



Colonization Trends in Common Milkweed, *Asclepias Syriaca*, in Central Minnesota

Kina Msuya, Lauren Sherman, Sam Ronneberg, Siviwe Dlamini, Emily Mohl

Department of Biology, St. Olaf College, Northfield, MN, CURI 2021



Monarch Caterpillar Dominant Herbivore

In our study, monarchs were typically the first organism visible on milkweed plants. However, predators such as spiders and other herbivores like aphids and leaf miners were also frequently observed. Milkweed plants have a variety of defenses that would impact the preference and performance of these insects (Johnson 2011). Here we show trends in insect abundance on milkweed over time (Fig. 1).

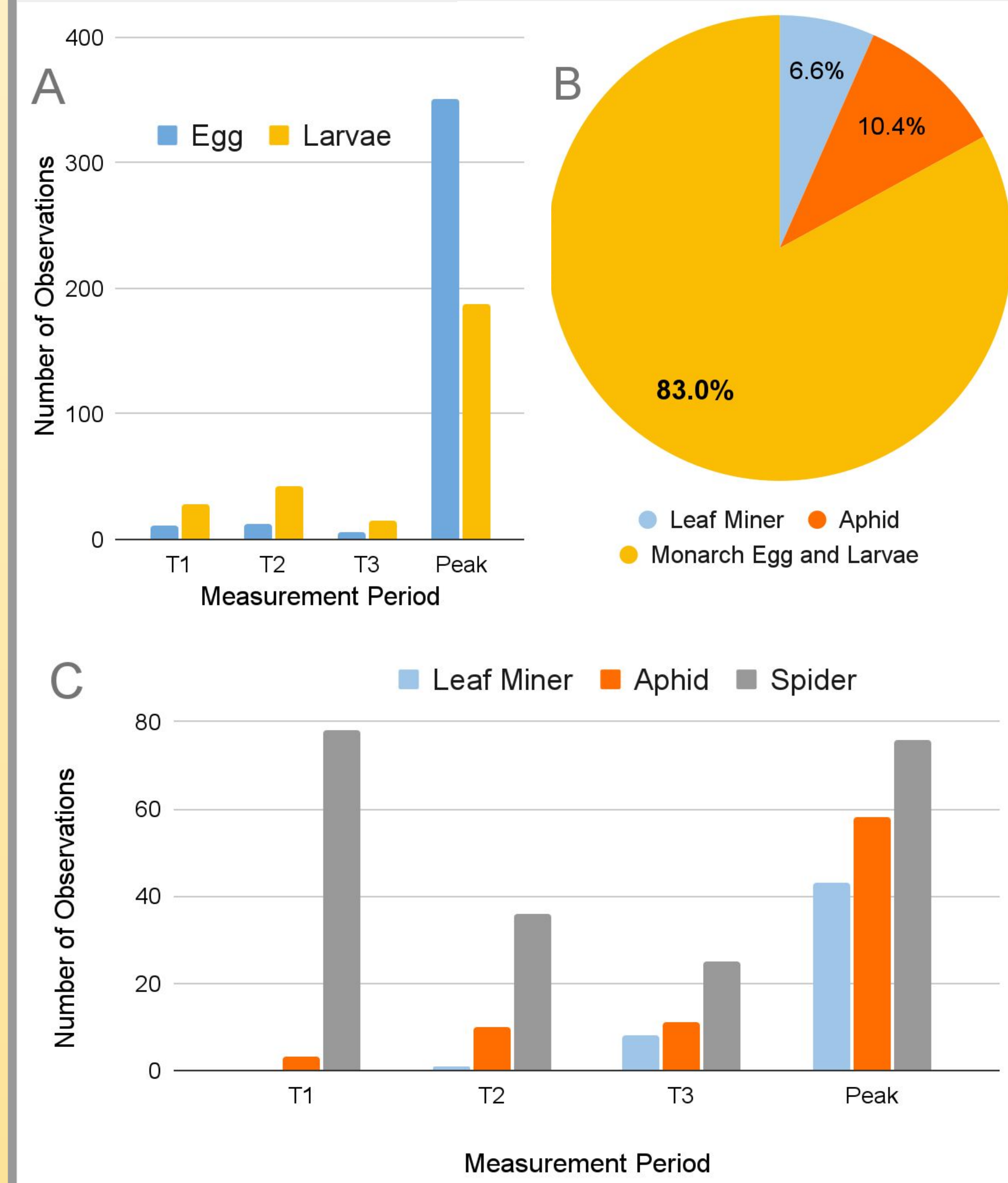


Fig. 1 A: Number of monarch caterpillars and eggs in the field by measurement period. Early trend showed greater caterpillar presence than egg presence which flipped during peak period. A possible explanation is that, during peak, we were measuring at the beginning of the second generation.

