
Pattern vs process: comparing estimates of land-use impacts from the PREDICTS and Madingley models of biodiversity

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Abstract

The PREDICTS project (www.predicts.org.uk) has collated biodiversity data from scientists worldwide in order to produce a global database of terrestrial species' responses to land use and related human pressures. The database has been successfully used to model anthropogenic impacts to local biodiversity on a global scale and its outputs are now being integrated into global and regional policy. The Madingley General Ecosystem model (www.madingleymodel.org) is a mechanistic model used to evaluate how anthropogenic pressures influence whole ecosystems. Between them, these models can make predictions about a wide range of facets of natural capital, from species-richness to biomass production. It is therefore important to assess whether results from the PREDICTS and Madingley models agree when they are used to answer the same question. Good agreement would help to produce a unified message to policy makers and increase confidence in both models; even disagreement may provide valuable clues as to the strengths and weaknesses of the models. Unlike PREDICTS, the Madingley model does not model communities of known taxonomic identification, but cohorts based around sets of functional traits. Therefore we used both models to estimate human impacts on the abundance of groups of individuals with specific functional traits. Anthropogenic pressure was quantified in both models using Human Appropriation of Net Primary Production. We examine how the model results compare for different trophic levels (omnivore, carnivore, and herbivore), body mass sizes and thermoregulatory groups. We discuss how these results strengthen the models, how they may inform model intercomparisons more generally, and how they may provide novel insights into the links between biodiversity loss and impacts to ecosystem services.

Keywords: biodiversity, functional traits, model intercomparison, anthropogenic impacts

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