Assessment of conservation status and niche projection for *Cladonota apicalis* (Hemiptera: Membracidae)

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INTRODUCTION

Cladonota apicalis (Hemiptera: Membracidae) is a Neotropical species distributed from Mexico to Argentina, primarily inhabiting tropical and subtropical climates (Flynn, 2019). This membracid has been reported to associate with multiple host plants across 14 families, including *Piper hispidum* (Piperaceae) and *Coffea arabica* (Rubiaceae) (Flynn, 2018).

Members of the genus *Cladonota* are known for their specialized feeding on xylem and phloem fluids, which ties their distribution to the availability of host plants in their habitat (Rodríguez Juárez & Pinedo-Escatel, 2018). Previous reviews of the genus have highlighted its diversity, particularly in subgenera such as Falculifera (Flynn, 2018). These studies emphasize the importance of understanding ecological requirements and host plant interactions to support conservation efforts.

This study employs ecological niche modeling to predict the potential distribution of *C. apicalis* focusing on bioclimatic variables and their influence on the species' range and to evaluate its potential degree of conservation was assessed according to RedList criteria. The aims were to identify regions critical for its conservation and assess potential habitat shifts due to historical climatic changes

METHODS

- **Data Collection**: Refined GBIF records yielded 55 occurrences in the Neotropics.
- **Environmental Variables**: Multicollinearity was assessed using the Variance Inflation Factor (VIF), resulting in the selection of eight bioclimatic variables (BIO2, BIO3, BIO9, BIO10, BIO13, BIO15, BIO18, BIO19) and two topographic variables (elevation, slope).
- **Modeling**: MAXENT predicted current and historical distributions (AUC = 0.987).

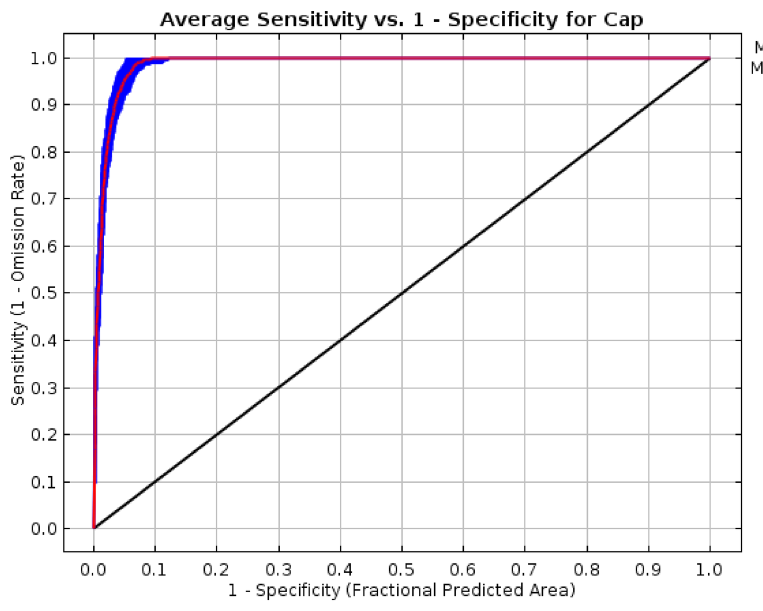


Fig. 1. Average sensitivity vs. specificity graphic, mean AUC = 0.987, indicating excellent model performance in predicting *C. apicalis* distribution.

