Assessing predation of monarch butterfly larvae in urban and rural landscapes using clay caterpillar models

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Introduction: Objectives

1. Determine if larval clay models are a useful tool for measuring predation in the monarch predator/ prey complex

2. Asses the rates of predation by poorly understood predators of monarch larvae (e.g. birds and mammals)

Monarchs are host plant specialists

Asclepiadoideae

Common Milkweed
Asclepias syriaca

Swamp Milkweed
Asclepias incarnata

Butterfly Milkweed
Asclepias tuberosa

Introduction: Background and context

Introduction: Background and context

*Brower *et al.*

Introduction: Background and context

Predators of monarch butterfly eggs and neonate larvae are more diverse than previously recognised

Sara L. Hermann[1], Carissa Blackledge[2], Nathan L. Haan[2], Andrew T. Myers[2,3] & Douglas A. Landis[2,3]

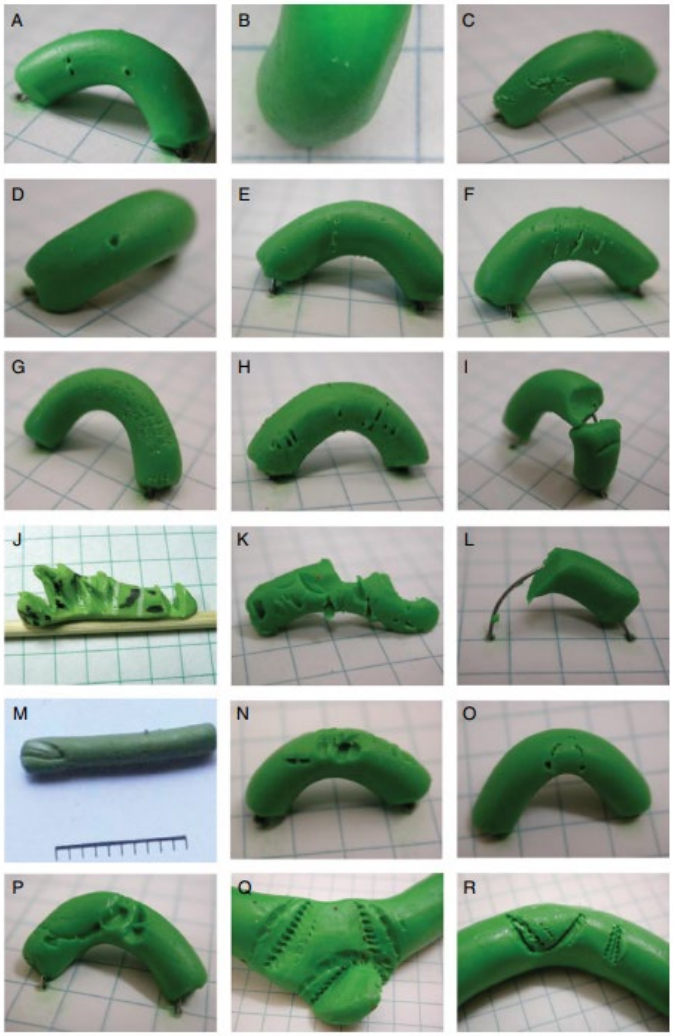
Invertebrate Natural Enemies and Stage-Specific Mortality Rates of Monarch Eggs and Larvae

Alma De Anda and Karen S. Oberhauser

Invasive paper wasp turns urban pollinator gardens into ecological traps for monarch butterfly larvae

