Modeling waterbird diversity in irrigation ponds of Taoyuan, Taiwan using an artificial neural network approach

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Abstract

The study develops an approach adopted by artificial neural networks (ANN) to model the relationship between pondscape and waterbird diversity. Study areas with thousands of irrigation ponds are unique geographic features from the original functions of irrigation converted to waterbird refuges. The model considers pond shape and size, neighboring farmlands, and constructed areas in calculating parameters pertaining to the interactive influences on avian diversity, among them the Shannon–Wiener diversity index. Results indicate that irrigation ponds adjacent to farmland benefited waterbird diversity. On the other hand, urban development leads to the reduction of pond numbers, which reduces waterbird diversity. By running the ANN model, the resulting index shows a goodfit prediction of bird diversity against pond size, shape, neighboring farmlands, and neighboring developed areas with a correlation coefficient (r) of 0.72, in contrast to the results from a linear regression model (r<0.28).