Does climate limit arboreality in lungless salamanders?

Lauren Mellenthin[1], Erica Baken[1], Dr. Dean Adams[1]

[1]Iowa State University, Ames, Iowa

☛ **GO SEE POSTER #32 FOR A PHYLOGENETIC APPROACH!**

Introduction

- Arboreality has evolved *at least* 5 times within Plethodontid salamanders. [1]
- Yet no morphological differences separate arboreal and terrestrial species. [1]
- There is minimal range overlap between the two microhabitat types. Preliminary results discovered that **71**% of the arboreal species distribution does not overlap with the terrestrial species distribution.

From these observations we tested the following hypotheses:

(***H1***) The climate models differ between arboreal & terrestrial microhabitats.

(***H2***) Arboreal species do not live in habitats suitable for terrestrial life.

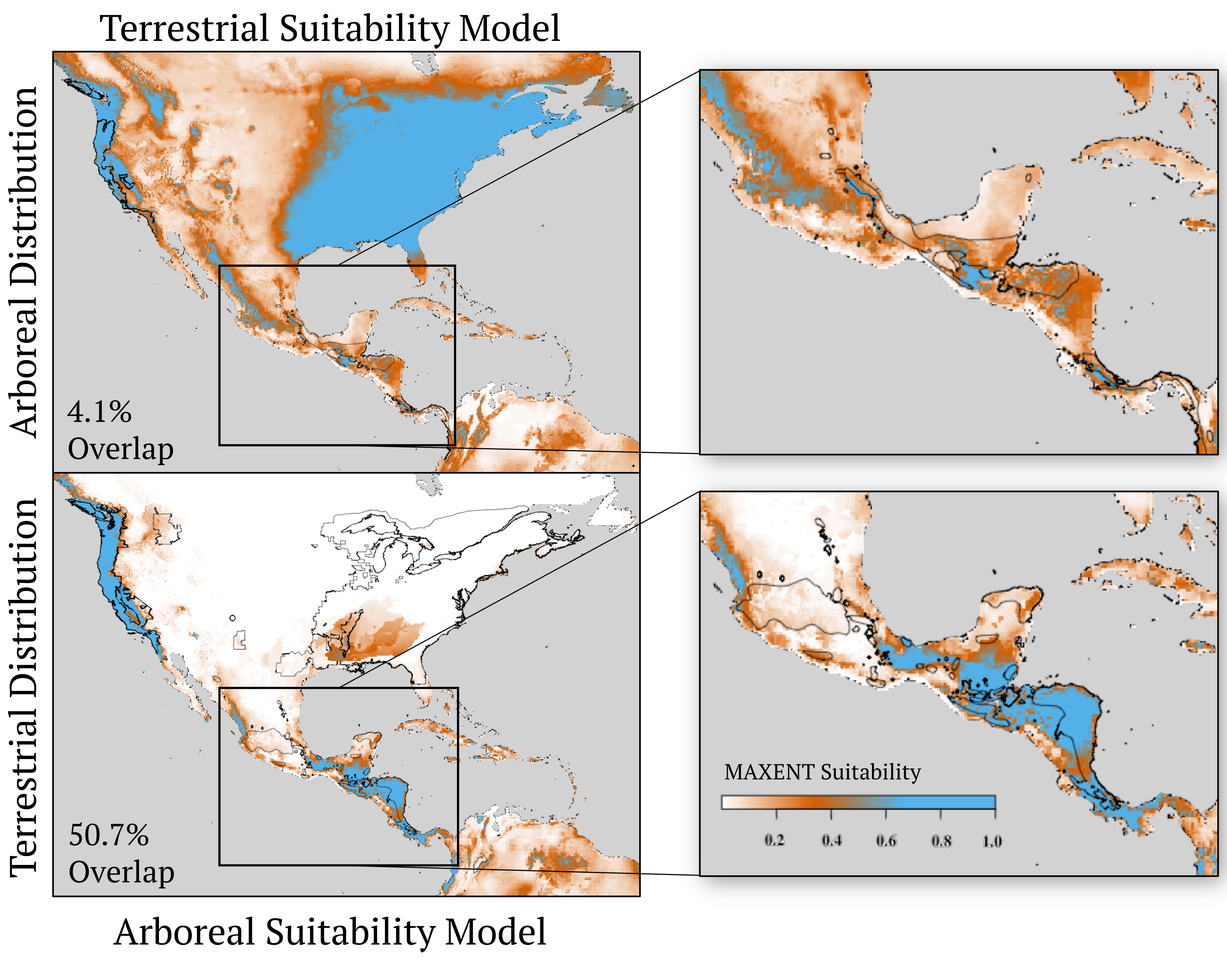
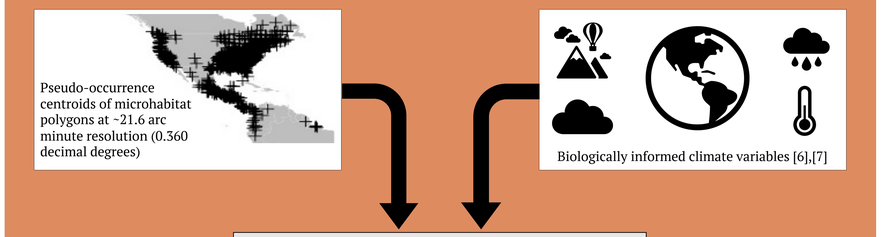
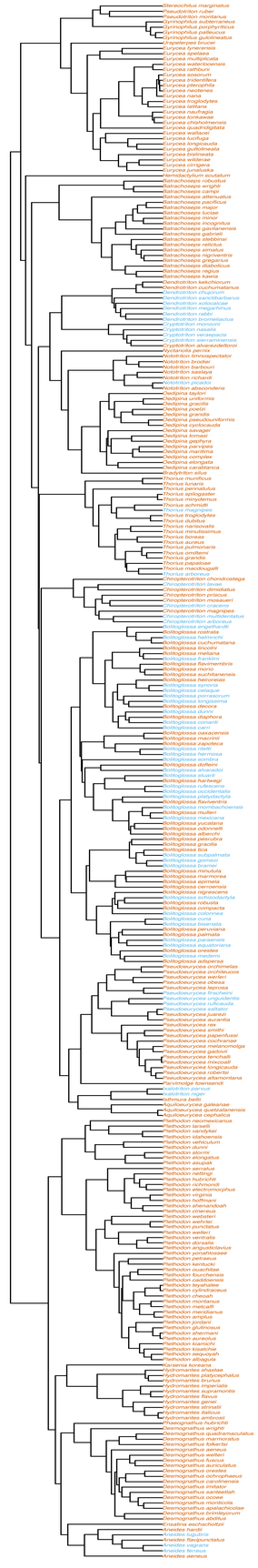