Adam M. Baker & Daniel A. Potter

Introduction: Previous studies



*Low *et al.* 2014

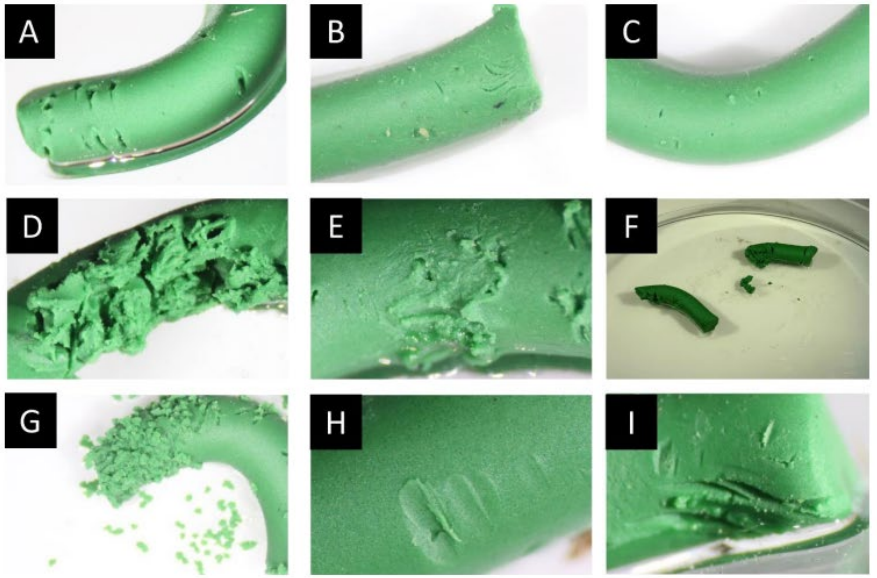
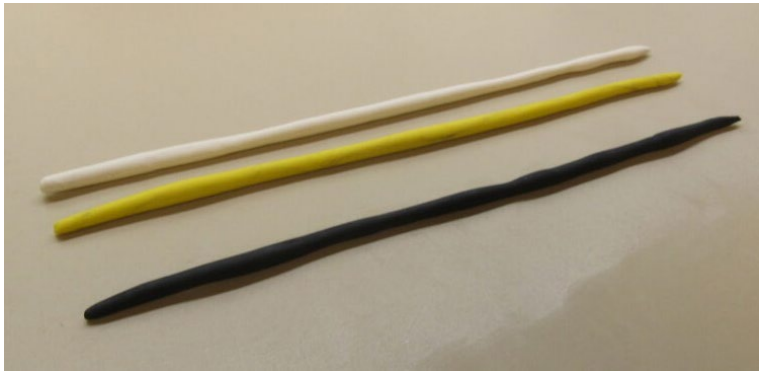


Figure 2.1. Impressions created by arthropods on clay models (A) paired marks, (B) scratches, (C) pricks, (D) deep distortion, (E) disturbed surface, (F) detached segments, (G) granulated surface, (H) dents, and (I) elongated scratches.

*Khan *et al.* 2021

Figure 3 Examples of typical attack marks from arthropods (A–H), birds (I–M), mammals (N–P), and reptiles (Q–R). All models are on 5-mm grid, except (M) which is next to scale with 1-mm intervals.

