

Ecological and biological indicators of the accuracy of species distribution models: lessons from European bryophytes

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Abstract

The predictive power of species distribution models (SDMs) substantially varies among species depending on their ecological and life-history traits, but which of these traits are the most relevant and how they influence species ‘predictability’ remains an area of debate. Here, we address these questions in bryophytes. SDMs were calibrated for 411 species in Europe and externally evaluated using an independent dataset in southern Belgium. Predictors included macroclimatic, topographic and edaphic variables. Eleven species traits describing ecological preference, niche breadth and life-history were scored to determine whether they could help interpreting variation in model accuracy among species. A substantial drop in predictive power was observed when moving from internal to external model validation, emphasizing the relevance of external model validation. SDM accuracy substantially varied among species. This variation was significantly explained by species characteristics, including life-history traits, ecological preference and niche breadth, supporting the hypothesis that the strength of species–environment correlations is affected by characteristics of the species themselves. Species ecological preferences, and in particular, pH and nitrogen preference index, were by far the variables most contributing to relation between predictive performance and species traits. SDM accuracy tended to decrease in widespread generalist species. The fact, that model accuracy was higher for species from oligotrophic, and hence, more restricted habitats, is important in a conservation context as ubiquitous species from eutrophic environments are precisely the ones of lower conservation relevance.