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Interactive effects of urbanization and year on invasive and native ant diversity of sacred groves of South India

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Abstract

Urbanization is a major threat to native biodiversity. Invasion of tramp species is a major consequence of urbanization, which might threaten native species. Ants are established robust ecosystem indicators. We assessed the changes of ant community in sacred groves (SGs) of urban and rural landscapes of south India between 2013 and 2019, and asked, 1) what is the effect of urbanization on ant community? 2) has the population of invasive ants, particularly *Anoplolepis gracilipes* – a globally notorious tramp species, changed in response to urbanization and year? 3) is species composition of ants in SGs different between landscapes and years? and 4) has the population of native ants or any ant functional groups responded with the population of invasive ants? The richness of overall species, native species, and invasive species was not affected by year or landscape, but the abundance was. In six years, the abundance of ants doubled, but due to *A. gracilipes*. *A. gracilipes*, previously restricted only in the urban SGs had established in rural SGs in six years. A signific[illegible]urnover of native species was observed across years and with the population rise of *A. gracilipes*. While Generalist Myrm[illegible]es and Tropical Climate Specialists increased with the abundance of invasive ants, Cryptic Species decreased. We consider the stability maintained in the native species composition and richness in SGs, the aftermath of the conditions provided by SGs. However, the evident shift in the composition of native ants over the years point out how invasive ants affect the native species composition.

Keywords Urbanization · Invasive ants · *Anoplolepis gracilipes* · Tramp species · Native ants · Sacred groves

Introduction

Urbanization, despite may create new habitat for resilient wildlife (Roshnath and Sinu 2017), can lead to destruction of habitat of many species and invasion by tramp species, which results in species competition, displacement, and extinction of species (Shochat et al. 2010; Buczkowski and Richmond 2012). Biotic invasion seems to be a major impact of urbanization (McKinney and Lockwood 1999; Alberti et al. 2001). The invasive species use urban environment for entering, invading, and colonizing natural wild landscapes around urban areas. Long-term biodiversity monitoring in urban-rural gradient can inform us the complex pattern of urbanization-driven invasion and spill-over of invasive species and its impact on native fauna (Alberti et al. 2001; Fisher and Cover 2007).

Among invertebrates, ants are pivotal in the functioning of communities and terrestrial ecosystems. To name a few, ants are involved in natural pest control, decomposition and nutrient cycling, and secondary dispersal of seeds (Ramos et al. 2012; McGlynn and Poirson 2012; Gallegos et al. 2014). Ants, due to their taxonomic stability, diversity, and functional trait diversity, are frequently picked as bioindicators of various ecosystem processes and changes including urbanization (Holway and Suarez 2006; Clarke et al. 2008; Sanford et al. 2009; Uno et al. 2010; Rocha-Ortega and Castaño-Meneses 2015; Rajesh et al. 2017). Their robustness as indicators of the ecosystem has been gone over and over again in many contexts (Bharti et al. 2016). For instance, the first signs of habitat disturbances in Kakamegha, an African rain forest, was indicated by the ants (Ross et al. 2018). In another study (Mauda et al. 2018), the ant species diversity, assemblage, and functional diversity indicated potential changes in land-use in African savannas.

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