Can African elephants influence predator-prey interactions through vegetation modification?

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Abstract

Interspecific interactions, such as predation or competition, are key drivers of the structure and functioning of communities. While interactions between two species have been widely studied, there is an increasing awareness that natural communities are complex systems and that there is a need to consider the network of interspecific interactions operating in a community and the effect of interaction modification. This is typically the case for ecosystem engineers, which modify the structure of the environment and thus have the potential to influence the interspecific interactions occurring in the environment they modify. In this work, we studied such environment-mediated interaction modifications by investigating the role of African elephants as modifiers of predator-prey interactions in savanna ecosystems. We first analyzed data from 12 long-term vegetation plots (2001-2015) in the savanna ecosystem of Hwange National Park (Hwange LTSER), Zimbabwe, which is an ecosystem characterized by one of the highest elephant population density to assess elephant-induced vegetation structure changes. We showed that elephants mainly modify the canopy structure of the understory of the vegetation, i.e. in the < 2m height stratum that is relevant for large mammalian interactions. We then used data from GPS-collared African lions to detect lion kill sites (n=209) and measure vegetation characteristics at these sites to assess whether elephant induced vegetation changes can influence the hunting success of lions. We revealed that lion kills are located mainly in areas modified by elephants (an unexpected result as these sites have a higher visibility and less ambush site opportunities) but at the microhabitat scale, they killed close to a potential vegetation ambush site. Our study suggests that ecosystem engineers can indirectly mediate trophic interactions, but that mechanisms are scale-dependent.

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