

Exploring the dynamics of interactions between trees and granivores: from global patterns to intraspecific variation

PhD Thesis – abstract

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The relationship between plants and granivores varies in magnitude - from weak to strong – and in sign – from negative to positive. To make sense of this variation, we need global syntheses of numerous existing studies, and field studies that focus on overlooked sources of complexity in plant-granivore interactions. My thesis aimed to address both of these goals. The thesis consists of three parts: (i) a meta-analysis of the predator-satiation hypothesis, (ii) a study on the impact of variation in seed size on foraging decisions of rodents, (iii) a study on the effects of intraspecific variation in granivore traits on the patterns of seed dispersal. In the first part of my thesis, I revisited predator-satiation hypothesis in a meta-analysis based on 48 studies that gathered at least 4 years of data on seed production and seed predation. The predator-satiation hypothesis is one of the most widely known hypothesis explaining evolutionary advantages of mast seeding. It states that intermittent, abundant crops evolved to reduce seed losses by starving granivores between mast events and overwhelming them with seeds during mast years. I found evidence of both starvation between mast years and satiation during mast years. However, the effectiveness of predator satiation varied between predator types; there was evidence for satiation of invertebrates, but not vertebrates. Moreover, satiation became less effective over recent decades, probably due to global anthropogenic changes. In the second part of my thesis, I investigated the impact of acorn size on their removal and dispersal by granivores. Because trees have modular construction, copies of the same organ, such as seeds, may exhibit considerable variation. Since most granivores display preferences towards seeds of particular size, indirect interactions can arise between larger and smaller seed, which further impacts seed survival and seedling establishment. We found that interactions among different sized acorns varied from year to year: in the first, but not the second year of the study, the presence of small acorns protected large ones from removal. In the third part of my thesis, I investigated the impact of individual traits of yellow-necked mice on the dispersal of common oak acorns. We found that more explorative individuals tend to disperse seeds further from other trees. However, other effects of individual traits varied substantially among years, indicating that their impact on interactions with plants changes when ecological conditions fluctuate. Overall, my results underscore the importance of conducting multi-year studies to detect context-dependent interactions between species and long-term trends in ecological phenomena.

Key words: plant-granivore interactions, masting, predator satiation hypothesis, seed dispersal, seed predation, intraspecific variation, animal personality