

Title : Climate-Driven Habitat Suitability Modeling for Megaloptera in Thailand Using MaxEnt

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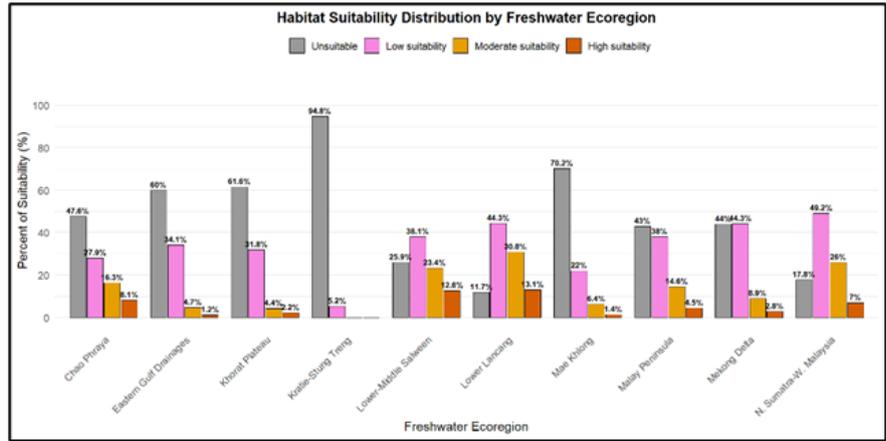
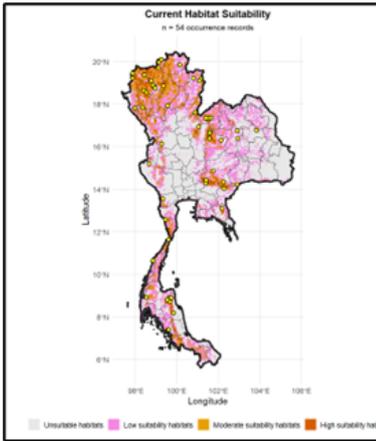
## ABSTRACT

Habitat suitability of Megaloptera in Thailand was assessed using Maximum Entropy (MaxEnt) species distribution modeling based on 54 spatially thinned occurrence localities derived from 116 original records using spThin to ensure spatial independence. Thirteen environmental variables, comprising eight bioclimatic and five landscape variables, were selected after screening to remove highly correlated variables. The best model was identified based on the lowest AICc value (1343.42) and demonstrated strong predictive performance with training and validation AUC values of 0.834 and 0.807, respectively. Precipitation seasonality (16.5%) and distance to urban areas (15.0%) were identified as the most influential predictors, with bioclimatic variables collectively accounting for 60.0% of model importance compared to 40.0% for landscape variables. Under current conditions, approximately 17.5% of Thailand's freshwater habitats were classified as moderately to highly suitable, with the Lower Lancang (43.9%) and Lower-Middle Salween (36.0%) ecoregions identified as priority conservation areas. Future projections under four Shared Socioeconomic Pathways for the 2050s and 2090s indicated a progressive decline in suitable habitat across all scenarios, with the most severe reduction in high suitability areas observed under SSP585 by the 2090s (1.8%). These findings suggest that climate change poses a significant threat to

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Megaloptera habitat in Thailand, emphasizing the urgent need for climate-adaptive conservation strategies targeting key freshwater ecoregions, particularly in northern Thailand.



**Keywords:** Megaloptera; MaxEnt; Species distribution modeling; Habitat suitability; Climate change; Freshwater ecoregions; Thailand

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