Accounting for species taxonomy improves distribution models

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Abstract: The use of species atlas data and correlational modelling approaches has become common practice in species distribution modelling. However, the effect of spatial extent on the performance of species distribution models remains unclear. We propose using species taxonomy to delineate environmental extent, and assess how this affects the performance of species distribution models. Using atlas data, two taxonomically enhanced datasets were created for 356 terrestrial species of mainland Spain. As well as a species' presence, its absence was recorded. However, an absence was only recorded for localities where another species of the same family or order was known to be present. We then assessed the effects of environmental extent on the predictive performance of five species distribution models, namely on model calibration and discrimination, comparing the results to those obtained with the original atlas dataset. Using family and order datasets significantly improved the calibration of the species distribution models. While the discrimination capacity decreased for several species when using the family dataset, this drop was significant when the models were trained with the order dataset. The species distribution model algorithms differed only slightly in performance. Enhancement of atlas data by excluding irrelevant absences based on species taxonomy significantly improved the calibration of species distribution models and thus their capacity to predict environmental potential. We therefore recommend the inclusion of species taxonomical extent when atlas data are employed in distribution models.