Modelling Impacts of Climate Change on Habitat Suitability of *Lavandula stoechas* in the Tanger-Tetouan-Al Hoceima Region (North of Morocco)

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Abstract

Species distribution modeling serves as a vital tool in ecological conservation, particularly for forecasting changes in species' habitats under varying climate scenarios. Understanding such changes is essential for the preservation of biodiversity, especially for species that are vulnerable and underexploited. This study aimed to simulate the current distribution of suitable habitats for *Lavandula stoechas* in the Tanger-Tetouan-Al Hoceima region (North of Morocco) and to evaluate the potential impacts of climate change on its habitat suitability by the 2050s and 2070s. Using two shared socioeconomic pathways (SSP 126 and SSP 254), we projected future habitat suitability under different climate scenarios. The modeling process employed MaxEnt, a widely recognized method, using presence-only data combined with ten critical environmental variables. These variables, mainly climate and soil related, included factors like precipitation, temperature, pH, cation exchange capacity and soil texture (sand, silt, and clay). Validation of the models was conducted using AUC and Jackknife methods, demonstrating robust performance with AUC scores exceeding 0.85, indicating strong predictive power. The study found that pH, soil texture, isothermality (bio3) and the precipitation of driest month (bio14) have a significant influence on the current habitat distribution of the species. Projections suggest that suitable habitats for *Lavandula stoechas* may decrease by 2050 and the 2070s two shared socioeconomic pathways (SSP 126 and SSP 254). Significant loss of native habitats is likely, highlighting the need for strategic conservation planning. Based on these projections, we recommend designating areas that are vulnerable to climate change as conservation protection zones to safeguard this species.

Keywords

Lavandula stoechas, Habitat Suitability, MaxEnt, Species Distribution Modelling