Methodology: Creating model larvae

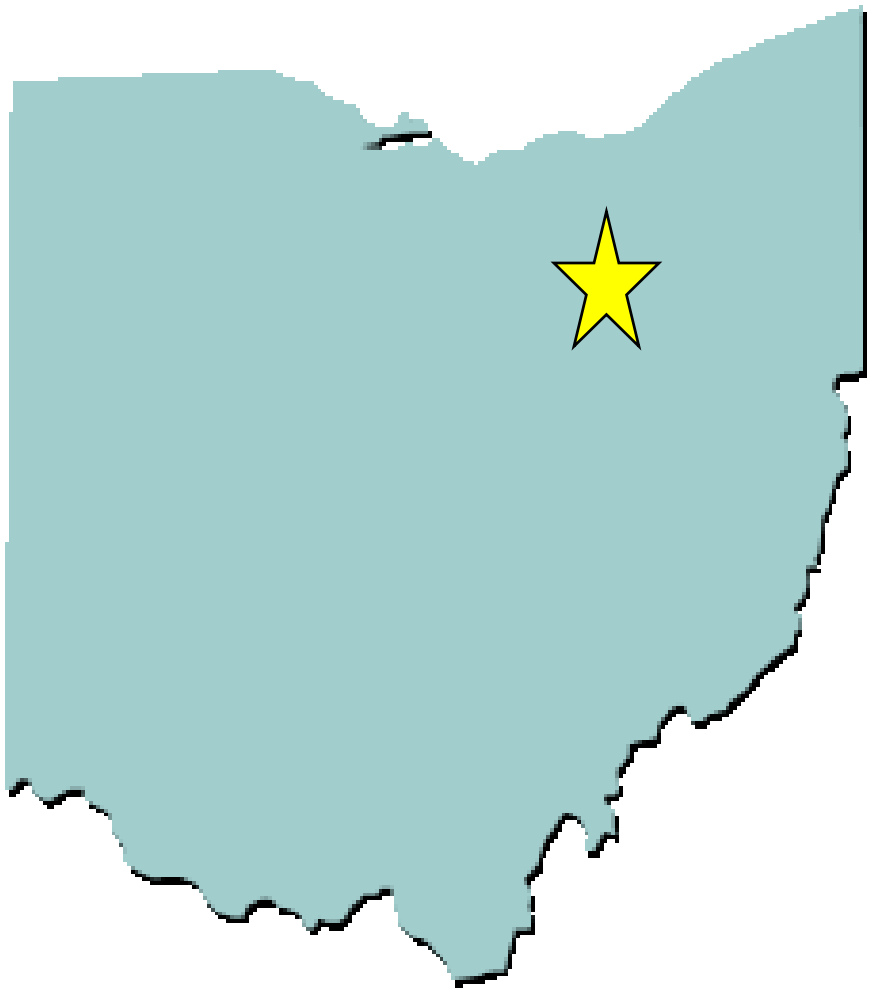


- Late 3rd/Early 4th instar caterpillars
- Size in mm
- Sargent plasticine modeling clay
  - Stays malleable
  - Handles summer temps
  - Remain intact on plants

Methodology: Deployment in the field

- Attached models to adaxial leaf surface
- Top third of plant material (*A. syriaca*)
- Pin though mid-rib of leaf and secured with piece of cork
- 72h deployment period
- Twice a month from May to September

Methodology: Site selection



- 5 Urban
- 5 Rural
- 3 Periurban

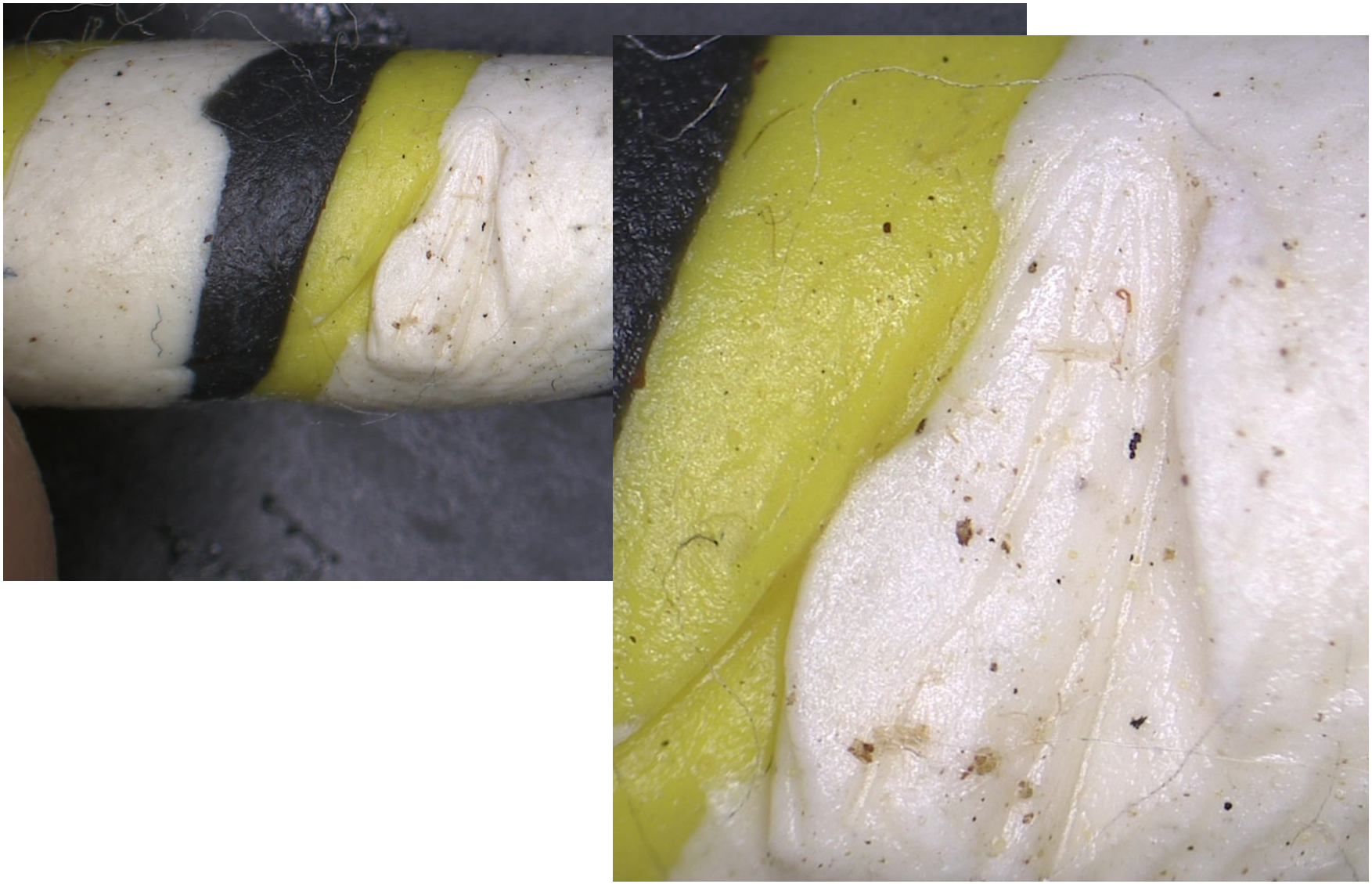
Sites include:
Gardens
Monarch Waystations
Meadows

