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LETTER

Reevaluating introduced herbivores in conservation

Jonas Trepel[1] | Robert Buitenwerf[1] | Kristy Ferraro[2] | Elizabeth le Roux[1,3] | Erick Lundgren[4] | Brian Maitner[5] | Tanya Strydom[6] | Jens-Christian Svenning[1] | Matthew R. Kerr[1]

[1]Center for Ecological Dynamics in a Novel Biosphere (ECONOVO), Department of Biology, Aarhus University, Aarhus, Denmark

[2]Department of Biology, Memorial University, St John's, Newfoundland and Labrador, Canada

[3]Mammal Research Institute, Department of Zoology and Entomology, Faculty of Natural and Agricultural Sciences, University of Pretoria, Pretoria, South Africa

[4]Centre for Open Science and Synthesis in Ecology and Evolution (COSSEE), University of Alberta, Edmonton, Alberta, Canada

[5]Department of Integrative Biology, University of South Florida, Tampa, Florida, USA

[6]Ecology and Evolutionary Biology, School of Biosciences, University of Sheffield, Sheffield, UK

Correspondence

Jonas Trepel, Aarhus University, Office 1540-315, Ny Munkegade 114-116, 8000 Aarhus, Denmark. Email: jonas.trepel@bio.au.dk; jonas.trepel@gmail.com

Matthew R. Kerr, Aarhus University, Office 1540-318, Ny Munkegade 114-116, 8000 Aarhus, Denmark. Email: matthew.kerr@bio.au.dk

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The impacts of non-native species are the subject of enduring controversy in conservation research and policy. This debate has renewed relevance in light of rewilding approaches that introduce or reintroduce herbivores to restore trophic complexity. However, because large herbivores inherently have strong effects, recent work has warned that the "harms of introduced large herbivores outweigh their benefits" (Bescond-Michel et al., 2025; Nogués-Bravo et al., 2016; Nores et al., 2024). We argue that such conclusions are conceptually and methodologically flawed, particularly because they conflate the predictable consequences of herbivory with harmfulness attributed to a species' non-native status. Without assessing whether effects of non-native herbivores differ from those of native herbivores, these approaches risk depicting the fundamental process of herbivory as problematic. This can misinform conservation and restoration efforts at a time when herbivores, native or introduced, are increasingly recognized as essential for sustaining biodiversity and ecosystem function (Lundgren et al., 2018; Malhi et al., 2016; Pringle et al., 2023; Smith et al., 2016; Svenning et al., 2024; Trepel et al., 2024).

CONCEPTUAL FLAWS IN ASSESSING THE IMPACT OF LARGE HERBIVORES

The International Union for Conservation of Nature's (IUCN) Environmental Impact Classification for Alien Taxa (EICAT and EICAT+) (Kumschick et al., 2020; Vimercati et al., 2022) uses vote-counting methods to categorize non-native species based on their effects on native species' fitness and abundance (Kumschick et al., 2020). We argue that using these classifications to determine whether "harms" outweigh "benefits" (Bescond-Michel et al., 2025) lacks ecological foundation. All terrestrial animals eat, move, and reproduce. Inevitably, eating reduces the abundance of food resources, and movement alters surroundings. Yet, EICAT classifies these predictable ecologi-

Jonas Trepel and Matthew R. Kerr contributed equally to this work.

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cal processes as "negative impacts". By this logic, every living animal has negative effects on the species it consumes.

Moreover, there is little focus in the literature on the positive and neutral impacts of non-native species (Vimercati et al., 2022), and studies on the impacts of introduced species frequently frame non-native species as harmful regardless of their actual impacts (Pereyra et al., 2024). Even though EICAT+ allows recording of positive effects, it is difficult to see how these biases will not result in a circularity: using reports that are biased toward negative impacts of introduced herbivores to confirm that introduced herbivores have negative effects.

Treating ecological processes as inherently harmful ignores their role in maintaining biodiversity. Ecological theory predicts that so-called negative effects are often precisely what sustains biodiversity. In fact, processes, such as predation, herbivory, and physical disturbance, are core stabilizing mechanisms (Chesson, 2000) that prevent competitive exclusion and enable diverse assemblages to persist (Janzen, 1970; Koerner et al., 2018; Olff & Ritchie, 1998). By interpreting these impacts as harmful, EICAT moralizes natural processes and conflates ecology with value judgments, preventing robust scientific inference about the impact of non-native species. Applied universally, EICAT would indicate that all herbivores are harmful, a highly misleading outcome given the fundamental role of herbivory in shaping ecosystems and sustaining biodiversity.

ILL-SUITED METHODOLOGY TO SUMMARIZE THE EFFECTS OF NON-NATIVE HERBIVORES

To verify claims that introduced herbivores are harmful—and thus unsuitable for inclusion in trophic rewilding and ecosystem restoration—comparisons with appropriate controls (impacts of native herbivores) are required. After all, native species already have a variety of positive and negative impacts on other species. For example, native rhinoceros reduce vegetation cover but thereby help smaller grazers and reduce wildfire severity (Waldram et al., 2008); native elephants damage trees but increase understory biomass and open habitats (Coverdale et al., 2016); and native, large herbivores in East Africa suppress small mammal populations but decrease tick densities and disease risks (Titcomb et al., 2017).

Undoubtedly, introduced herbivores can contribute to species endangerment, particularly on islands, and these cases are important conservation concerns. Yet, similar outcomes can occur with native herbivores. For example, native giraffes can drive extirpations of tree species in South Africa (Bond & Loffell, 2001). Most of the "negative" evidence compiled in a recent summary (Bescond-Michel et al., 2025) reflects nothing more than introduced herbivores reducing the abundance of their food resources. Moreover, a recent systematic meta-analysis shows no difference in the effects of native and introduced large herbivores on plant abundance or diversity (Lundgren et al., 2024).

