

Nocturnal Pollination in Alpine Grasslands

- Investigating Lepidoptera Activity Across Treatments

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1. Why are we annotating pollinators?

- Study plant-pollinator and pollinator-pollinator interactions in mountain ecosystems affected by climate change.
- Create a benchmark dataset to support automatic pollinator detection in dynamic ecological scenes with deep learning.

Objective:

- Simulate future temperature conditions using **Open Top Chambers (OTCs)** to explore impacts on day and night pollinator activity.

Key questions

- Are any pollinator taxa more active at night compared to during the day?
- How does the rate of visitation vary under different treatments for day and night flying Lepidoptera?

3. Results

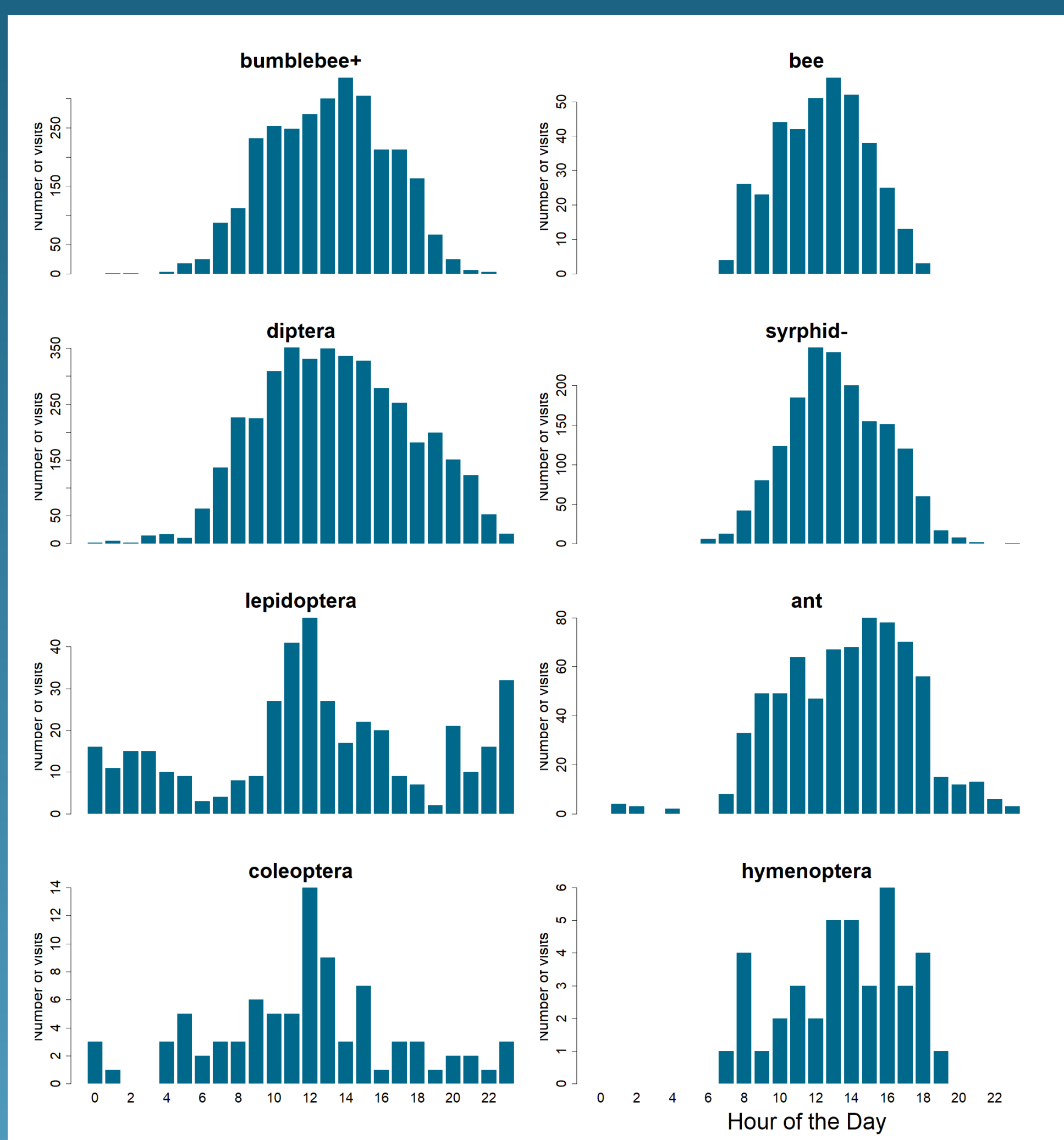


Fig 1: Histogram showing the distribution of different pollinator activity during a 24-hour period.

