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Figs and frugivores in the Afrotropics: inferring biotic interactions in a seed-dispersal meta-network

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Natural and anthropogenic climate change influence the geographical range and survival of species and can lead to new or lost species interactions, eventually re-organizing entire biological communities into new novel communities. However, species networks are inherently complex and difficult to fully characterize, thus we often have an incomplete picture of all potential interactions in a community. Machine learning has proven useful for inferring biotic interactions in ecological networks, thereby filling the gap of unobserved but potential interactions. Here we develop a macro-ecological framework for inferring seed-dispersal interactions. Specifically, we gathered data on mutualistic interactions between Afrotropical figs (*Ficus*) and frugivorous animals which consume figs, dispersing their seeds. Based on 734 studies, we compiled a database of 4570 unique empirical interactions between 106 fig species and 492 frugivore species (271 birds and 214 mammals). Here we show how these data are taxonomically and geographically biased toward highly studied families and geographic areas, highlighting the need for unbiased predictions of potential species interactions. We also elucidate how these observed interactions can be combined with functional traits of both the figs and frugivores in machine-learning algorithms for classifying novel interactions. By understanding how functional traits drive seed dispersal interactions on a macro-scale, it is possible to model lost or acquired interactions as well as extinction velocity and sensitivity as species move in response to global change. The proposed framework can ultimately provide new insights into the stability of ecological communities on a continental scale, and the importance of specific functional traits in seed dispersal networks.