The effect of land-use on the butterfly diversity of ecological refugia within an agricultural landscape

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An ecological refuge is a geographic area large enough to support populations of species over both ecological and evolutionary time-scales. In light of forecasted climate change, it is likely that many species of plants and animals will require ecological refugia for their long-term persistence. This seems especially relevant in the mixed-use landscapes of the eastern Free State, South Africa. The region contains many free-standing sandstone mountains called inselbergs, which provide a rich variety of microhabitats to buffer against future climate change. This study proposes to survey the butterfly diversity of these inselberg refugia. Butterflies are reliable indicators of both land-use and climate change. Moreover, they provide important regulation ecosystems services by serving as pollinators. Since inselbergs are, in essence, 'islands' of suitable habitat in an 'sea' of less suitable habitat, their ecological dynamics should conform loosely to the Theory of Island Biogeography (TIB). However, the surrounding agricultural 'sea' is not uniform, but rather a patchwork of wetlands, cultivated- and grazing-lands. This study, therefore, aims to determine whether surrounding land-use affects the diversity of ecological refugia. To this end, this study intends to estimate butterfly population densities from Pollard walks within both the inselberg refugia and the surrounding agricultural matrix. This will allow the assessment of whether agricultural intensification jeopardises the ability of inselbergs to provide the supporting ecosystem services associated with ecological refugia. The outputs are twofold: (1) high resolution density data of butterfly species, coupled to data on the habitat characteristics and spatial structure of refugia. (2) The survey will determine the interplay between diversity in ecological refugia and the surrounding agricultural landscape.