4. Summary of Key Findings

- No pollinator taxa exhibited higher activity at night compared to during the day.
- Diurnal visitation rates for high OTC flowers were significantly lower than those for low treatment flowers.
- Pairwise comparisons between other groups (high vs. high OTC, high vs. low) were not significant according to Dunn's test with Bonferroni correction.

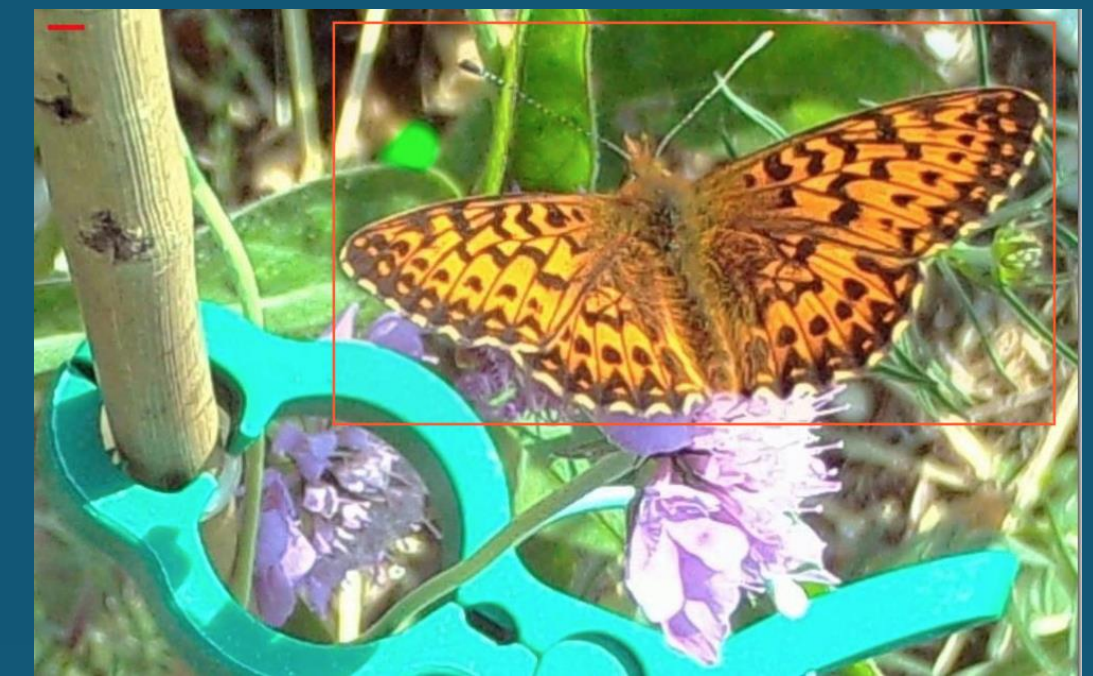
2. Methods

Study sites:

- Conducted in two mountainous regions: Calanda (Swiss Alps) and south of Voss (Norway).

Camera Monitoring:

- 24 time-lapse cameras captured images every minute, with LED flash at night to document nocturnal pollinators.
- OTCs used for warming treatments at high elevation.



Annotation:

- Annotated pollinators and inflorescences using the **Computer Vision Annotation Tool (CVAT)**.
- Bounding boxes were drawn to track individual pollinators, focusing on the following taxa: Bees, bumblebees, ants, Hymenoptera, Syrphids, Diptera, Lepidoptera, and Coleoptera.

