QUANTIFYING A SPECIES ECOLOGICAL NICHE USING SDM (SPECIES DISTRIBUTION MODELS)

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Ecological niche represents a basic problem of ecology and biology. It has been addressed actively for a solid century; this yielded multiple dramatically varying definitions. A fruitful approach was proposed by Hutchinson who attributed niche to species rather than geographical space. According to Hutchinson, ecological niche can be drawn in a multidimensional space with ecological factors along the axes. This hypervolume can be transformed into corresponding geographical environment; this two-way transitions represents Hutchinson's duality [1]. The idea behind ecological niche serves as a basis for Species Distribution Modelling (SDM). This type of ecological modelling employs machine learning and uses environment covariates in order to predict species spatial distribution [2].

Here we used SDM as a tool for estimating ecological niche of four most presented (over 50 observations) representatives of Crataegus phylum which inhabit Crimea. The data came from GBIF biodiversity database [3]. These served as a training set. Next, for each of the localities as well as for 100 randomly picked background points environmental variables were taken from Worldclim 2.0 dataset [4]. R free software was used to train models based on Random Forest algorithm (10 for each species); their excellent performance was evidenced by ROC. Finally, we extracted the importance of the environmental variables for each best-performance model. In our suggestion, this impact of covariates reflects real-life species ecological demands and thus may be useful in ecological niche quantitative estimates.

References.
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