47

A method to predict connectivity for waterbird species from tracking data

Many waterbird species undertake long-distance flights to access food, nesting habitat and other resources. Conserving species through these long-distance movements is challenging because they cover vast areas, which often makes traditional conservation tools such as permanent reserves infeasible. For some migratory species, long-distance movements are regular and predictable, and there have been recent high-profile conservation successes in providing temporary habitat during their migration. However, for species which undertake nomadic or semi-nomadic movements, the difficulty of predicting where birds will be during large-scale movements remains a barrier to conservation.

In this study we outline a statistical method to predict the probability of connectivity between key sites for a partially migratory species, the straw-necked ibis (Threskiornis spinicollis) in the Murray-Darling Basin, Australia. Our method uses 5 years of tracking data with high resolution landscape and weather variables to build a model of the expected distance travelled under environmental scenarios for different movement states, identified by hidden Markov modelling. Weather and landscape water variables are matched to tracked bird locations using downscaled big data sets to replicate the conditions experienced by the birds in flight. We generate least-cost paths between locations of interest (e.g., breeding sites) and simulate the probability that birds can exceed the least cost-distance as a measure of connectivity. The method separates static “potential” connectivity, based on landscape features that change slowly, from short-term “realized” connectivity, which captures the factors that have an immediate impact on birds during flight (e.g., wind, weather and local water conditions). We further extend our model by generating short-term forecasts (e.g. 1-3 days) of the probability of bird connectivity given the expected future environmental conditions. Our early results suggest that habitat type becomes less important as birds travel further, and that weather and other environmental variables become dominant for very long-distance movements. Our method provides one of the first ways to predict and forecast the movements of nomadic and partially-nomadic birds, providing a better understanding of how birds use and interact with large landscapes.