Statistical Analysis:

- Statistical tests included Kruskal-Wallis and Dunn tests (R version 4.3.1)

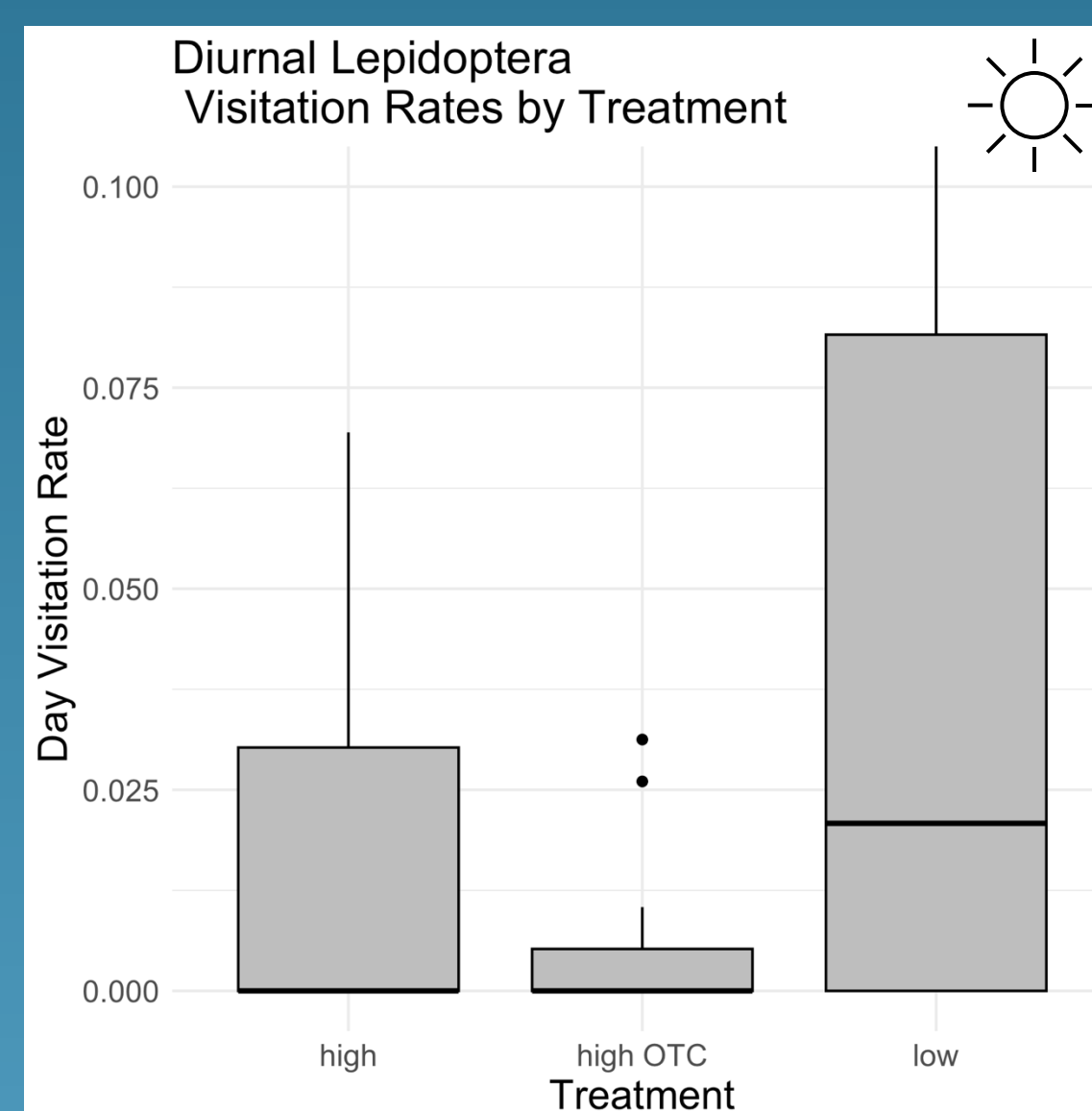


Fig. 2: Boxplot showing diurnal Lepidoptera visitation rates across different treatments ('high,' 'high OTC,' and 'low'). The 'low' treatment shows a higher and more variable visitation rate compared to other treatments.