Parks
Residential
Schools/Campuses

Results: Avian predation

Results: Avian predation

Results: Avian predation

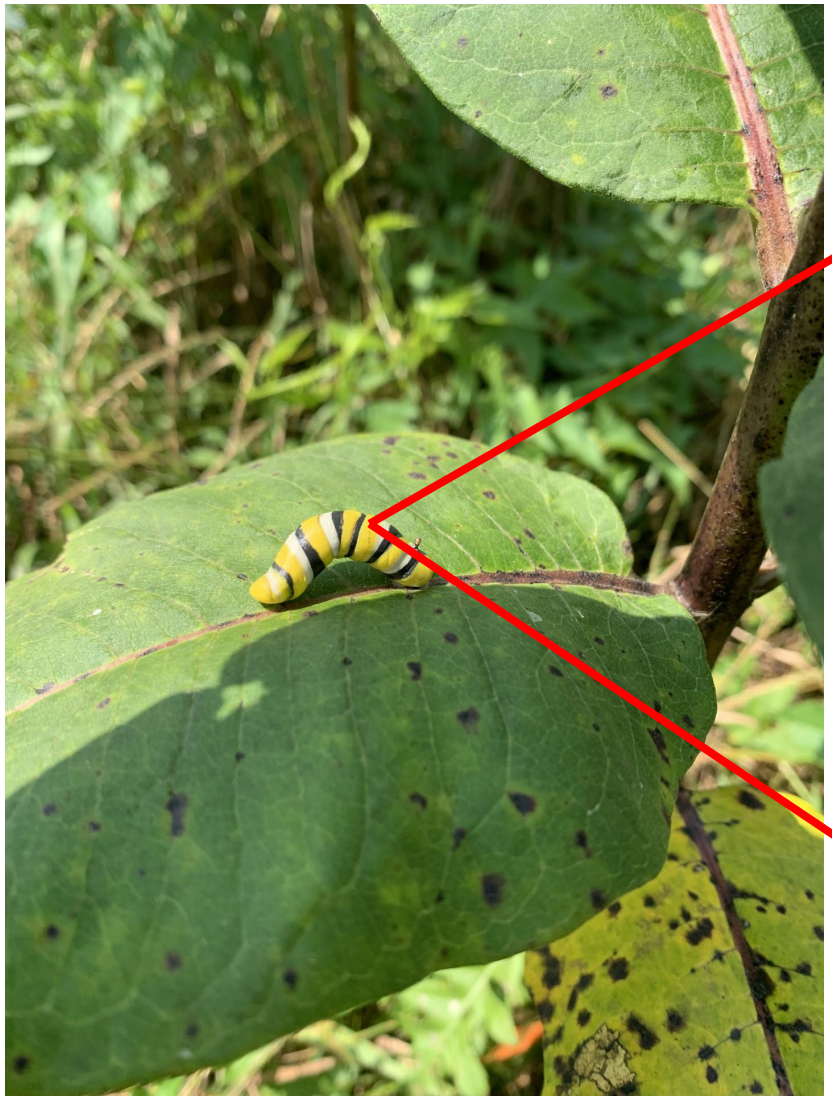


Results: Arthropod predation

Results: Mammalian predation

Results: Missing model larvae

Results: Other predators?