B: Total percentages of herbivores counted over measurement periods. Monarchs accounted for 83%, thus early in the growing season, plant damage can be attributed to monarchs.

C: Colonization trends of common milkweed from May to July 2021. Spiders establish early and remain consistent in the season while aphids and leaf miners establish later in the season. Monarchs are the dominant herbivores establishing early and having little competition in the early growing season.

Spatial, not Geographic Results for Monarchs

Monarch caterpillars are the primary consumer of milkweed and have little competition in the early growing season



Each caterpillar can consume multiple milkweed seedlings prior to metamorphosis



Monarch butterflies prefer to oviposit on milkweed plants with more leaves and less damage



Oviposition Preference for More Leaves

Plot 1: Peak observations

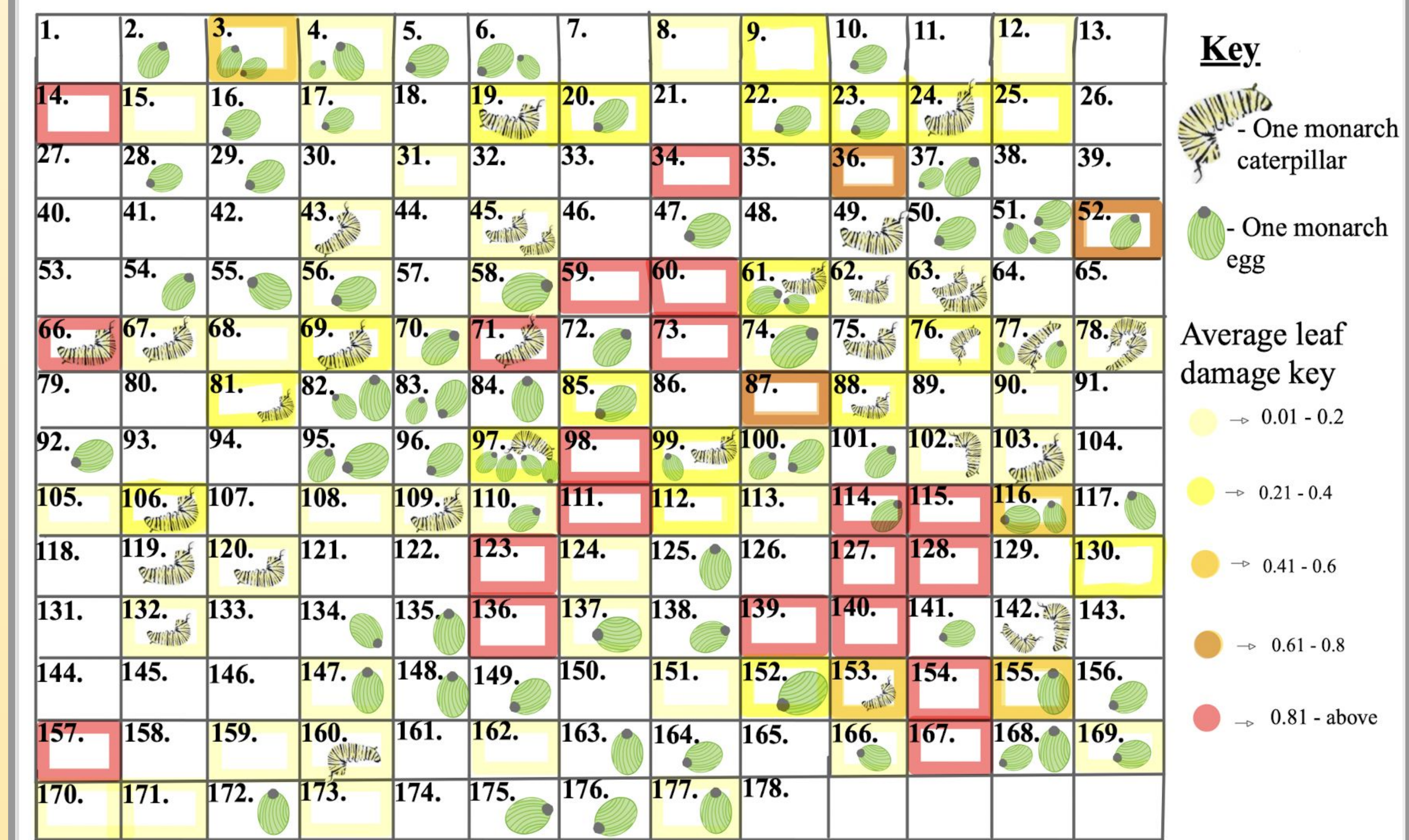
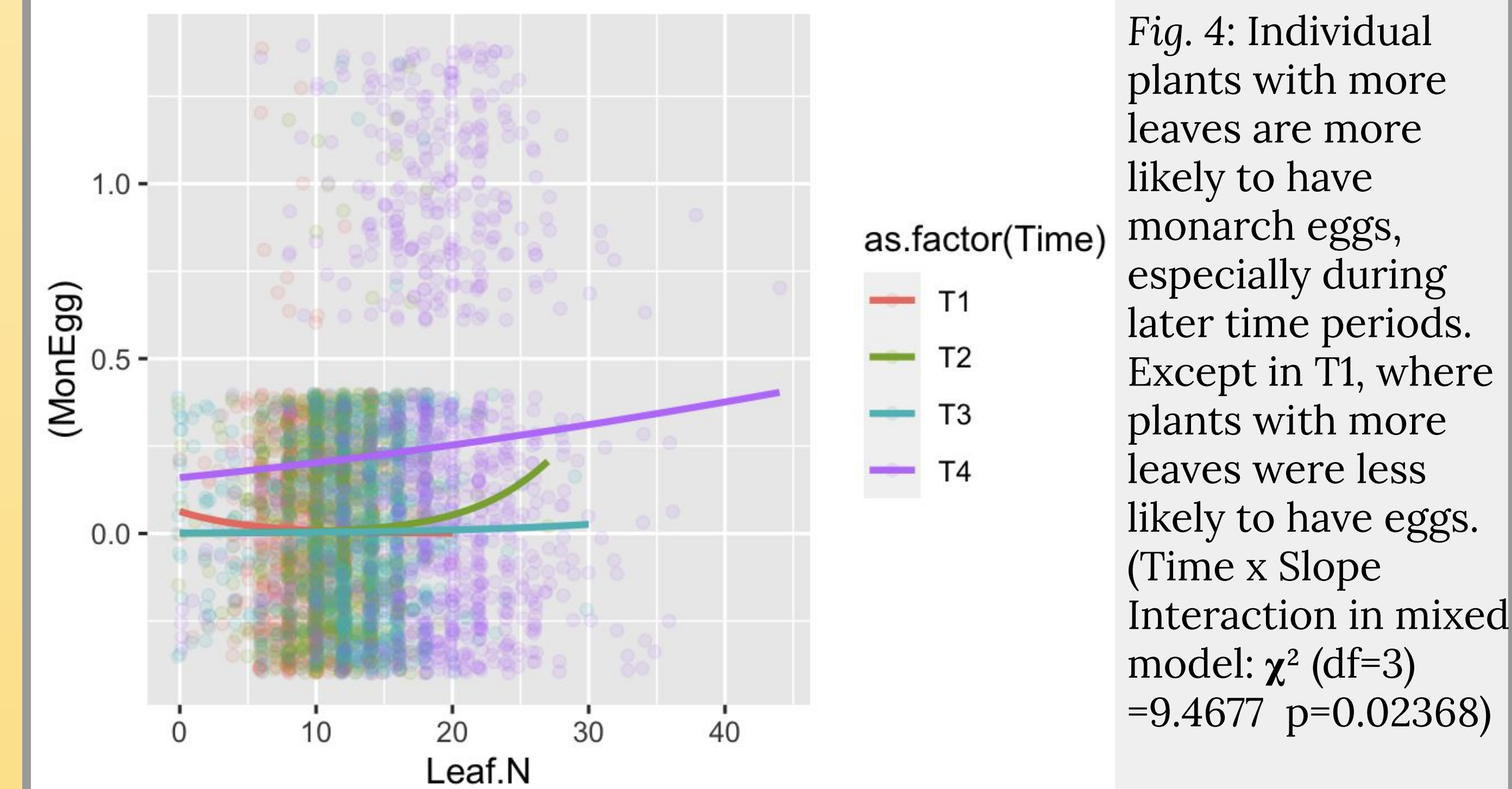


Fig. 3: Plot map of plot one showing damage, egg number, and larvae number per plant. A chi squared test demonstrated that monarch caterpillars and butterflies avoid the most damaged plants for feeding and oviposition.



