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Predicting Current and Future Potential Distribution of Endemic Plant Genera in Sri Lanka Through Ecological Niche Modelling

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Abstract

Rapid spatial and seasonal climatic variations have a significant impact on Sri Lanka's remarkable biodiversity and patterns of endemic species distribution. In terms of distribution, range size, habitat preferences, and ecological plasticity, endemic plant generics represent a uniform, threatened group within Sri Lankan flora. The present study was mainly conducted to identify the current and future potential distribution of total of 57 plant species included in 17 endemic plant genera in Sri Lanka by ecological niche modelling and to predict the extent of suitable habitat change of these species in 2070. In addition to that, the present study was aimed to calculate the niche overlap and the extent of niche overlap change in 2070. The current and future potential distribution of seventeen genera was mapped using MaxEnt v3.4.1 and ArcGIS v10.7.1 software. Layers of bioclimatic variables and species occurrence data were used as the input data for MaxEnt v3.4.1. Bioclimatic data were extracted from the WorldClim v2.1 database and the species occurrence data were gathered mainly from the specimens in the National Herbarium, Peradeniya, national and international databases. Each species' future potential distribution was projected under two Shared Socioeconomic Pathways (SSPs); namely, SSP2-4.5 and SSP5-8.5. Isothermality (bio 3), temperature seasonality (bio 4), precipitation of the coldest quarter (bio 19) and elevation were selected for the present study to remove the multicollinearity within bioclimatic variables (Pearson cross-correlation coefficient value<±0.8). Prepared models were then threshold to a 95% suitability score and the percent of suitable habitat change in 2070 was calculated using RStudio v1.3.1093. The current and future potential distribution models were overlapped separately, and the total overlapping area was calculated. The present study detected contractions of suitable habitats of fourteen of the seventeen endemic plant genera in 2070 under both SSP2-4.5 and SSP5-8.5 climate projections. *Phoenicanthus* sp*., Hortonia* sp. and *Podadenia* sp showed expansion of habitat in 2070 under two future climate projections. The major determinant of the distribution of the endemic genera; *Adrorhizon* sp*, Davidesa* sp*, Loxococcus* sp, and *Diyaminauclea* sp is elevation. Distribution of monotypic endemic genus; *Chlorocarpais* sp mostly determined by the coldest quarter's precipitation parameter (bio 19). The remainder endemic generics have a significant correlation with temperature seasonality (bio4).Moreover; a reduction of the total overlapping niche area of all endemic plant genera was detected. The findings of the study are expected to apply in the conservation of endemic plant generics by suitable habitat prediction and mapping.

Keywords*:* Niche, Endemic genera, Modelling, Predictions