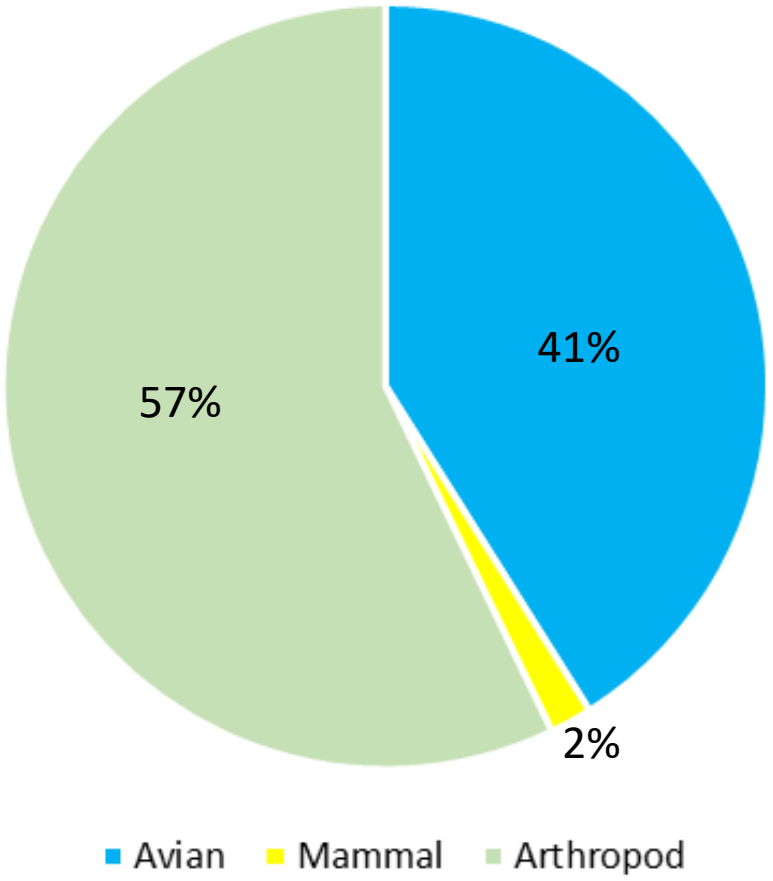


Results: Attacks by predator type

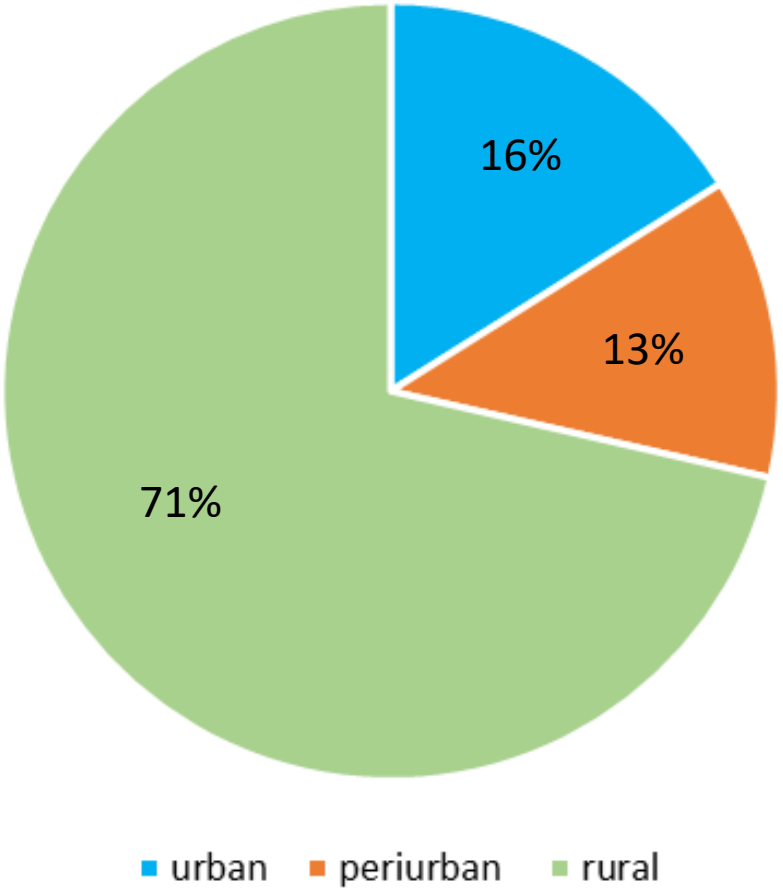
Deployed 1130 model caterpillars

- **56 attacks**
- **23 avian**
- **1 mammal**
- **32 arthropod**
- **Missing models censored**

