
The importance of accounting for imperfect detection when estimating functional and phylogenetic structure of bird communities on land-bridge islands

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Abstract

Incorporating imperfect detection when estimating species richness has become commonplace in the past decade. However, the question of how imperfect detection of species affects estimates of functional and phylogenetic community structure remains untested. The goal of this study is to assess how imperfect detection of species biases estimates of different measures of diversity, as well as community structure of island birds. Bird communities were surveyed annually in the breeding season (April–June) from 2007 to 2016 on 36 islands in the Thousand Island Lake, China. We employed multi-species occupancy models to assess the effects of imperfect detection of species on estimates of bird diversity and community structure by incorporating species traits and phylogenies in a land-bridge island system. Our results showed that taxonomic, functional and phylogenetic diversity were all underestimated significantly as a result of species' imperfect detection, with taxonomic diversity showing the greatest bias. The functional and phylogenetic structure calculated from observed communities were both more clustered than those from the detection-corrected communities due to missed distinct species. The discrepancy between observed and estimated diversity differed per the measure of biodiversity employed. Our study demonstrates the importance of accounting for species' imperfect detection in biodiversity studies, especially for functional and phylogenetic community ecology. With datasets that allow for detection-corrected community structure, we can better estimate diversity and infer the underlying mechanisms that structure community assembly, and thus make reliable management decisions for the conservation of biodiversity.

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