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BIRDIE: A data pipeline to inform wetland and waterbird conservation at multiple scales

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Introduction: Efforts to collect ecological data have intensified over the last decade. This is especially true for freshwater habitats, which are among the most impacted by human activity and yet lagging behind in terms of data availability. Now, to support conservation programmes and management decisions, these data need to be analyzed and interpreted; a process that can be complex and time consuming. The South African Biodiversity Data Pipeline for Wetlands and Waterbirds (BIRDIE) aims to help fast and efficient information uptake, bridging the gap between raw ecological datasets and the information final users need.

Methods: BIRDIE is a full data pipeline that takes up raw data, and estimates indicators related to waterbird populations, while keeping track of their associated uncertainty. At present, we focus on the assessment of species abundance and distribution in South Africa using two citizen-science bird monitoring datasets, namely: the African Bird Atlas Project and the Coordinated Waterbird Counts. These data are analyzed with occupancy and state-space models, respectively. In addition, a suite of environmental layers help contextualize waterbird population indicators, and link these to the ecological condition of the supporting wetlands. Both data and estimated indicators are accessible to end users through an online portal and web services.

Results and discussion: We have designed a modular system that includes tasks, such as: data cleaning, statistical analysis, diagnostics, and computation of indicators. Envisioned users of BIRDIE include government officials, conservation managers, researchers and the general public, all of whom have been engaged throughout the project. Acknowledging that conservation programmes run at multiple spatial and temporal scales, we have developed a granular framework in which indicators are estimated at small scales, and then these are aggregated to compute similar indicators at broader scales. Thus, the online portal is designed to provide spatial and temporal visualization of the indicators using maps, time series and pre-compiled reports for species, sites and conservation programmes. In the future, we aim to expand the geographical coverage of the pipeline to other African countries, and develop more indicators specific to the ecological structure and function of wetlands.

KEYWORDS

biodiversity informatics, citizen science, data pipeline, waterbirds, wetlands, species distribution, species abundance, diversity