

Examining homogenisation and ecological filtering of bird communities in three major South African cities

With ongoing urbanisation and a looming climate and biodiversity crisis, more attention must be given to sustainably designing the spaces we inhabit and to sharing them with nature. Understanding the distribution of biodiversity around urban areas can help us in creating more biodiverse cities. Current research suggests that cities tend to favour certain species, resulting in similar communities – they are drivers of biotic homogenisation, and filtering of surrounding communities. This study made use of data from the Southern African Bird Atlas Project (SABAP2) to examine the country's three major urban centres – Cape Town, Durban and Gauteng. Each city is embedded in a vastly different regional bird community. If these cities act as ecological filters, we expect their bird communities to be nested within the regional communities. If the cities act as homogenisers, we expect different city's communities to be more similar to each other than to their surrounding regional communities. We conducted multi-species occupancy modelling on a selected set of species in each city, to determine their response to cover of urban sealed surfaces, urban lawn, and urban vegetated area. We then used the modelled occupancy probabilities of each species to calculate alpha and beta diversity, as well as functional composition, in a subset of the most and least urban pentads (grid cells) of each city. In Durban, urban pentads saw a decrease in diversity relative to surrounding rural pentads, as we would have expected. In Cape Town and Johannesburg however, the opposite was true, and urban areas were actually more diverse. Durban therefore showed evidence of ecological filtering, while Cape Town and Gauteng did not. Looking at beta diversity measures we found that each city closely resembled its surrounding bird community and was different from the other cities. We thus did not find evidence of homogenised urban communities. Trends in functional groups reflected similar patterns. Our study shows how citizen science datasets and multi-species modelling can be used to determine whether cities in this understudied region mirror observations of urban biotic communities in other regions, thereby allowing for conservation recommendations more specific to each city's species.