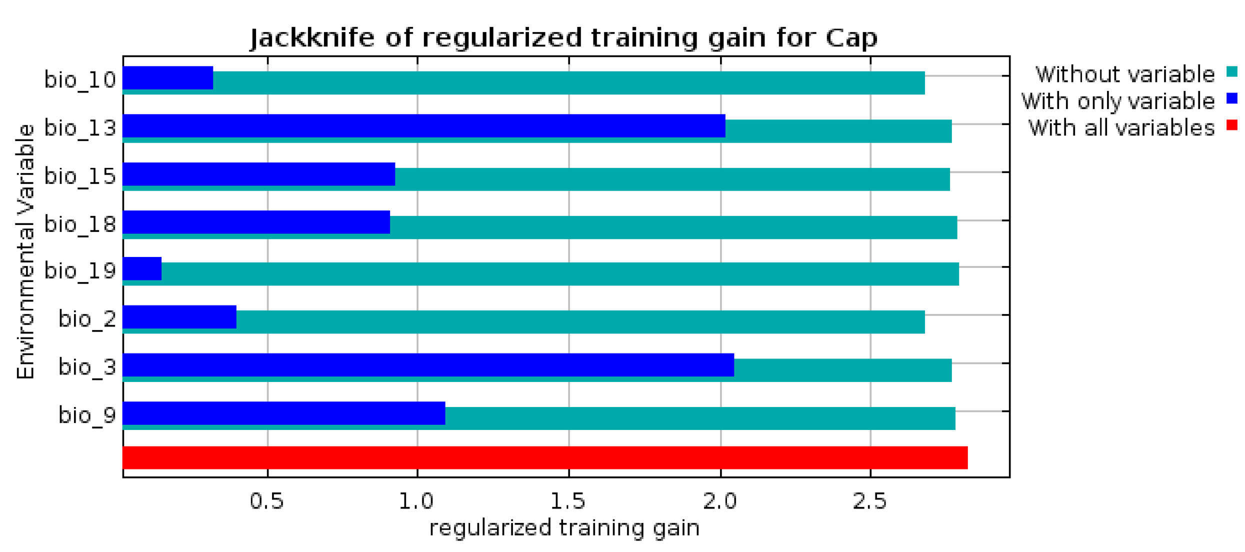


Fig. 2. Jacknife test, key bioclimatic variables, especially BIO3 and BIO13, show high predictive importance.