SHIFTED BASELINES

We suggest that the conflation of herbivory with ecological harm reflects shifting ecological baselines (Figure 1). For example, assuming that non-native species "destabilize eco-evolutionary dynamics" (Bescond-Michel et al., 2025; Rejmánek & Simberloff, 2017) ignores the fact that most contemporary ecosystems lack fundamental components of these dynamics: large herbivores. Large mammalian herbivores have shaped ecosystems worldwide for >40 million years, driving essential ecological processes through consumption, breaking and trampling of plants, seed and nutrient dispersal, and provision of food for predators and decomposers (Malhi et al., 2016).

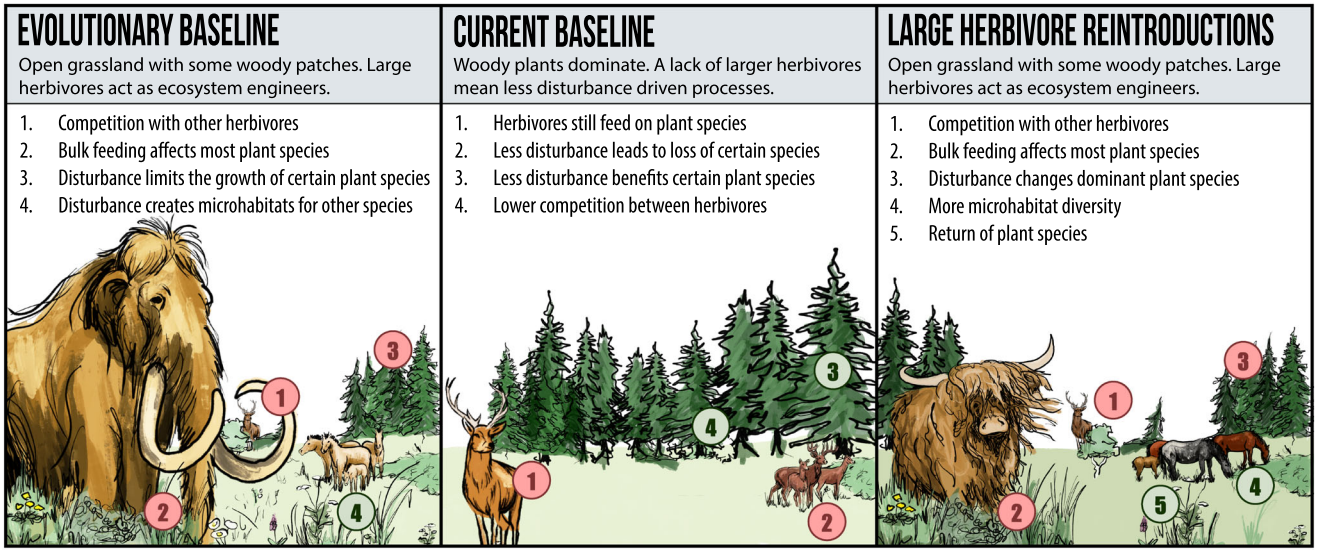


FIGURE 1 A community at three different stages: (left panel) evolutionary baseline, which includes large and megaherbivores; (middle) current state after the extirpation or extinction of most large herbivore species; and (right panel) the state after the introduction or reintroduction of large herbivores.

The loss of herbivores has resulted in large shifts in ecosystem structure (Svenning et al., 2024). Since the global expansion of *Homo sapiens*, megafauna declines and extinctions due to human activities have led to a shifted baseline, wherein defaunated ecosystems are seen as ecologically normal and intact (Søndergaard et al., 2025).

CONCLUSION

By definition, all herbivores reduce the abundance or performance of some plants simply through consumption. Although introduced herbivores can have strong effects that require management, conflating herbivory with ecological harm can obstruct efforts to restore and protect the processes that sustain biodiversity. In most contexts, the ecological roles of non-native large herbivores (and many other species) do not differ functionally from native species (Davis et al., 2011; Lundgren et al., 2020, 2024; Sagoff, 2005, 2009; Strauss et al., 2006; Wallach et al., 2015, 2023; Wooster et al., 2024): both generate a mixture of positive and negative effects that sustain biodiversity and ecosystem processes. Recognizing this is critical in the Anthropocene, where many large herbivores are extinct, confined to refuge populations, or persist at reduced densities. Ironically, 50% of introduced megafauna are threatened or extinct in their native ranges (Lundgren et al., 2026), further emphasizing the need to develop robust, ecologically grounded frameworks to evaluate their impacts, rather than relying on normative judgements. In conclusion, we argue that restoration and rewilding efforts should be guided by ecological impact and functional considerations not by a priori exclusions based on species' origin.

AUTHOR CONTRIBUTIONS

All authors contributed to the conceptualization, writing, and editing of the manuscript. T.S. designed the figure.

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ORCID

Jonas Trepel https://orcid.org/0009-0004-7358-9204
Robert Buitenwerf https://orcid.org/0000-0003-3356-2301
Kristy Ferraro https://orcid.org/0000-0002-0884-7826
Elizabeth le Roux https://orcid.org/0000-0001-8468-8284
Erick Lundgren https://orcid.org/0000-0001-9893-3324
Brian Maitner https://orcid.org/0000-0002-2118-9880
Tanya Strydom https://orcid.org/0000-0001-6067-1349
Jens-Christian Svenning https://orcid.org/0000-0002-3415-0862
Matthew R. Kerr https://orcid.org/0000-0002-0557-309X

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