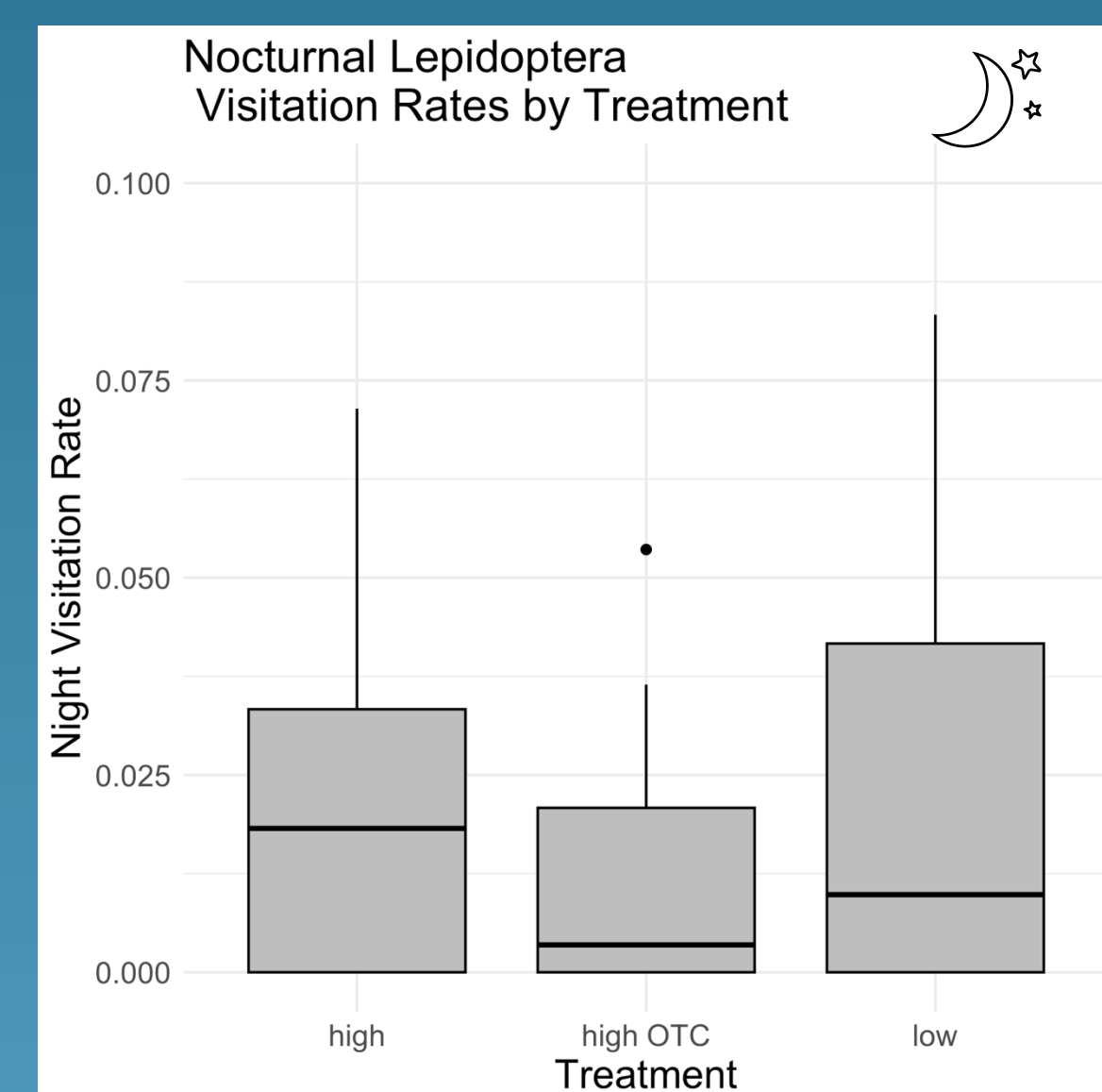


Fig. 3: Boxplot showing nocturnal Lepidoptera visitation rates across different treatments ('high,' 'high OTC,' and 'low'). Visitation rates remain relatively low and consistent across treatments, with limited variation.