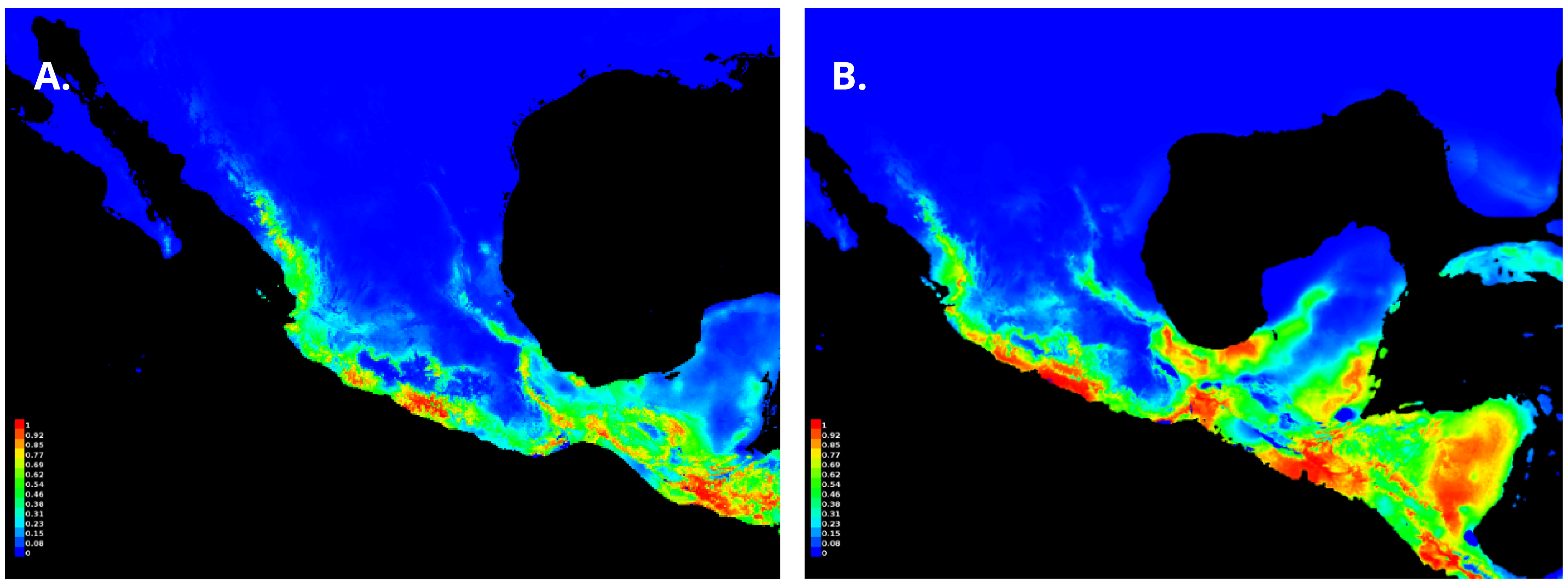


Fig. 3. Current and Pleistocene Predicted Distributions of *Cladonota apicalis*; **A.** Current distribution: High suitability in the Mexican Transition Zone and Neotropical regions. **B.** Pleistocene distribution: Broader range, indicating historical habitat availability.

RESULTS & DISCUSSION

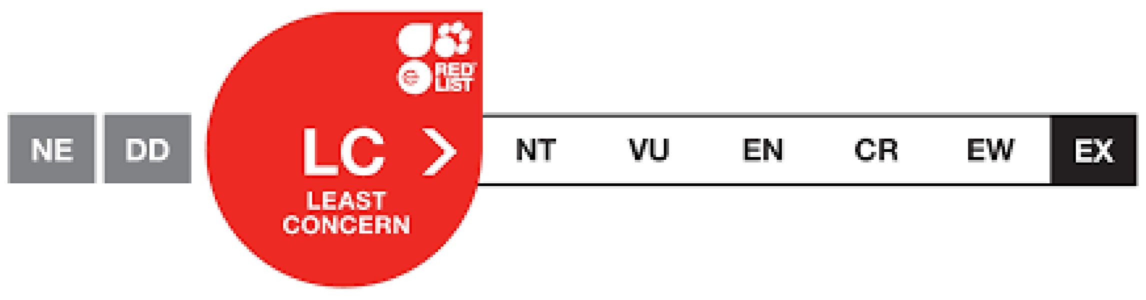
The ecological niche modeling for C. *apicalis* demonstrated high predictive accuracy, with an average AUC value of 0.987 (Fig. 1), indicating excellent model performance distinguishing between presence and absence points. This reliability underscores the robustness of the selected bioclimatic variables and the model's capacity to predict suitable habitats for the species.

Key variables driving the distribution of *C. apicalis* included isothermality (BIO3), precipitation in the wettest month (BIO13), and mean diurnal range (BIO2). The jackknife test (Fig. 2) revealed that BIO3 and BIO13 were the most influential individually, although their exclusion did not significantly alter the model's predictions. Meanwhile, BIO2, despite a lower individual contribution, proved essential for maintaining the overall predictive capacity. These findings highlight the importance of climatic stability, moisture availability, and temperature variability in shaping the species' ecological niche.

The modeled distribution under current climatic conditions (Fig. 3A) identifies the Mexican Transition Zone and Neotropical regions as areas of high habitat suitability. These regions align with the presence of host plants and underscore their critical role in supporting the species' survival.

Historical modeling (Fig. 3B) suggests that during the Pleistocene, *C. apicalis* had a broader distribution, with suitable habitats extending beyond its current range. This historical contraction in range could be attributed to climatic changes and habitat loss, which have likely reduced the availability of optimal conditions.

Overall records following RedList criteria placed it in Vulnerable category. These results emphasize the need for conservation efforts focused on the remaining suitable habitats to mitigate the risks posed by further climatic shifts and habitat degradation. The integration of these findings into conservation planning provides actionable insights to safeguard the long-term survival of *C. apicalis*. Additionally, understanding the historical adaptability of the species offers valuable perspectives on its resilience and potential responses to future environmental changes.



EXTENT OF OCCURRENCE (EOO)

215.7 KM

AREA OF OCCUPANCY (AOO)

70.4 KM

REFERENCES