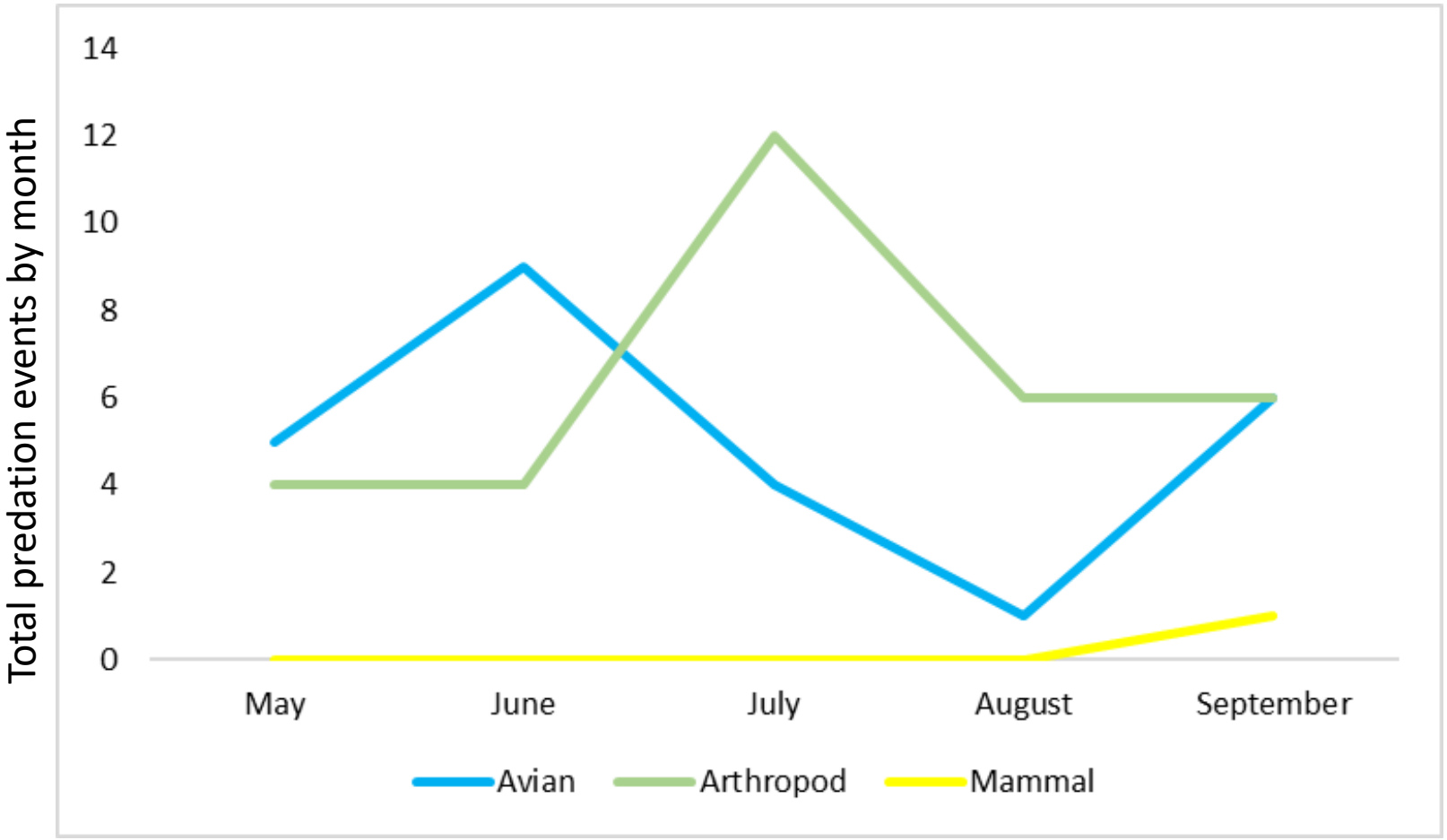
5% of models were attacked!



