

Species distribution models and their application in orchid biodiversity research

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Species distribution models (SDMs) are numerical tools that combine observations of species occurrence or abundance with environmental estimates. They are used to gain ecological and evolutionary insights and to predict distributions across landscapes, sometimes requiring extrapolation in space and time. SDMs are now widely used across terrestrial, freshwater, and marine realms. Differences in methods between disciplines reflect both differences in species mobility and in “established use.” Model realism and robustness is influenced by selection of relevant predictors (climatic variables, geological substrate, slope and orientation, etc.), by modeling method (usually MaxEnt program, but other models can also be used), spatial scale considered (region, country, continent), and by the extent of extrapolation (i.e., how far we extrapolate from the sites where data were collected).

Biologically speaking, SDMs enable to predict occurrence of the species in question based on a set of GPS coordinates of the known sites and a set of biotic and abiotic characteristics of these sites. The output of these models is a map of potential distribution of the species, where the likelihood of its occurrence (a number between zero and one) is depicted in the same way as, e.g., altitude in classical maps – usually by different colors.

The species distribution models are especially useful in regions, which were not yet fully explored, as they enable to pinpoint sub-regions of potential occurrence of the species studied. Based on such results, areas with special protection may be declared. We will show some examples of such maps using data on several orchid species.