Impact of Temperature on Proportion of Juvenile Salamanders

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Introduction

Spring of 2023, I was given the opportunity to do undergraduate research with the College of Natural Resources and Environment. I also, worked in the lab as a wildlife technician, doing data entry and proofing. I worked with Dr. Carola Haas and graduate student Tori Engler to learn more about their salamander lab.

Plethodontidae is the largest family of salamanders, with over 275 species in 28 genera (Deban et al 2000). Temperature affects virtually all aspects of amphibian physiology, including digestion, vision, locomotion, growth, and metabolism (Rome et al 1992). Salamanders preferred cooler and more mesic environments and occupied microhabitats that maintained constant moisture conditions at both high- and low-elevation sites (Farallo 2018).

Objective

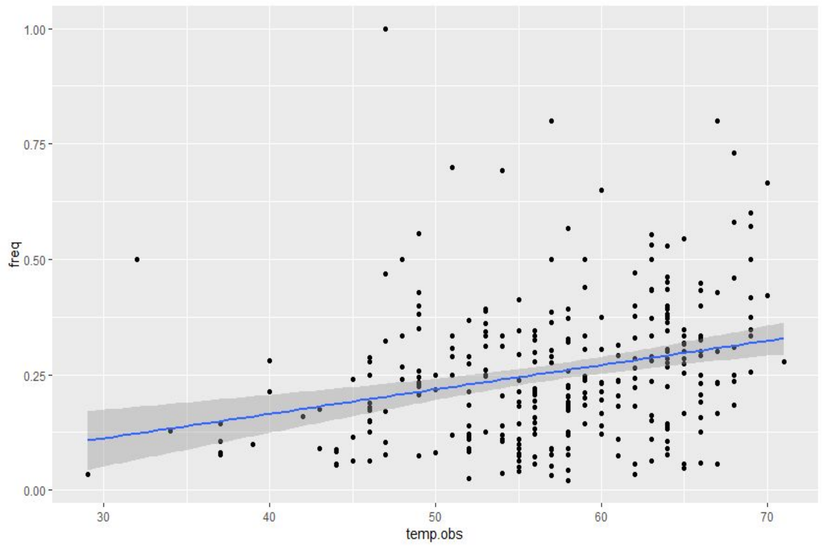
The purpose of this research is to elucidate correlations between environmental temperatures and the proportion of terrestrial juvenile salamanders. I hypothesize that sampling occassions with high environmental temperatures, will result in fewer juveniles captured. To better understand the relationship between changes in environmental temperature and the number of juveniles, an extensive dataset from the Silviculture and Southern Appalachian Biodiversity (SASAB) study will be analyzed.

Materials and Methods

I made use of a long-term dataset available from the Silviculture and Southern Appalachian Biodiversity (SASAB) project. I also extracted data on the proportion of juveniles captured in each season from this data set and compare it to historical temperature data. To have a better understanding of the source of this data, I also participated in collecting data in the field and lab, capturing salamanders and measuring them to assess the proportion of juveniles. After processing, I analyzed the data using a statistical method - pearson's correlation coefficient.

Results

The image below represents the correlation between the the frequency of juveniles (y-axis) and the given temperature (x-axis) on a specific day. As seen in the image, you may notice that there is loosely a general positive correlation (corr 0.2679) of juveniles and warm temperatures, but there is also a lot of noise.



Discussion

I was partially correct in my prediction that there would be fewer juveniles on warmer days. Due to their nocturnal nature, salamanders are most active at night. However, they also frequently appear on particularly cloudy and rainy days.It is necessary to conduct more research to account for all factors affecting the salamander's frequency.

There could also be other factors affecting the frequency of which the juveniles are deciding to come out. For instance, as mentioned before, salamanders prefer cooler and more mesic environments (Farallo 2018), so rainfall could be also have an effect on the the proportion of juveniles.

Distribution or abundance may be influenced by temperature, water, sunlight, pH, and nutrient concentrations, which are examples of abiotic influences. Biologic factors include competition, prey availability, and predators (Peterman et al. 2023).

Lessons Learned

I've never worked in a lab before outside of biology class, and I've learned a lot more about lab work than before. My perspective on how things should be managed while conducting research and while using animals has significantly changed as a result of taking the IACUC and lab safety trainings. Additionally, this was my first time learning about salamanders, and the entire time, I was fascinated. I learned how to utilize the R program, which was the most interesting thing to me. In APSC I've never had to learn coding of any type, so this was a completely new experience, so understanding how to use some of its functions significantly broadened my knowledge.

Acknowledgements

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