

## ORIGINAL ARTICLE



# Rodent abundance triggered switch between the relative mutualism and predation in a rodent–seed system of the subtropical island forest

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## Abstract

Density-dependent non-monotonic species interactions are important in maintaining ecosystem stability and function, but empirical evidences are still rare. Rodents, as both seed dispersers and seed predators, have dual effects on plant regeneration and may result in non-monotonic rodent–plant interactions. According to the non-monotonic models, the relative positive or negative effects of rodents on seedling establishment can be measured based on the positive or negative association of seedling recruitment rate and rodent abundance. In this study, we investigated the fates of acorns of *Quercus serrata* by tracking tagged seeds on 21 fragmented subtropical islands in the Thousand Island Lake, China. We found that the proportion of germinated seeds of all released seeds showed a dome-shaped association with rodent abundance per seed. The proportion of removed seeds and cached seeds showed a saturated- and a weak dome-shaped association with rodent abundance per seed, respectively. Our results demonstrated a clear empirical evidence that rodent abundance per seed triggered a switch between the relative mutualism and predation in a rodent–seed system. Our study implied that the observed non-monotonic interactions between plants and animals may play a significant role in maintaining biodiversity and ecosystem function. We appeal for more investigations of the complex non-monotonic interactions in various ecosystems.

**Key words:** ecological non-monotonicity, plant–animal interaction, relative mutualism or predation, rodent abundance per seed

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## INTRODUCTION

Species interactions are often assumed to be monotonic with fixed sign, that is, either positive, negative or neutral, however, density-dependent non-monotonic species interaction may also be important in natural ecosystems (Zhang *et al.* 2015). Several theoretical modeling