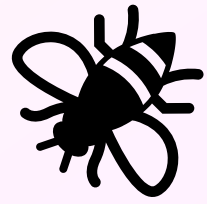


THE USE OF WARMING CHAMBERS: INCREASING OR OBSTRUCTING POLLINATOR VISITATION RATE?



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1 Project RangeX:

Our project is part of the RangeX, a project studying how the climate warming affects plants and causing them to expand their ranges. Their focus is on mountain species, where they observe species on two sites; **low** and **high elevation**. On some species at high elevation, they use **open top chambers** (OTCs) to simulate warming and compare the visitation rate inside and outside of them (see figure 2).



Figure 2: OTCs in the field area.
Foto: Nadine Michaela Artz.

The project's overall purpose:

Our project focused on observing whether there is a difference in pollinator visitation rate for the three treatment groups *low*, *high* and *high with OTC*, where low and high refer to elevation. We observed several pollinators and divided them in two groups; one with just bumblebees and one with the remaining pollinators being bees, ants, wasps, hoverflies, flies, butterflies, moths and beetles.



Figure 1: *Knautia arvensis* with two bumblebees.
Foto: Dagmar Dorothea Egelkraut.

2 Annotations of the visiting pollinators:

In videos containing images, or **frames**, we looked for pollinators sitting on or hovering around the flowers. When a pollinator was observed, they were annotated (marked) and assigned correct order. This was done in the website *app.cvat*.

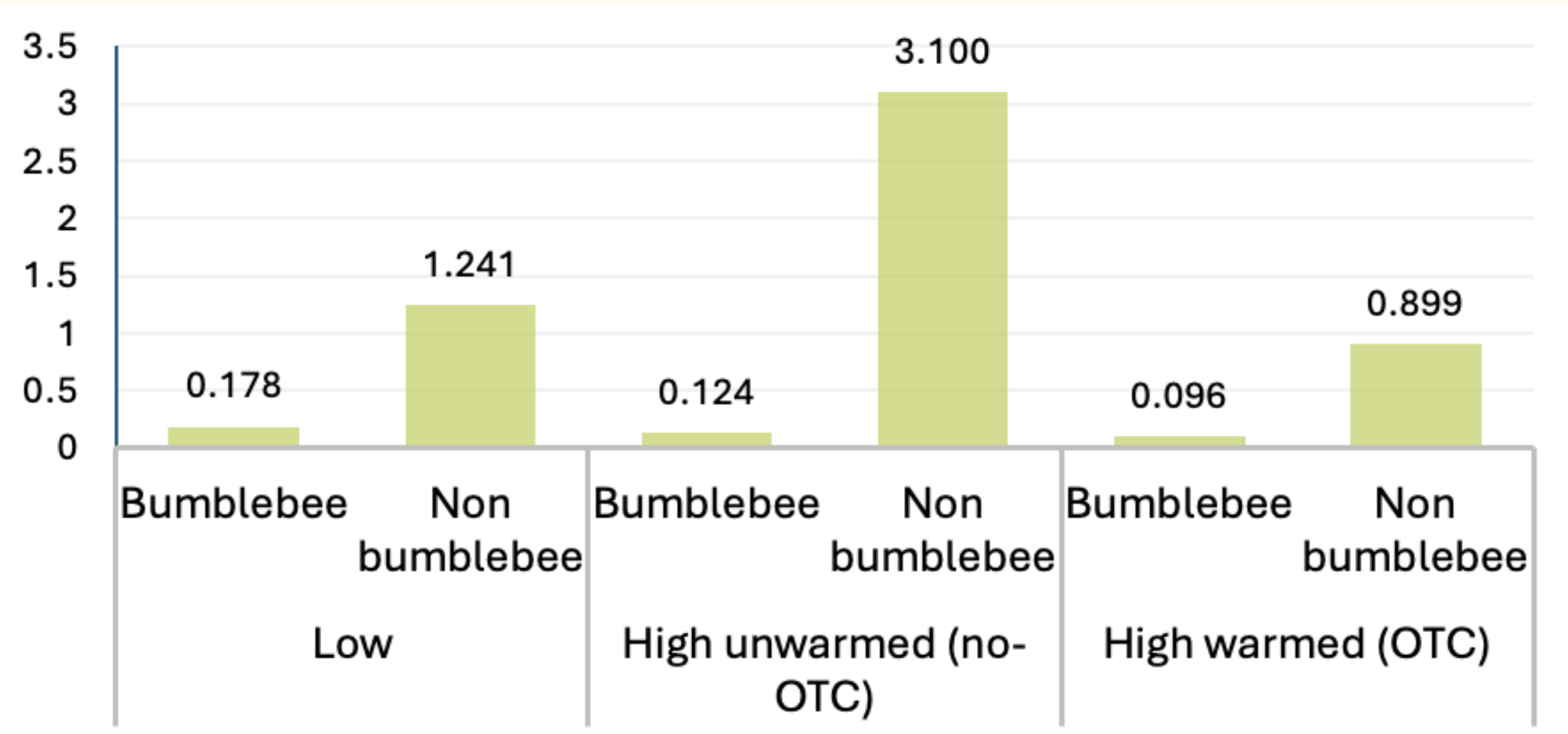


Figure 3: Barplot of visitation rate per day for the two groups at the three different elevation-sites, low, high and high with OTC

3 Key findings:

By conducting a **nonparametric group comparison test** we compared the visitation rate in the groups high warmed and high unwarmed for both bumblebees and non-bumblebees. The test showed significant difference in visitation rate.

- For bumblebee; visitation rate was close to identical for the treatments low, high unwarmed and high warmed.
- For non-bumblebee; variations in visitation rate between treatments, and an overall higher visitation rate than bumblebee group.

4 Conclusion:

- For the bumblebee group, we clearly saw that the visitation rate for the three treatment groups were very similar, telling us that the OTC had little to no effect for this group.
- For the non-bumblebee group, there was a much higher visitation rate for the high unwarmed group, once again telling us that the OTCs may not be as popular as we thought.

