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Prey–predator interaction suggests sacred groves are not functionally different from neighbouring used lands

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Research Article

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Abstract

Sacred groves (SG) of south India are either relics of primary or secondary forests or swamps, worshipped by the local communities, and distributed in the countrysides (CS) and forest landscapes of India. Studies suggest that SGs harbour a biodiversity different from that of adjoining CS and have a structural similarity to protected forests. Studies also suggest a negative effect of structural complexity of forests on predation. Considering these two expectations, we compared the predation of artificial caterpillars inside SGs and CSs with the hypothesis that predation will be less in SG than in CS. Examining the predation marks, we identified the likely predator and scored the intensity of predation. Bite marks of arthropods, birds, lizards and mammals were observed on caterpillars of both habitats. The predation rate and predation intensity were similar for overall predators and for each predator taxon in both habitats, despite the fact that mammal predation was mostly encountered in SGs. Because the proportion of predated caterpillars is not different between habitats and the intensity of predation is high in SGs, we conclude that SGs may not have a quality of the expected standard.

Introduction

Around the world, sacred sites are recognized as important centres of biodiversity conservation, despite this differing from their original purpose (Berkes 2009, Lowman & Sinu 2017). India, particularly the south of India, has a history of local involvement in managing forests and natural resources (Nagendra & Gokhale 2008). For instance, the Soppinabetta forests of the Western Ghats biodiversity hotspot in south India are portions of pristine natural forests allocated to farmers for sustainable use of resources from forests – leaf litter and green leaves – and production of agricultural crops, such as betel nut, rice and coffee (Nagendra & Gokhale 2008, Sinu *et al.* 2012*a*). Since they have a direct use for farmers, they are still well protected, and therefore play a crucial role in conserving endemic and threatened biodiversity (Sinu *et al.* 2011, 2012*b*). Sacred groves (SGs) of India are another fine example of traditional management of forests. They generally forbid anthropogenic modification of forests, therefore maintain a structural integrity of a protected forest. The SGs of south India have primary or secondary forests or swamps (Bhagwat *et al.* 2005, Prashanth Ballullaya *et al.* 2019). They were protected long ago by the pre-religious animistic tribal community to worship nature and its resources (Bhagwat *et al.* 2005, Prashanth Ballullaya *et al.* 2019). This community later had local deities and Serpent Gods, and today has *Sanskritized* Hindu gods. This transformation in faith has modified the nature–human relationship among the local community (Landry-Yuan *et al.* 2020, Prashanth Ballullaya *et al.* 2019). Due to urbanization and population increases, SGs today exist in countryside (CS) and forest landscapes both within and outside the Western Ghats biodiversity hotspot. Studies suggest that SGs maintain a structural integrity and biodiversity different from that of adjoining used lands and protected forests (Bhagwat *et al.* 2005; Boraiah *et al.* 2003, Brown *et al.* 2006, Chandrashekara & Sankar 1998, Rath *et al.* 2020). Recently, studies have indicated a degradation of quality of SGs in some parts of south India for a variety of reasons, including growing disbelief in traditional cultural practices and rituals among youth, socio-economic changes and land-use change (see Prashanth Ballullaya *et al.* 2019 and references therein, Osuri *et al.* 2014). This calls for regular monitoring of quantifiable and sensitive biodiversity and biotic interactions that can indicate the state of affairs in the forests.

Prey–predator interactions respond to various ecosystem processes and global changes including fragmentation and habitat deterioration (Posa *et al.* 2007, Seifert *et al.* 2015, Tvardikova & Novotny 2012). It is suggested that prey–predator trophic function decreases with structural complexity of habitats (King *et al.* 1998, Muiruri *et al.* 2016, Pocha & Simonetti 2013, Richards & Coley 2007, Roels *et al.* 2018, Root 1973, Schuldt *et al.* 2011, Zou *et al.* 2013). Considering SGs are relatively pristine as depicted by other studies (Bhagwat *et al.* 2005, Brown *et al.* 2006, Chandrashekara & Sankar 1998, Manoj *et al.* 2017, Rajesh *et al.* 2017)