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RESPONSE

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Don't bite the hand that feeds you: Meta food webs help in the face of the Eltonian shortfall

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Brimacombe & colleagues (BBF hereafter) challenged the robustness of our conclusions on the influence of land use intensity on European tetrapod food webs.

Their first issue concerns the realism of the local realizations of a meta food web, that is local meta food webs. This approach assumes that if species interact someplace, for example a wolf and a deer, and if they co-occur in the long run they will inevitably interact, and it has been broadly used in ecology as a way to approximate local networks (critically reviewed in Thuiller et al., 2024). Soil ecologists have long classified species in diet categories and analyzed variation of local meta food webs in response to disturbances (Barnes et al., 2014). Similar approaches have been used in lake and marine ecology (Albouy et al., 2019, Gravel et al., 2011, Havens, 1992, Kortsch et al., 2019) as well as for vertebrates (Galiana et al., 2022; Lurgi et al., 2012). BBF rightly questioned the hypothesis that interactions exist even if two species were observed to occur 10 years apart at the same location. Indeed, the overall methodology implies a vague definition of time, assuming known interactions will inevitably happen at some point, across multiple years and in the vicinity of the pixel.

Validating local meta food webs with empirical data would be ideal. Yet, observing interactions in the field is immensely challenging, as many potential interactions are likely not observed within the limited spatiotemporal window of most sampling (Hortal et al., 2015). To date, empirical food webs are generally sampled using a variety of different methods, spatial resolution or taxa aggregation (Cirtwill et al., 2015). Global efforts and funding are needed together with standards and methods to assess whether local meta food webs adequately represent empirical food webs. Meanwhile, local meta food webs are a reasonable starting point, can be refined with observations, and are comparable across space, which is central to our question.

The second issue was that land use intensity weakly explained food web metric variation compared to climate and land use according to its partial R^2, something notably explained by a minority of outliers that reduced model fit (Table S7.3). Yet, effect sizes associated with land use intensity were important, with up to 10% of the total variability of food web metrics (Figure 4-a). This influence was even stronger in specific climate and land use contexts. Contrary to what BBF suggested, our results made only marginal use of the significance of statistical tests. Our interpretations mostly relied on the effect sizes related to land use intensity and the proportions of each type of response (positive, negative and discordant) among the

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significant responses of food web metrics to intensification across contexts (Figure 4-b). Eliminating the non-significant contexts was a way to filter weak signals when analyzing the discrepancy of responses to intensification across contexts. Even though statistical significance is often criticized for its sensitivity to sample size, the proportions of types of response that we used should not be affected in this way.

CONFLICT OF INTEREST STATEMENT

We declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed for the current article.

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