



# Bold urbanites and shy hillbillies?

## Variation in novel environment exploration in *Haemorrhous mexicanus*

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### Introduction

Cities present urban-dwelling species with novel structures (e.g. buildings) and feeding sites (e.g. bird feeders, trash cans).



In the United States, 43% of people provide supplement feeding to birds, which may make them more willing to approach novel feeding sites.

Because animals in cities typically experience more complex and novel environments, I predict that urban and suburban birds will show lower levels of stress and spend more time exploring a novel environment and eating at novel feeding structures.

Because of exposure to humans and human-related structures, I predict urban and suburban birds will show fewer stress-related behaviors in captivity than rural birds.

### Study Sites



Six sites were labeled urban, suburban or rural based on population within 1 km of site. A = Estrella Mountain (rural); B = Phoenix neighborhood (urban); C = Arizona State University campus (urban); D = South Mountain (rural); E = Chandler neighborhood (suburban); F = Gilbert Crossroads Park (suburban).

### Conclusions

Urban birds had more hops (activity behavior) and ruffles (displacement behavior) when acclimating to the cage but fewer hops and ruffles in the novel environment. They also spent less time on the feeder and near the novel bird.

Suburban birds hopped more in the novel environments and less in captivity than urban birds. They also spent more time on the feeder in the novel environment. They did not differ significantly from either urban or rural birds in ruffles or time near bird.

There were no significant differences between populations in time spent on the novel structures or latency to approach novel structures. Thus, we cannot conclude that urban or rural house finches are more exploratory in a novel environment.

### Methods

Captured 30 adult house finches (15 male, 15 female) at each of six sites (see map) throughout the greater Phoenix area using walk-in traps.

House finches are native to the desert Southwest and can be found in both urban and rural environments.

#### Captivity Measurements

On the day after capture, each bird was recorded for 30 minutes in its home cage.



We measured:

- Hops (activity behavior)
- Ruffles (displacement behavior, which can indicate stress)
- Time spent on feeder

#### Novel Environment Test

Each bird was recorded for one hour in a large aviary filled with:

- Large box with holes full of food
- Picnic table with food
- Branch with feeder
- Two novel birds (zebra finches, one male and one female, selected because they are not native)



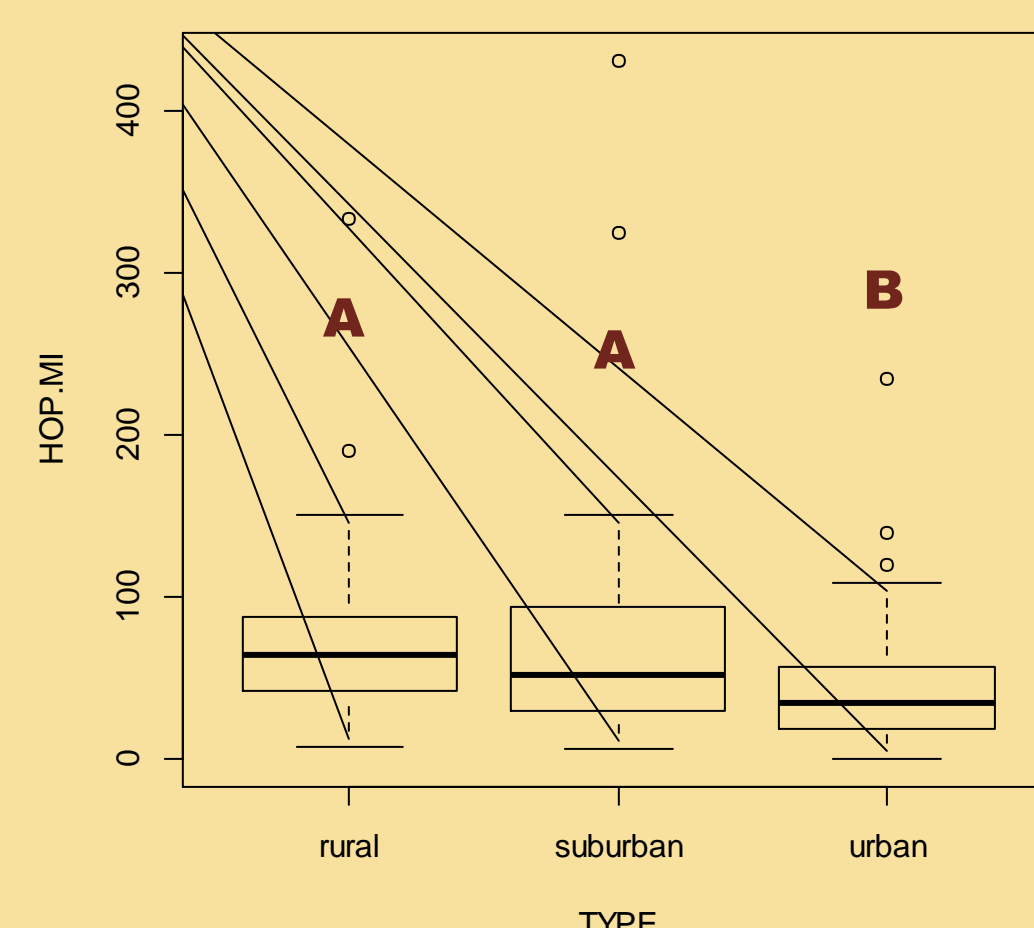
We recorded the same behaviors listed above as well as time spent on novel structures and time to approach novel structures.

