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Explicitly integrating trophic interactions in species distribution models improves ecological niche estimations and predictions

Biotic interactions are certainly one of the main processes ruling the assembly of multitrophic species communities. Yet, there is no species distribution model (SDM) explicitly accounting for biotic interactions. Here, we propose a framework that combines knowledge of trophic interactions with Bayesian structural equation models to model each species as a function either of its prey, or of its predators, and environmental conditions. We tested and validated our framework on realistic ecological communities simulated with a generalised Lotka-Volterra model. We show that our multitrophic SDMs improve inference of both fundamental and realised niches compared to classical SDMs, especially for species with a strong biotic control, ultimately increasing model predictive performances. Our framework stands out as a novel solution to model multitrophic communities distribution when trophic interactions are known.