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Parallels between biological invasions and human migration are flawed and undermine both disciplines. Response to Ahmed et al.

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Parallels between biological invasions and human migration are flawed and undermine both disciplines. Response to Ahmed et al.

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A recent article by Ahmed et al. (2025) attempts to draw parallels and assess distinctions between biological invasions and the human migration. This comparison conflates two globally occurring phenomena in a scientifically flawed way and risks the misappropriation of scientific concepts for ideological and political agendas. The repeated use of '*similarity*' and '*parallels*' throughout the text, including in the title, could easily lead to misconceptions among broader audiences, such as educators and policymakers, who can help shape public discourse. Despite their acknowledgement that comparing introductions of non-native species to human migration "*may be inappropriate and cause confusion,"* Ahmed et al. argue that it reveals "*complex parallels that are potentially fruitful to explore.*" However, they fail to make their case.

While interdisciplinary analogies can sometimes yield fresh insights, applying concepts of biological invasions to human migration is both conceptually flawed and ethically problematic. Invasion science examines ecological processes and the subsequent environmental, economic, and public health impacts. In contrast, migration studies explore the drivers of human movement and their effects on individuals, communities, and countries, emphasizing that

human migration—unlike biological invasions—is a single-species phenomenon in which individuals are not passive agents. Although external forces like war or famine can drive their movement, humans actively make decisions and respond to these pressures. This distinction is overlooked by Ahmed et al., when they wrongly compare human migration to interspecific invasional meltdown—a process involving the accumulation of multiple non-native species and their compounded ecological impacts, not merely a group of conspecifics (Simberloff and Von Holle 1999).

Such analogies are not only scientifically inaccurate but also carry serious ethical implications. In framing human migration through the lens of biological invasions, Ahmed et al. falsely portray migrants as threats. For example, they misapply the concept of *establishment*, which in invasion biology refers to the formation of self-sustaining populations of a species outside its historical range, often as a precursor toward spread and negative impacts. When this logic is extended to human migrants, it risks implying that their integration or success is inherently problematic, potentially reinforcing anti-immigration sentiments. This error is compounded by their application of frameworks designed to categorize the impacts of non-native species on human society [e.g., Socio-economic Impact Classification of Alien Taxa (SEICAT; Bacher *et al*., 2018)] in evaluating human migrants. This is incompatible and inappropriate for human-to-human interactions.

Similarly, by forcing comparisons between the standard framework describing pathways of non-native species introductions (Hulme et al. 2008) and to human migrants, the authors frame migration as a process largely controlled by the recipient country, equating deprecatory terms including ‘contaminant’, ‘stowaway’, and ‘escape’ with the deeply complex socio-cultural phenomenon of immigration. Likewise, Ahmed et al. equate language used for neutral classification in medicine and invasion science with human migration, resulting in unacceptable comparisons that liken refugees to at-risk species or harmful diseases, depict successful migrants as filling ecological niches, and equate the containment of migrants with the containment of infectious disease, harmful contaminants, or invasive species. This approach dehumanizes these groups by reinforcing the comparisons Ahmed et al. themselves cautioned against and prevents scientific interdisciplinary progress.

In contrast, robust interdisciplinarity, such as the use of welfare economics by invasion scientists to develop the SEICAT (Bacher et al. 2018), or the integration of sociological analysis to incorporate context-sensitive Indigenous knowledge (Brondízio et al. 2021), prioritises conceptual rigor and fosters genuine dialogue between disciplines to avoid misconceptions. Ahmed et al., by contrast, neglect the scientific collaboration needed to bring social sciences and invasion ecology together for effective interdisciplinary work in invasion science (Guareschi et al. 2024). As a result, they neither advance invasion science nor provide meaningful insights into human migration. For social scientists in migration studies, drawing parallels between biological invasions crossing biogeographic or jurisdictional boundaries and human migration occurring within or across jurisdictional boundaries reflects a conceptual mismatch rather than a scientifically sound comparison. Such comparisons fail to apply key distinctions, particularly the role of agency and intentionality in human migration, and risk oversimplifying or misrepresenting the complex social, political, and economic drivers that shape human migration.

Apart from failing to demonstrate heuristic value, Ahmed et al.’s misguided comparison of humans to non-native species, even as an academic exercise, is needlessly provocative, especially at a time when scientific concepts and associated data are increasingly misused for ideological and political purposes that disproportionately harm marginalized groups. This also highlights the responsibility of scientific journals and editors in this regard. Even if studies

such as Ahmed et al.'s review were scientifically sound, those with strong ethical implications and high potential to impact marginalized groups should be scrutinized more carefully for their ethical implications during decision for publication. This is especially relevant as ecologists increasingly engage with their peers in the social sciences. We urge that future research and publication practices should prioritize ethical integrity, especially when addressing topics with significant social impacts.

In summary, by drawing untenable equivalencies between biological invasions and human migration, Ahmed et al. open the door for both intentional and unintentional misuse instead of preventing it. Their stated caveats in the review are undermined by the fact that the authors themselves disregard them in their own synthesis. We strongly recommend such comparisons should be avoided altogether and reiterate Ahmed et al.'s own warning that this analogy is "*fundamentally flawed and dangerous and so these two phenomena should not be directly compared*".

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