

SACAD: John Heinrichs Scholarly and Creative Activity Days

Volume 2023

Article 60

4-17-2023

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Recommended Citation

Brandt, Sonja (2023) "Relationships between environmental stressors and Cliff Swallow (*Petrochelidon pyrrhonota*) feather coloration and colony size," *SACAD: John Heinrichs Scholarly and Creative Activity Days*: Vol. 2023, Article 60.

DOI: 10.58809/AHXZ1565

Available at: <https://scholars.fhsu.edu/sacad/vol2023/iss2023/60>

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Relationships between environmental stressors and Cliff Swallow (*Petrochelidon pyrrhonota*) feather coloration and colony size

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Abstract

Cliff Swallows (*Petrochelidon pyrrhonota*) are aerial insectivores that experience mortality from vehicle collisions, because they often nest and hunt under bridges and road culverts. Individual traits that may convey social information, such as body condition, or feather reflectance, may be associated with better coping around cars and other environmental stressors. Cliff swallow colony size may also be affected by environmental stressors. Our objective is to determine if proximity to roads and water level near the colony were related to wing length, body condition, colony size, and feather coloration in Cliff Swallows. We will do this by taking feather samples and measuring reflectance, and taking other body condition measurements, in addition to measuring colonies' proximity to roads and level of water near the colonies' locations.



Introduction

Environmental stressors can strongly impact breeding birds. Cliff swallows are not of conservation concern, but because they are aerial insectivores, their numbers could potentially be used as ecosystem indicators. As we mentioned above, due to their colonies often being in close proximity to roads, they experience mortality from vehicle collisions (Brown et al. 2020). However, recent work suggested that selection acting on wing length presumably provides birds with quicker maneuverability around cars and is thought to contribute to a decline in car collision mortality (Brown and Brown 2013). Other individual characteristics, such as body condition, or feather reflectance, may be associated with better survival around cars. To our knowledge, few studies have investigated relationships between feather coloration and stressors in this species, but these relationships are documented in other species, including the related Barn Swallow (Saino et al. 2013). Recent research has also suggested that the extent of water in the cliff swallow foraging area can determine prey availability and in turn, impact colony size. Cliff Swallows also depend on moisture in the environment to construct their mud nests (Brown et al. 2002).

Objectives

- Determine if proximity to roads is related to feather coloration, wing length, and body condition, as well as colony size.
- Determine if the extent of water near the colony is related to feather coloration, body condition, and colony size.

Methods

- Study area: Barton and Ellis Counties, KS (Currently in drought)
- Study Season: May-July 2023
- Determine colony size by counting the number of active nests
- Measure the extent of water in colony area and the distance of colony to roads
- Capture adult cliff swallows from colonies using mist nets
- For each individual captured we will:
 - Band
 - Measure: wing chord length, mass, tarsus length, and tail length
 - Collect feather samples of 6-9 feathers from the back, rump, and two areas on the breast
 - Measure feather reflectance using a spectrometer
 - Determine body condition by using the residuals from a regression of mass on tarsus length (Schulte-Hostedde al. 2005)