Figure 1. We used environmental niche models (ENM) to evaluate the overlap in species distributions and their corresponding suitable niche. Blue coloration representing > 0.5 suitability, red coloration representing 0.25-0.49 suitability, and white coloration representing 0-0.24 suitability.

Methods





Conclusions

Despite the broad scale of these climate data, we found:

(***H1***) The arboreal niche model is significantly different from the terrestrial niche model with respect to climate and environment (D = 0.35, P-value < 0.01, I = 0.62, P-value < 0.01).

(***H2***) About half of the terrestrial species distribution is suitable for arboreality (**51**%), while an extremely small portion of the arboreal species distribution is suitable for terrestrial life (**4**%).

Future Directions

- These results suggest climate may have influenced the macroevolution of *arboreality* in this family of salamanders.
- Understanding the climatic limits of different species can inform future climate projection models. [2]

Acknowledgments & Literature Cited

Thanks to the following: NSF for funding. Comments & feedback from Dr. Dean Adams' evolutionary morphology lab.

1. Baken and Adams. Accepted. Macroevolution of Arboreality in Salamanders. Ecology and Evolution.
2. McEntire, Kd. 'Plant Climbing by Salamanders as a Compensatory Behavior in Relation to Climate.' *Integrative and Comparative Biology.* 59 (2019)
3. Salamander silhouettes: Phylopic, Matt Reinbold (modified by T. Michael Keesey), License link: http://creativecommons.org/licenses/by-sa/3.0/
4. Bonett, R. M., and A. L. Blair. 2017. Evidence for complex life cycle constraints on salamander body form diversification. Proc. Natl. Acad. Sci. 114(37):9936-9941.
5. IUCN 2019. The IUCN Red List of Threatened Species. Version 2019-1. http://www.iucnredlist.org.
6. Fick, S.E. and R.J. Hijmans, 2017. WorldClim 2: New 1-km spatial resolution climate surfaces for global land areas. International Journal of Climatology.
7. IPCC, 2013. Climate Change 2013: The physical science basis. In: Stocker, T.F., Quin, D., Plattner, G.K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1535.