

Understanding Responses of the Bee Community to an Urbanizing Landscape in Bengaluru, South India

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Abstract : A majority of the world's food crops depends on insects for pollination, among which bees are the most dominant taxon. Bees pollinate vegetables, fruits and oilseeds which are rich in essential micronutrients. Besides being a prerequisite for a nutritionally secure diet, agrarian economies such as India depend heavily on pollination for good yield and quality of the product. As cities all over the world expand rapidly, large tracts of green spaces are being built up. This, along with high usage of agricultural chemicals has reduced floral diversity and shrunk bee habitats. Indeed, pollinator decline is being reported from various parts of the world. Further, the FAO has reported a huge increase in the area of land under cultivation of pollinator-dependent crops. In the light of increasing demand for pollination and disappearing natural habitats, it is critical to understand whether and how urban spaces can support pollinators. To this end, this study investigates the influence of landscape and local habitat quality on bee community dynamics. To capture the dynamics of expanding cityscapes, the study employs a space for time substitution, wherein a transect along the gradient of urbanization substitutes a timeframe of increasing urbanization. This will help understand how pollinators would respond to changes induced by increasing intensity of urbanization in the future. Bengaluru, one of the fastest growing cities of Southern India, is an excellent site to study impacts associated with urbanization. With sites moving away from the Bengaluru's centre and towards its peripheries, this study captures the changes in bee species diversity and richness along a gradient of urbanization. Bees were sampled under different land use types as well as in different types of vegetation, including plantations, croplands, fallow land, parks, lake embankments, and private gardens. The relationship between bee community metrics and key drivers such as a percentage of built-up area, land use practices, and floral resources was examined. Additionally, data collected using questionnaire interviews were used to understand people's perceptions towards and level of dependence on pollinators. Our results showed that urban areas are capable of supporting bees. In fact, a greater diversity of bees was recorded in urban sites compared to adjoining rural areas. This suggests that bees are able to seek out patchy resources and survive in small fragments of habitat. Bee abundance and species richness correlated positively with floral abundance and richness, indicating the role of vegetation in providing forage and nesting sites which are crucial to their survival. Bee numbers were seen to decrease with increase in built-up area demonstrating that impervious surfaces could act as deterrents. Findings from this study challenge the popular notion of cities being biodiversity-bare spaces. There is indeed scope for conserving bees in urban landscapes, provided that there are city-scale planning and local initiative. Bee conservation can go hand in hand with efforts such as urban gardening and terrace farming that could help cities urbanize sustainably.

Keywords : bee, landscape ecology, urbanization, urban pollination

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