Background Information

Monarch populations are decreasing over time (Fig. 2) and Malcolm et al. (2018) has connected this decrease to milkweed decline. As monarch caterpillars depend on milkweed as their only food source, researchers are working to restore milkweed to increase monarch populations (Thogmartin et al. 2017). Given widespread interest in planting milkweed, our goal was to understand how herbivores and predators colonize and consume milkweed plants that come from different regions. We conducted a common garden provenance trial measuring plant growth, fitness, and herbivory from May to August on biweekly basis.

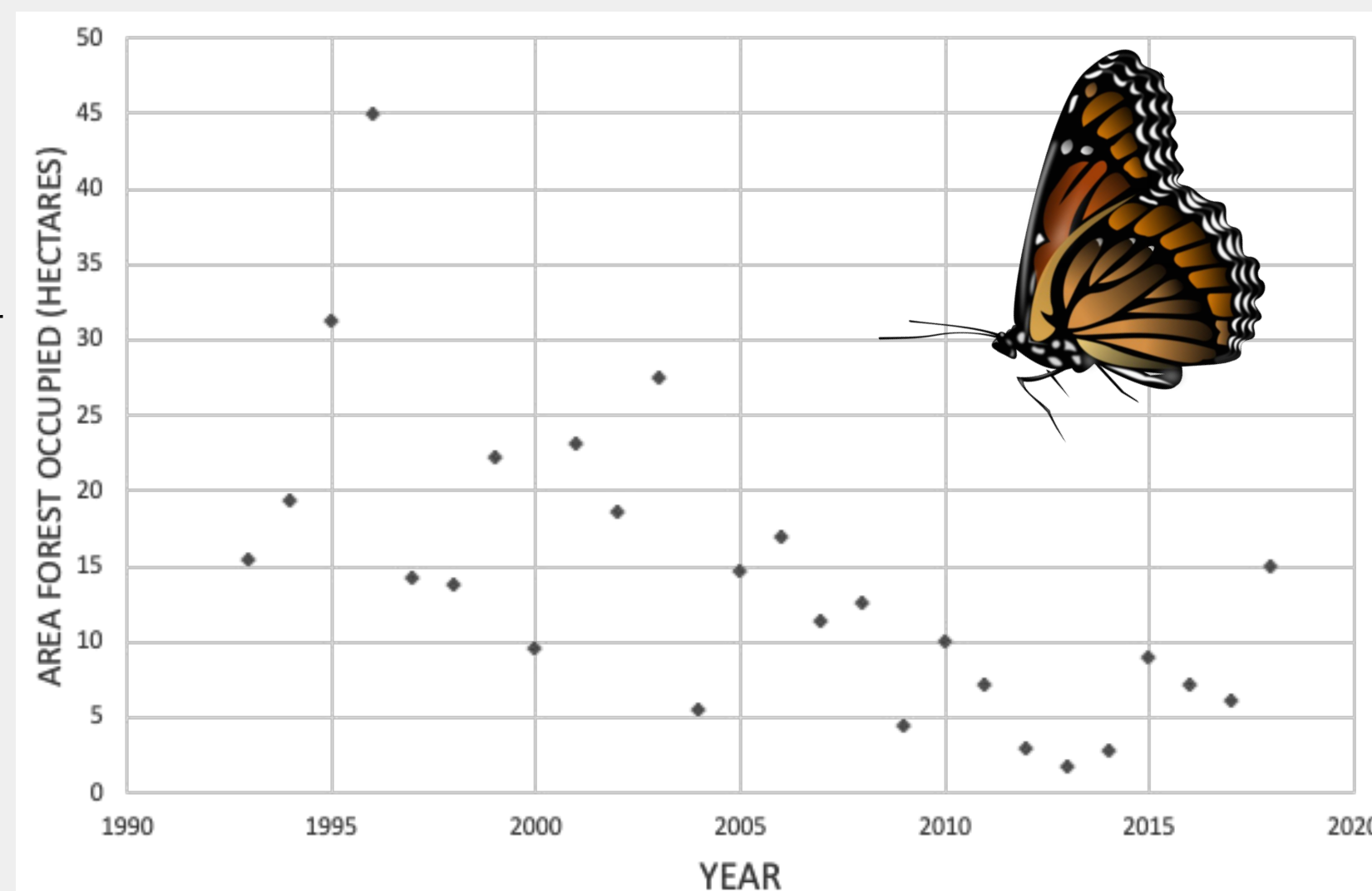
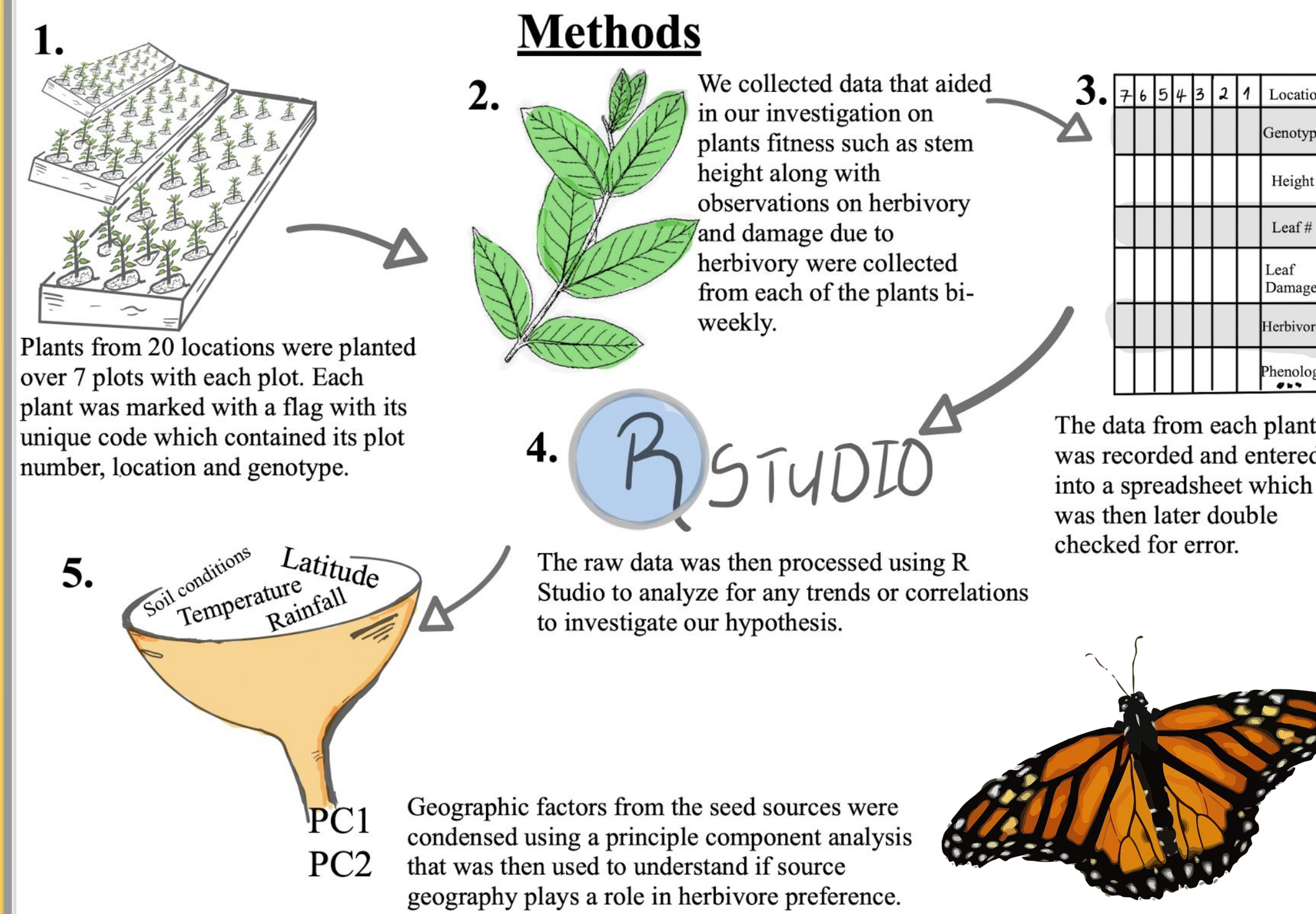


Fig. 2: The annual record of monarchs in Mexico (Updated December 2020) showing declining monarch populations (<https://www.fws.gov/wildlife/monarch/>)

Methods and Experiment Design



The design of the study was inspired by Woods et al. (2012). A common garden design (planting genotypes from different places in one area) with plants from 20 source populations is replicated across 3 sites. In the St. Olaf Natural lands field, there are 178 plants in each of the 6 plots, one from each genotype and, in plot 7, 192 plants with two from each genotype.

Application and More Information

In finding that monarchs are the dominant herbivores preferring less damaged plants with greater leaves, we suggest that restoration projects should have an abundance of younger plants to support the monarch population, and when planning seedling locations, consider that monarch larvae seem to feed proximally to oviposition. As these are preliminary findings, they may reveal different conclusions than past studies and require future research to generalize more broadly. Our results are applicable to Minnesota and early growing season.

Acknowledgements

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