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Ant and spider diversity in a rural landscape of the Vhembe Biosphere, South Africa

By

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ABSTRACT

The greatest threat to biodiversity is the loss of habitat through landscape fragmentation and attrition. Land use changes are therefore among the most immediate drivers of species diversity. Urbanization and agriculture are the main drivers of habitat loss and transformation in the Savanna biomes of South Africa. Agricultural expansion and intensification in particular, takes place at the expense of biodiversity and will probably be the primary driver of biodiversity loss in this century. Arthropods show measurable behavioural responses to changing land mosaics at the smallest scale and heterogeneous environments are therefore predicted to support more complex and diverse biological assemblages. Ants are premier soil turners, channelers of energy and dominates the insect fauna, while spiders are a mega-diverse group that can regulate other invertebrate populations. This study aims to quantify the response of these two taxa in a rural-urban mosaic of a rapidly developing communal area. The study took place in and around two villages in the north-eastern corner of South Africa. Two replicates for each of the dominant land use categories, *viz.* urban settlements, dryland cultivation and cattle rangelands, were set out in each of the villages and sampled during the dry and wet seasons for a total of 2 villages × 3 land use categories × 2 seasons = 24 assemblages. Local scale variables measured included vertical and horizontal habitat structure as well as structural and chemical composition of the soil. The response of richness to local, landscape (land use) and regional (village) factors were modelled using generalized linear mixed models with Poisson error distributions whereas assemblage structure was analysed using both non-parametric (non-metric multidimensional scaling, ANOSIM, PERMANOVA and PERMDISP) as well as parametric (RDA) approaches. Ant richness was not affected by land use but local scale variables such as vertical vegetation structure (+) and leaf litter cover (+), although vegetation complexity at lower levels was negatively associated with ant richness. However, ant richness was largely shaped by regional and temporal processes invoking the importance of dispersal and historical processes. Spider species richness was mostly affected by land use and p value indicated that local conditions highlighting their landscape elements. Spider richness did not vary much between villages and across seasons and seems to be less dependent on context or history. There was a considerable amount of variation in spider richness that was not explained and this could be related to factors which were not measured in this study such as temperature, competition with e.g. ants (ants were very abundant in the settlements). For both ant and spider assemblages the constrained ordination explained 18 %

of variation in these taxa. Three environmental variables (leaf litter cover, active carbon and rock cover) were important in explaining ant assemblage structure, while two (sand and leaf litter cover) were important for spider assemblage structure. This study highlights the importance of disturbance (land use activities) and leaf litter with the associated effects on ant and spider assemblages across the study area.