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# Bird's response to seasonality: Investigating the range dynamics of birds through dynamic occupancy models.

Birds can respond to seasonal environmental fluctuations through migration. Among different migratory species and populations, there is varying sensitivity to different seasonal environmental cues, thus leading to different seasonal range dynamics and migration strategies. In this study, we used dynamic occupancy models on the South African Bird Atlas Project 2 (SABAP2) data to investigate the seasonal range dynamics of a selection of five migratory and six nomadic bird species in western South Africa. We used dynamic occupancy models to estimate monthly changes in occupancy between 2014 and 2018. We modelled local extinction and colonisation as a function of changes and anomalies in average monthly rainfall, temperature and vegetation. Among the migrants, the best performing models indicated that colonization and extinction parameters were mostly driven by seasonal changes in average rainfall, temperature and vegetation. In nomadic species, colonization was driven by seasonal changes in average rainfall, temperature and vegetation, while extinction was driven by anomalies in rainfall, temperature and vegetation. The models successfully captured the generally known seasonal pattern in occupancy (arrival and departure) of all five migrants, while no seasonal fluctuation in occupancy was evident among the nomadic species. Over the four-year period, no species showed a strong shift in seasonal range dynamics in both groups. However, we do suspect that the same methodology done at a finer scale and possibly longer period may reveal changes in seasonal range dynamics of some species. This study demonstrates that dynamic occupancy modelling using citizen science data is a viable methodology for investigating seasonal range dynamics.