

Drivers of diversity and community structure of bees in an agroecological region of Zimbabwe.

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Abstract

1. Worldwide bees provide an important ecosystem service of plant pollination. However, environmental pressures are threatening their survival. Information is lacking on how land-use systems and weather patterns in developing countries influence bee populations. 2. We investigated how environmental and land use mediated factors influence the abundance, diversity, and distribution of bees across seasons in a farming communal area of Zimbabwe. Bees were systematically sampled in five land-use types (natural woodlot, pastures, homestead, field, and garden) recording ground cover, grass height, flower abundance, and types, tree abundance, and recorded elevation, temperature, light intensity, wind speed, wind direction, and humidity. The hurdle model, general linear model, and PCA were conducted to understand the influence of explanatory variables on bee abundance and Shannon diversity. 3. We found out that bee abundance was highly positively influenced by the number of flower types $P < 0.0001$ and significantly positively correlated to tree abundance $P = 0.0475$. We also highlight the high sensitivity of bees to weather changes as wind speed increases, thus reducing the probability of finding bees ($P = 0.033$). Temperatures above 28.50°C significantly lowered bee abundance ($P < 0.001$). 4. Bee diversity was highest in homesteads (coefficient 0.4438) and natural woodlots (coefficient 0.4172) than gardens with fields and pastures having a disproportionately high abundance of *Apis*. Bee species also showed tolerance to different land-use types with *Megachile* associated with homesteads and *Nomia* with grasslands. Homesteads however supported more diverse species ($P = 0.0453$) highlighting the importance of some of its components to bee conservation. 5. Synthesis and applications. Our study showed that land-use change reduced the diversity of species and proliferated species that could tolerate the changes. These results highlight the importance of setting aside bee-friendly habitats that can be refuge sites for species susceptible to land-use change.

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