Mist nets will be used for swallow capture

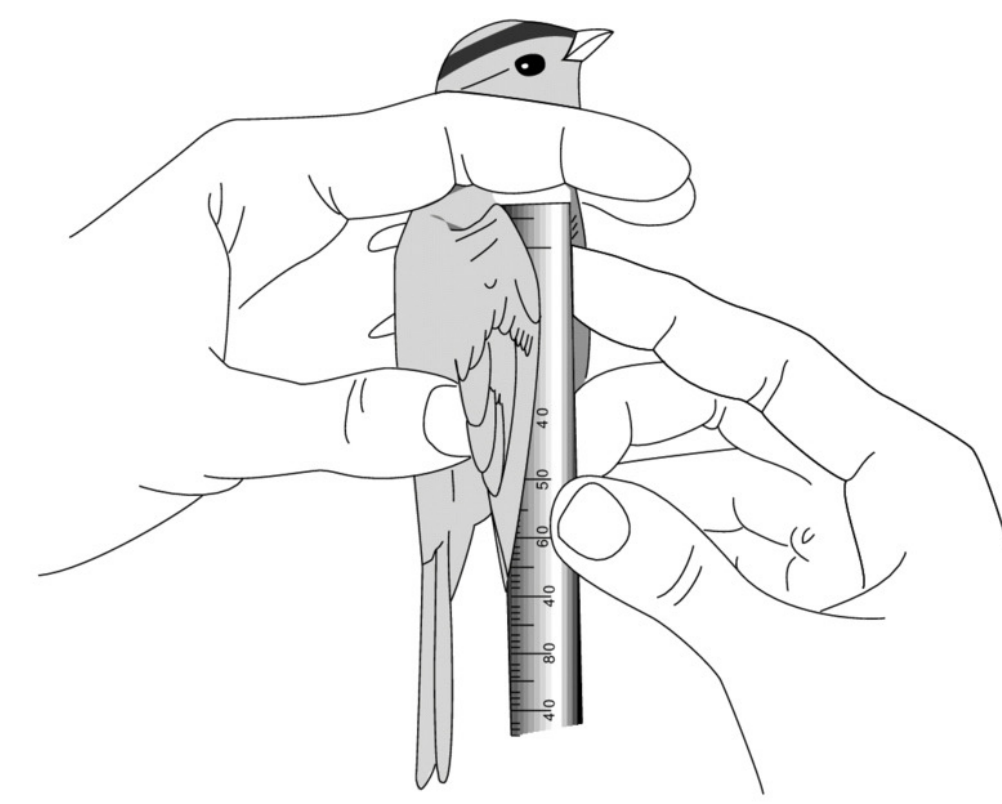


Figure 1. Measuring wing chord length

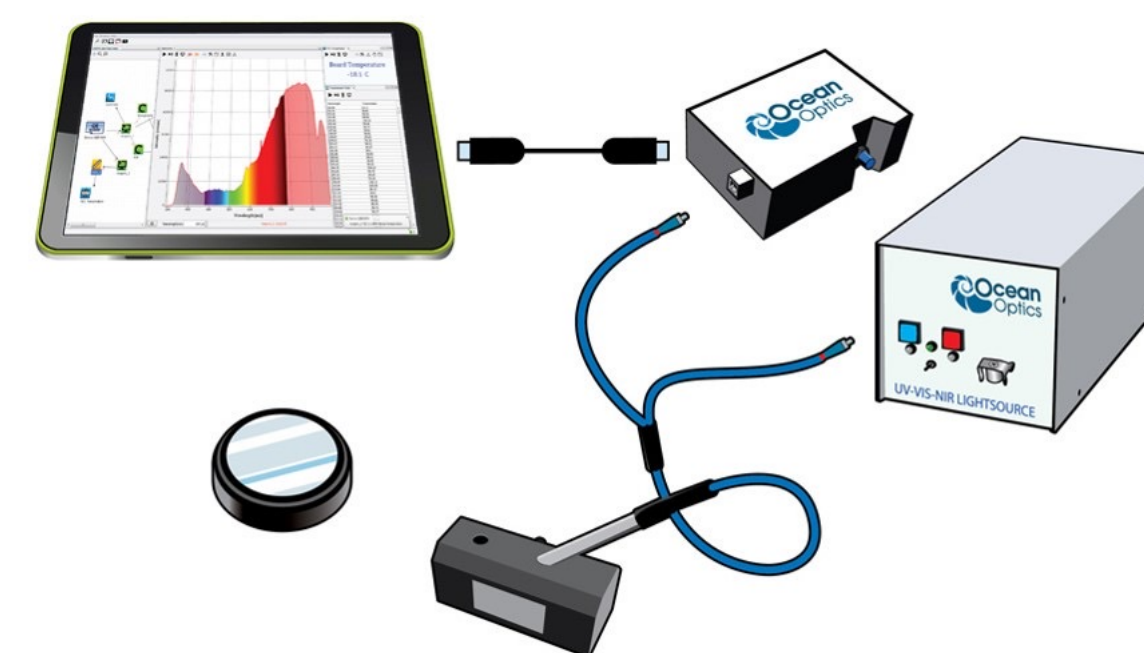


Figure 2. A spectrometer for measuring feather coloration



Anticipated Results

We expect that individuals with more colorful feathers and in better body condition will use colonies that are near areas with higher water levels and farther from roads. We expect to see a relationship between wing length and proximity to roads. This would suggest a relationship between body and feather quality and environmental stressors. We also expect to see greater colony sizes in locations with higher water levels and farther from roads.

Conclusions

Since Cliff Swallows are common and widespread in North America, they could be helpful ecosystem indicators, especially if this research suggests that they are affected by drought, roads, or other environmental stressors.

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Acknowledgments

We would like to thank Robert Channell, Robert Penner, William Stark, and the Nature Conservancy.