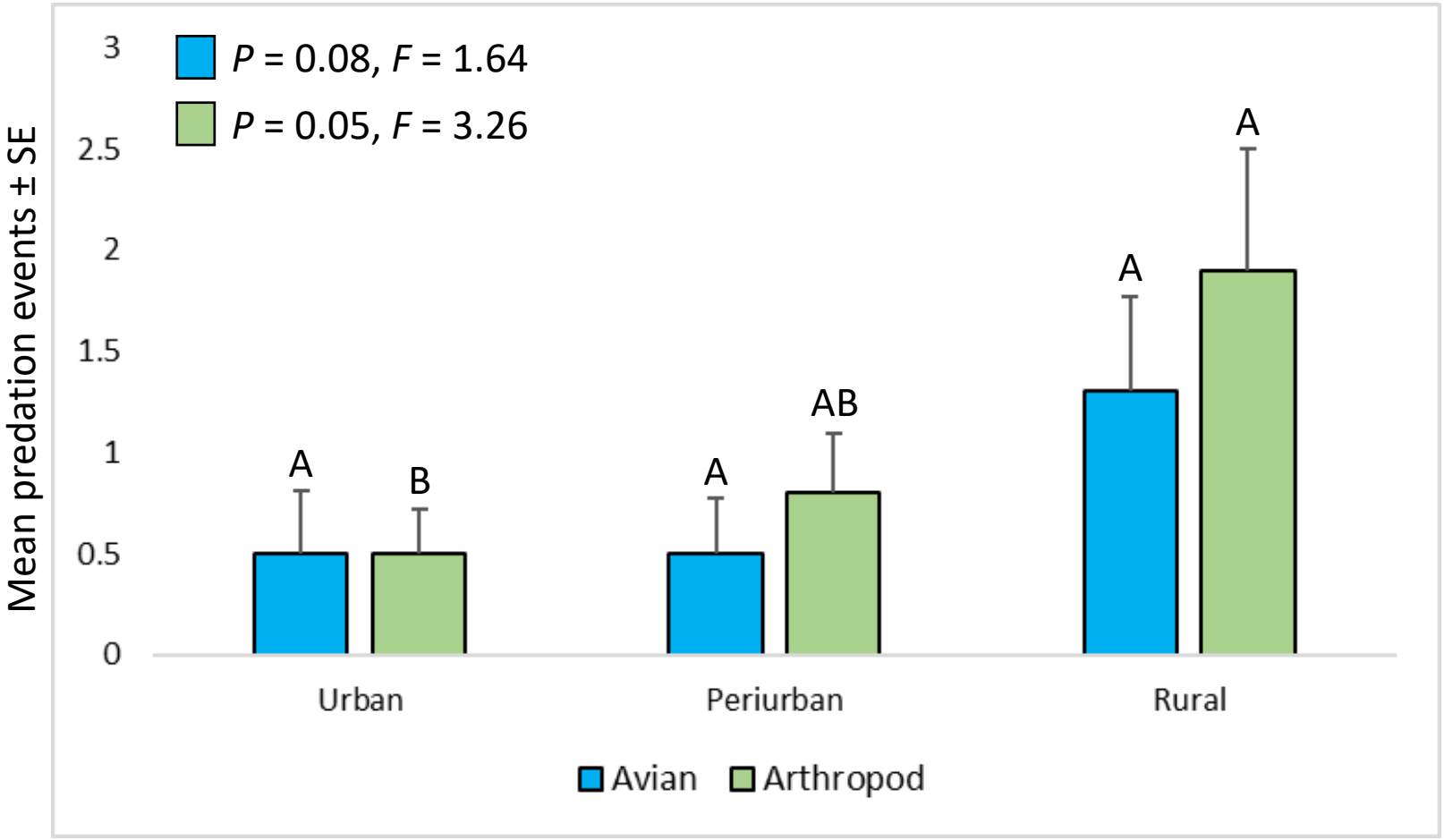
Results: Attacks along an urban/rural gradient



Results: Attacks by date



Results: ANOVA



Discussion: Take-home points

Birds, arthropods, and mammals were observed to attack aposematic caterpillar models in the field

5% of model larvae were attacked

Predation was greatest in rural habitats

Arthropods and avian attacks made up 98% of attacks

Avian predation may be more important in climates further south where monarch larval abundance is higher in May/June

Arthropod predation was highest in July/August

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Questions?