



How does the future look for highly specialized leafhoppers?: A case study of *Ladoffa dependens* Young, 1977



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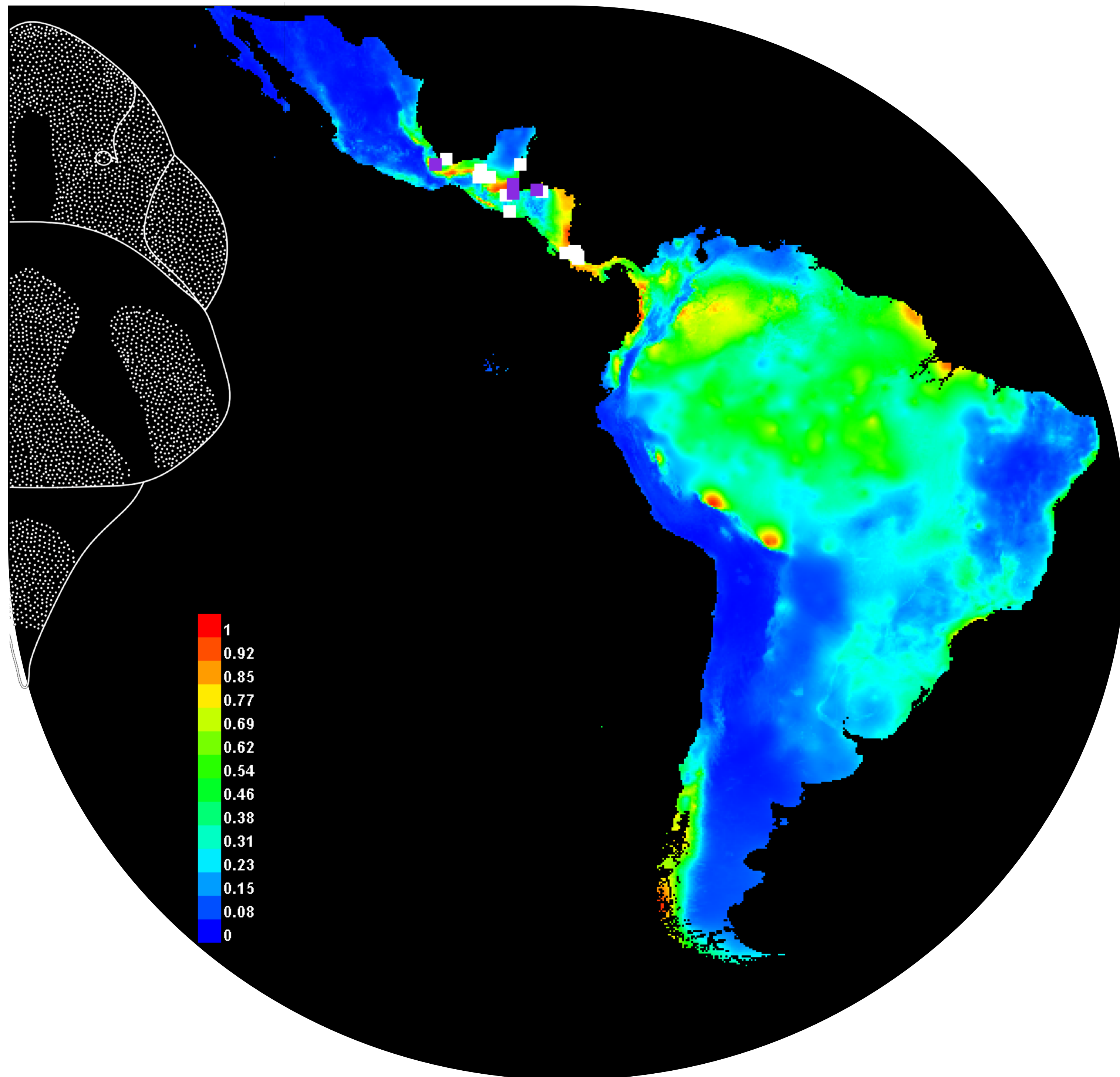


Figure 1. Maxent model representation for *Ladoffa dependens*. Warmer colors show areas with better-predicted conditions. White dots show presence locations used for training, while purple dots show test locations.

Materials and methods

All specimens from the Colección Nacional de Insectos (CNIN), IBUNAM were reviewed. Materials of *Ladoffa dependens* showed collecting events made between 1956 and 1995, label data of those were compiled in a general dataset. Individuals with complete and sufficient data on labels were georeferenced in Google Earth and those with old locality names were corrected and double-checked with collection fieldwork historical itinerary, when necessary.

The bioclimatic variables were extracted and filtered from the World Clim platform and layers of interest were adapted in QGIS shortening according to the distributional boundaries of study area and listed to countries of South America where the genus is distributed. For the projection, the World Clim variables were used to explore a scenario for 2041 -2060.

Modeling test ran in MaxEnt, using Steven J. Phillips's (2009) guide, and code provided followed version 1.4 in Java runtime environment.

Results

For both potential distribution and projection modeling maps, an AUC of 0.885 was obtained, variable with the highest percentage of contribution to the model was the Precipitation of the rainiest month, followed by the average of diurnal light (versus MaxTem -MinTemp).

Introduction

The subfamily Cicadellinae colloquially referred to as 'sharpshooters' feed exclusively on the xylem of plants and most can be found in all environments with major vascular plants, of which the Neotropical region has the greatest diversity (Feng et al., 2024). Within the largest tribe, Cicadellini, the red-sparkled genus *Ladoffa* is composed of 42 species distributed from Mexico to Argentina and the species *L. dependens* is strictly found inhabiting threatened rainforests of Mexico.

