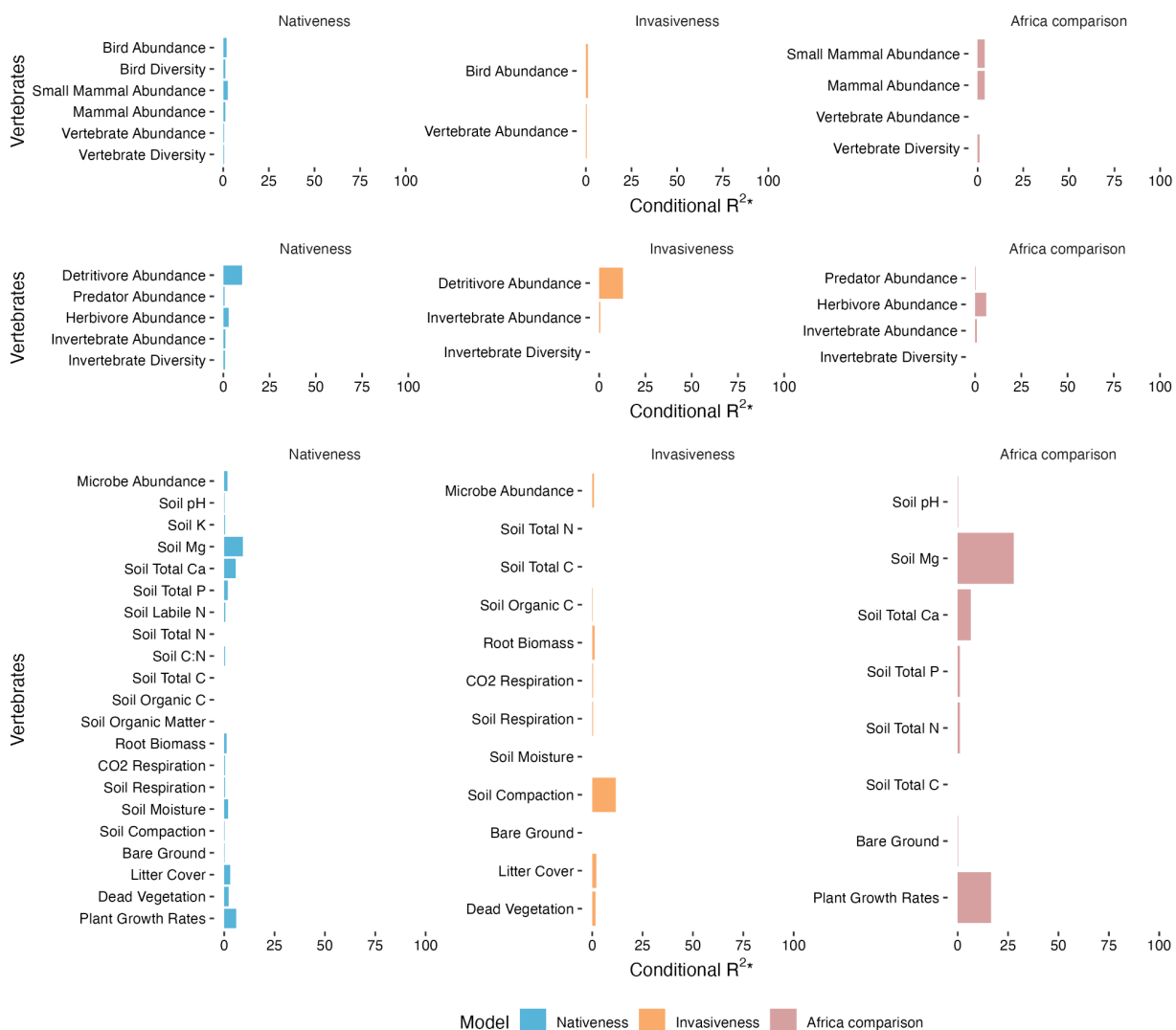


Figure S9. R^{2*} , a modified version of R^2 , formulated to because of extremely low heterogeneity in root biomass and soil CO₂. This used total variance in effect sizes as the denominator, instead of summing model variance components. The data and scripts used to produce the analyses are provided on Github⁷⁷

Table S1. Search string update on October 9th 2025. This search string was modified from the original in ^{1,2} with the addition of the second clause (in bold). This reduced the total records retrieved from >50,000 to 4,876.

TS=(ungulat* OR herbivor* OR megafauna OR antelope* OR aoudad OR argali OR elephant* OR bison OR banteng OR oryx OR camel* OR deer OR pig OR boar OR hog OR rhino* OR wildebeest OR sheep OR goat OR capybara OR caribou OR chital OR eland OR feral cattle OR gemsbok OR gazelle OR kudu OR hirola OR hartebeest OR addax OR ibex OR tapir OR barasingha OR gaur OR babirua OR impala OR ibex OR guanaco OR kob OR kouprey OR anoa OR moose OR lechwe OR muskox OR tahr OR nilgai OR nyala OR okapi OR huemul OR pronghorn OR hippo* OR puku OR serow OR sambar OR saola OR sitatunga OR tamaraw OR takin OR taruca OR topi OR vacuna OR llama OR wapiti OR elk OR buffalo OR water buffalo OR yak OR duiker OR kangaroo* OR macropod*)

AND

TS=(exclosure OR exclusion OR fence* OR natural comparison OR island OR eradication OR reintroduc* OR introduc*)

AND

TS=(disturb* OR graz* OR brows* OR impact* OR effect OR affect OR disrupt OR facilitate OR invasi* OR ecosystem* OR vegetat* OR plant* OR fauna* OR reptil* OR amphib* OR bird* OR rodent* OR fish* OR invertebrat* OR insect* OR soil* OR carbon OR river* OR riparian OR desert* OR forest* OR tundra OR decomposition OR grassland* OR savanna* OR chaparral OR scrub OR diversity OR heterogeneity OR extinction OR richness OR environment OR ecolog* OR hydrolog* OR disturbance OR density OR biodiversity OR response* OR ecosystem OR herbaceous OR canopy OR germination OR cover OR pollinator* OR tree OR nutrient* OR understory OR erosion OR grass* OR vegetation OR community OR exclosure OR competition)

AND

WC=(ECOLOGY OR ZOOLOGY OR ENVIRONMENTAL SCIENCES OR BIODIVERSITY CONSERVATION OR EVOLUTIONARY BIOLOGY OR GEOGRAPHY PHYSICAL OR REMOTE SENSING OR PLANT SCIENCES OR MULTIDISCIPLINARY SCIENCE OR FORESTRY OR ENTOMOLOGY OR MARINE & FRESHWATER BIOLOGY OR MYCOLOGY OR BIOLOGY OR OCEANOGRAPHY OR ORNITHOLOGY OR BEHAVIORAL SCIENCES OR FISHERIES)

Filtered in Web of Science to Article, Early Access, Book Chapters, Corrections, Letters, Data Paper

Supplementary References

1. Trepel, J. *et al.* Meta-analysis shows that wild large herbivores shape ecosystem properties and promote spatial heterogeneity. *Nat Ecol Evol* **8**, 705–716 (2024).
2. Lundgren, E. J., Bergman, J., Trepel, J. & le Roux, E. Functional traits—not nativeness—shape the effects of large mammalian herbivores on plant communities. *Science* (2024).
3. Lundgren, E., Nakagawa, S., Trepel, J. & sageraymond. *Ejlundgren/ecosystem_metamega: Final Submission*. (Zenodo, 2026). doi:[10.5281/ZENODO.20261849](https://doi.org/10.5281/ZENODO.20261849).