We also measured corticosterone (hormone associated with stress) before and after these trials, but that data has not yet been analyzed.

### Results

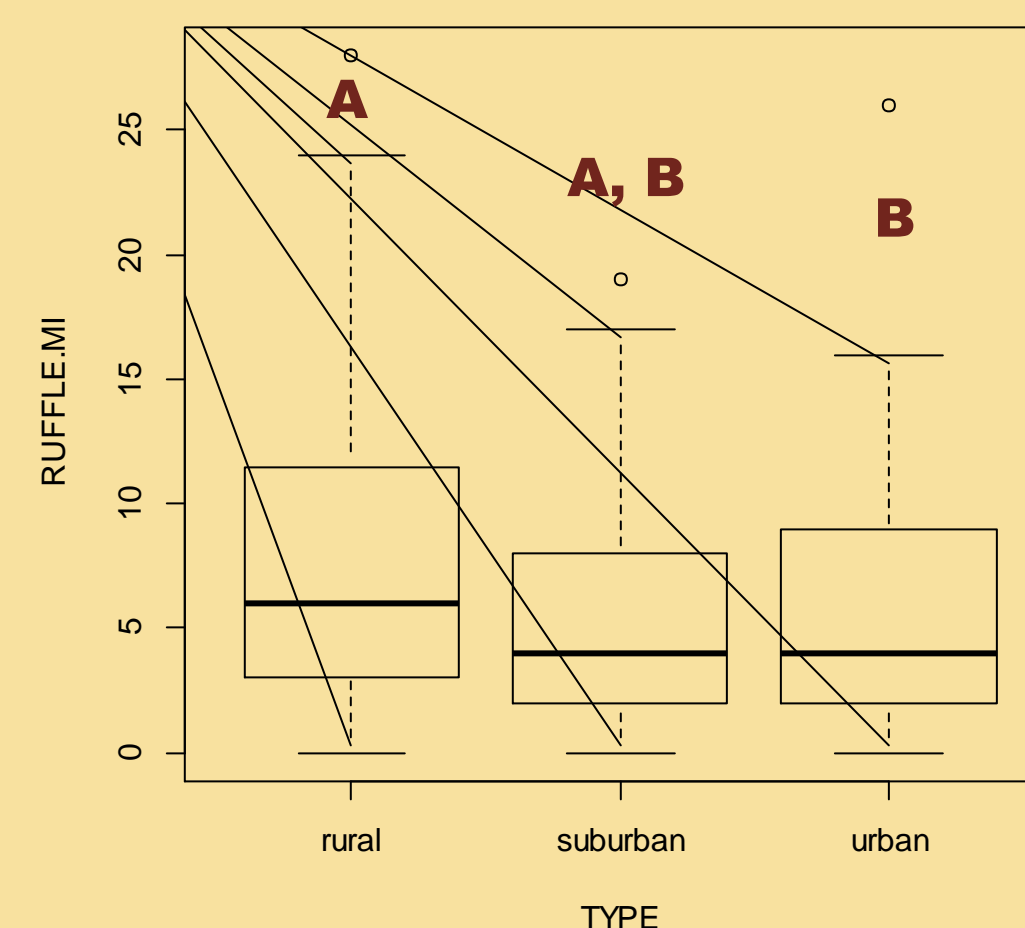