The potential geographic distribution of any species is a tool that allows predicting presence data until extrapolation of optimal associated areas for dispersion with implementation of environmental and climatic parameters. The Maximum Entropy Model (MaxEnt) estimates a probability of occurrence and creates a distribution model, broadly used with different approaches to evaluating invasive and endangered species.

Constant and increasing modification of native habitats in which our particular species is distributed, we aimed to analyze its distribution in southern Mexico, Belize, Guatemala, Honduras, Costa Rica, and Panama through MaxEnt, to illustrate potential geographical distribution and also to predict future patterns that might help decisionmaking on insect conservation.

Discussion and conclusion

Other similar studies reported that pest species will be affected directly by climate change and regions with high and moderate distribution characteristics will be reduced (Wei et al. 2023), but also proposed potentially suitable areas for the growth of the species dispersal.

Opposite to this statement, our data showed undesirable scenarios with reductions in species distribution. It is necessary to evaluate and compare different scenarios with more variables to explain overall population decline. The identified causes in Mexico are accelerated changes in environmental conditions such as precipitation and temperature due to deforestation, land use change, and abrupt expansion of urban areas that modify biological corridors.

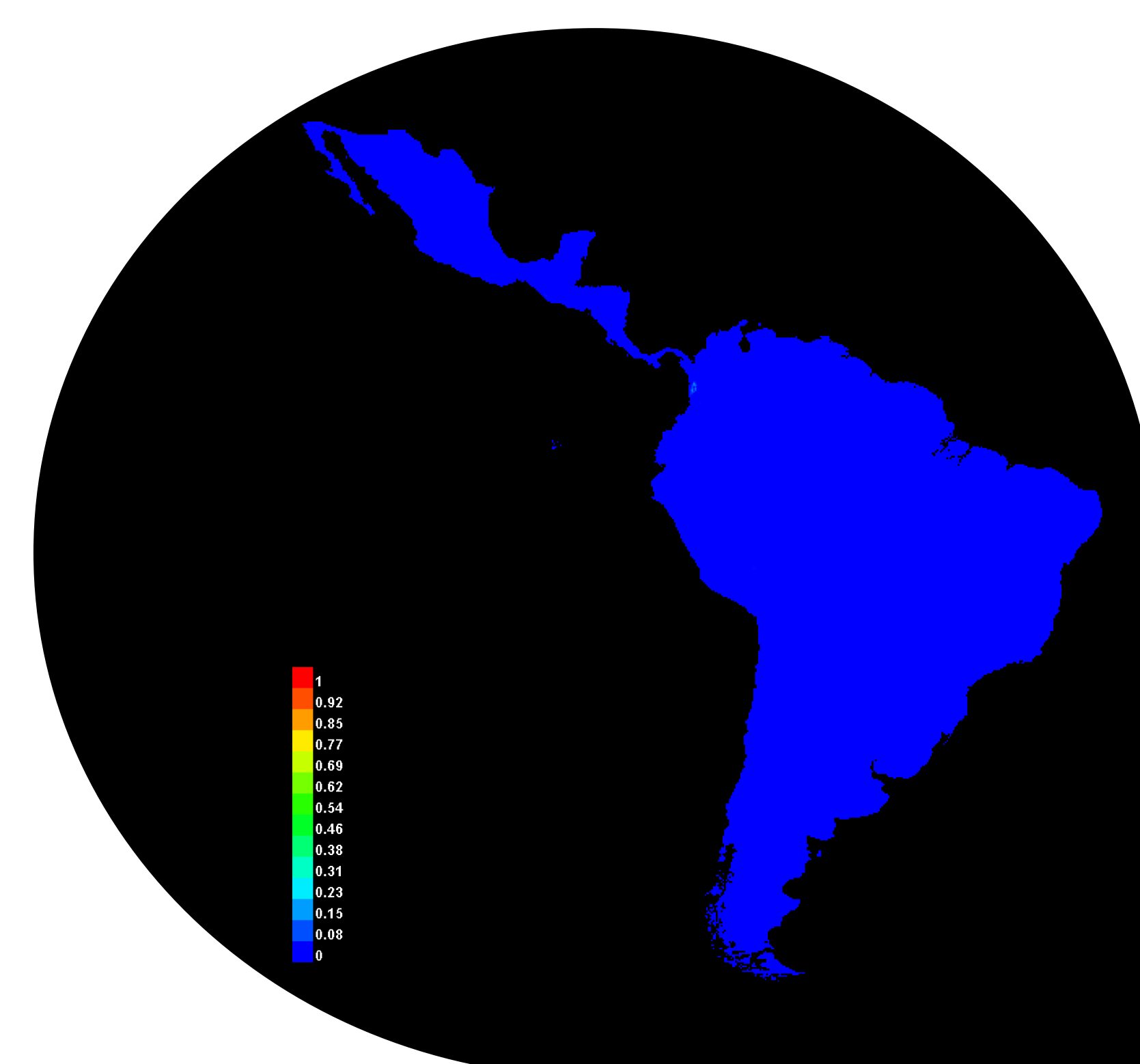


Figure 2. Prediction most affected by variables outside the training range. Warmer colors show areas where treating variable values outside their training ranges is likely to have a large effect on predicted fitness.

References

