Modelling the effect of land use diversification on avian species richness, abundance and assemblage intactness

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Abstract

One of the leading anthropogenic causes of global biodiversity loss is land use change, such as converting forest to farmland. Diversification measures in farming – forestry, agriculture, livestock rearing – are an option to mitigate the impacts of land use change on biodiversity. These include rotating crops, retaining non-crop vegetation or other natural elements, and diversifying the livestock reared. The impact of diversification is commonly evaluated based on comparisons of agricultural management intensity, the level of diversification, the use of organic management practices or the inclusion of agri-environment schemes. Comparisons to the state of biodiversity in natural reference sites, as a measure of ecological integrity, are thus uncommon. One previous study on mammals found that the inclusion of natural elements in forest plantations and cropland led to higher relative species abundance and richness (compared to natural reference sites), as well as assemblage intactness, than when they were absent. However, while birds have been shown to be a good indicator of overall ecosystem health, the impact of diversified farming practices on this taxon remains to be assessed. We consolidated a database of bird species abundance and richness in diversified and undiversified farmed sites, compared to nearby natural reference sites, collected from close to 100 primary studies. We test whether richness and abundance are significantly different in natural habitat compared to farmland, distinguishing between farmland with and without diversification measures. We also study how the difference between natural reference habitat compared to farmland is affected by species characteristics such as body mass, as well as environmental conditions, such as latitude. These models, in combination with the previously developed ones for mammals, could be included in an updated version of the global biodiversity model GLOBIO, which currently does not distinguish diversification levels in farmed land use types. It could also be used in other similar models, to improve global biodiversity outlook studies, key in understanding anthropogenic impact hotspots, as well as be included in corporate biodiversity impact evaluation tools.

Keywords: birds, agriculture, diversification, abundance, richness

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