The Effect of Ambient Temperatures on Pika Activity

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Introduction

- Contemporary climate change is causing abnormalities in temperature profiles across the globe; this reduces the time in which animals can engage in essential activities. These changes can modify the times in which animals engage in essential activities (Hall and Chalfoun, 2018; Seneviratne et al., 2012).
- The American pika (hereafter pika) is a temperature-sensitive small mammal used by the National Park Service as a "sentinel species" due to its high resting body temperature, which is only 2.4 degrees Celsius below its lethal upper temperature (MacArthur and Wang, 1974).
- Pika disperse distances that are not long enough for them to shift geographically, and climate change is occurring at a faster pace than evolution can take place , previous studies have hypothesized that behavioral plasticity will be a way to cope with environmental anomalies (Peacock,1997; Quintero and Wiens, 2013; Moyer-Honer et al., 2015).
- In this study, we aim to assess the relationship between ambient temperature and pika surface activity by daytime in alpine and sub-alpine environments. Studying this relationship is important to understand the pika's ability to overcome climate change and whether we will lose its ecological services. In our preliminary analysis, we hypothesize that due to pika's inability to shed heat easily, surface activity will be more significant when the ambient temperature is low.

Data Set

- Data collected at two study sites in Niwot Ridge.
- Camera traps were set to trigger 3 photos in 3 seconds.
- Photos include a stamp with temperature and time.

Camera Trap

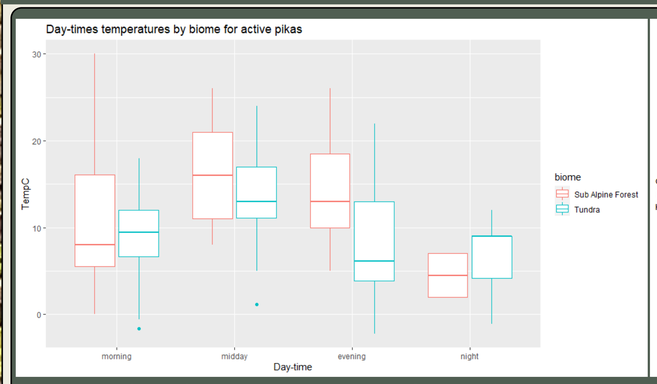
North American Pika (Ochotona princeps)

Methods

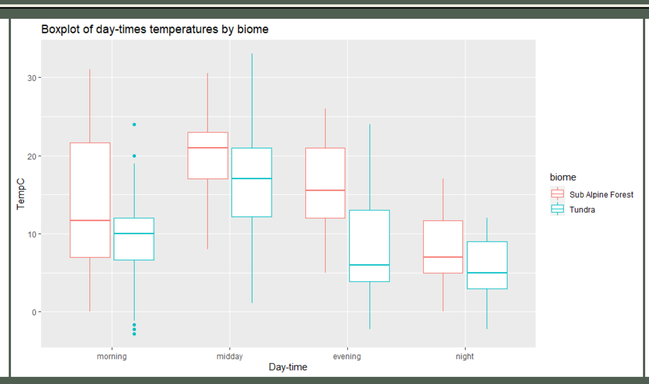
R software was used to:

- Perform descriptive statistics to evaluate data and test normality assumptions.
- Due to our data not being normally distributed, I used nonparametric Mann-Whitney-Wilcoxon tests to evaluate if the median of ambient temperatures when pikas were active was equal to when they are not.
- H_0: Non-active$_{AT}$ ≤ Active$_{AT}$

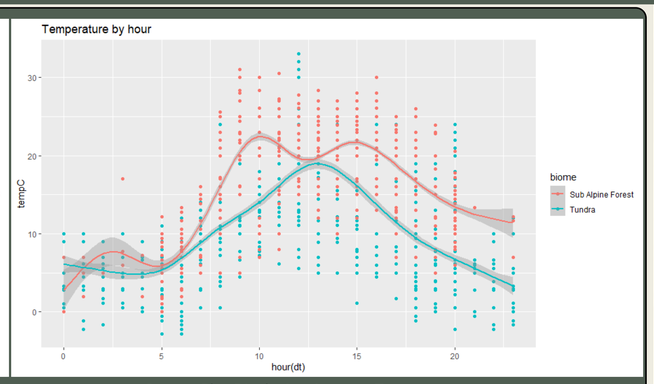
Results



Box Plot Displaying Average Temperatures of Highest Pika Activity



Box Plot Displaying Average Temperature



Scatter Plot Displaying Average Temperature

Time Intervals Used: Morning- 5 A.M. – 11 A.M., Midday- 11 A.M. – 5 P.M., Evening- 5 P.M. – 11 P.M., Night- 11 P.M. – 5 A.M.

Daytime	N_{ACTIVE}	$N_{NON-ACTIVE}$
Morning	642	1647
Midday	276	2445
Evening	420	1367
Night	160	371

The results for the test showed that Pikas were active when temperatures were low during morning$_{(W = 381277, p\ value = 2.182e\text{-}10)}$, midday$_{(W = 486270 , p\ value = 2.2e\text{-}16)}$, and evening$_{(W = 234099 , p\ value = 8.133e\text{-}08)}$. Nevertheless, during night, the temperature when pika were active was higher$_{(W = 12696 , p\ value = 1)}$

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Discussion

The results in the Mann-Whitney-Wilcoxon for morning, midday, and evening reject our H_0, which agrees with previous literature that states pikas are not active during temperatures that exceed its thermal tolerances (Hall and Chalfoun, 2018). However, during the night activity, ambient temperatures were higher; this result could be due to presence of high winds which are not tolerated by pika, but more research is needed to evaluate pika-wind-temperature interaction to confirm this statement (C. Ray, Personal communication, June 24, 2020).

Conclusions / Future Work

Our preliminary analysis shows a trend of pikas being more active at lower ambient temperatures during the daytime. However, night activity suggests more research is needed to evaluate the effects of other climatic factors on pika activity.

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