#### Behavior in Novel Environment

##### Activity Behavior



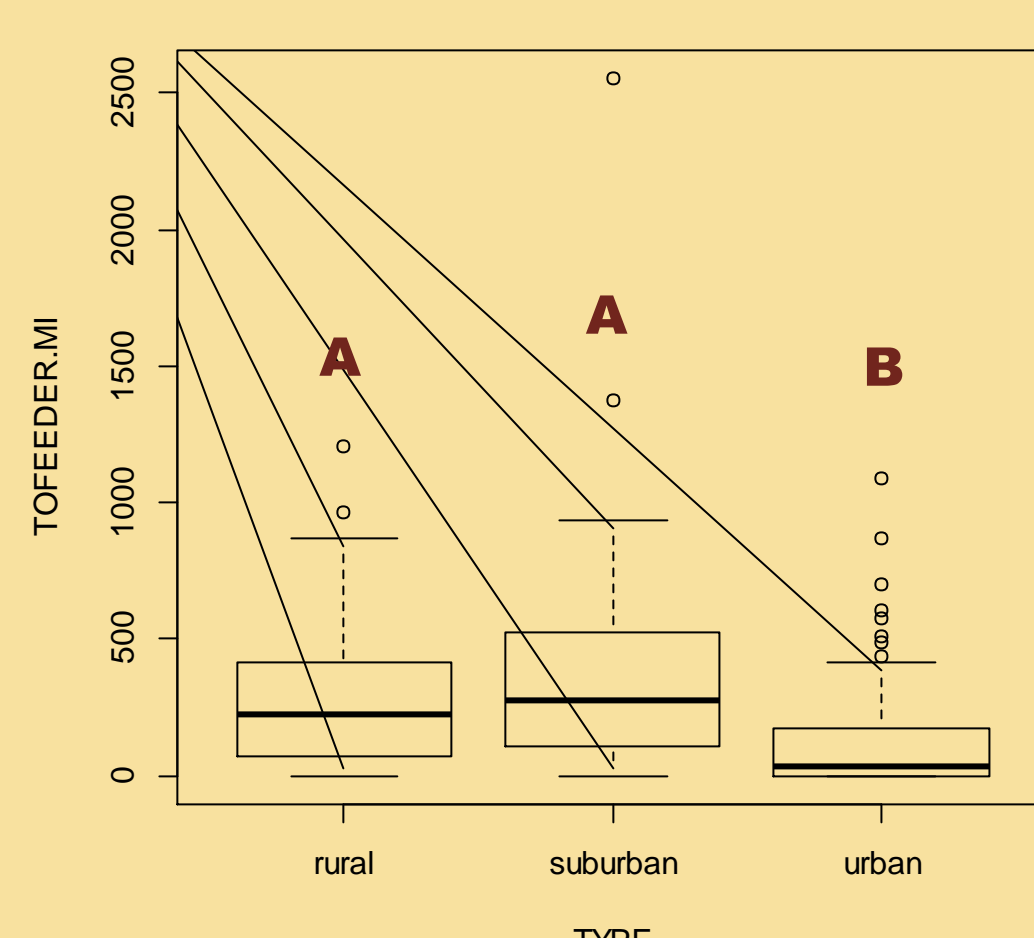
Sites differed significantly in hops in the novel environment ( $F=7.52$ ,  $df=2$ ,  $p=7.82 \times 10^{-4}$ ).

##### Displacement Behavior



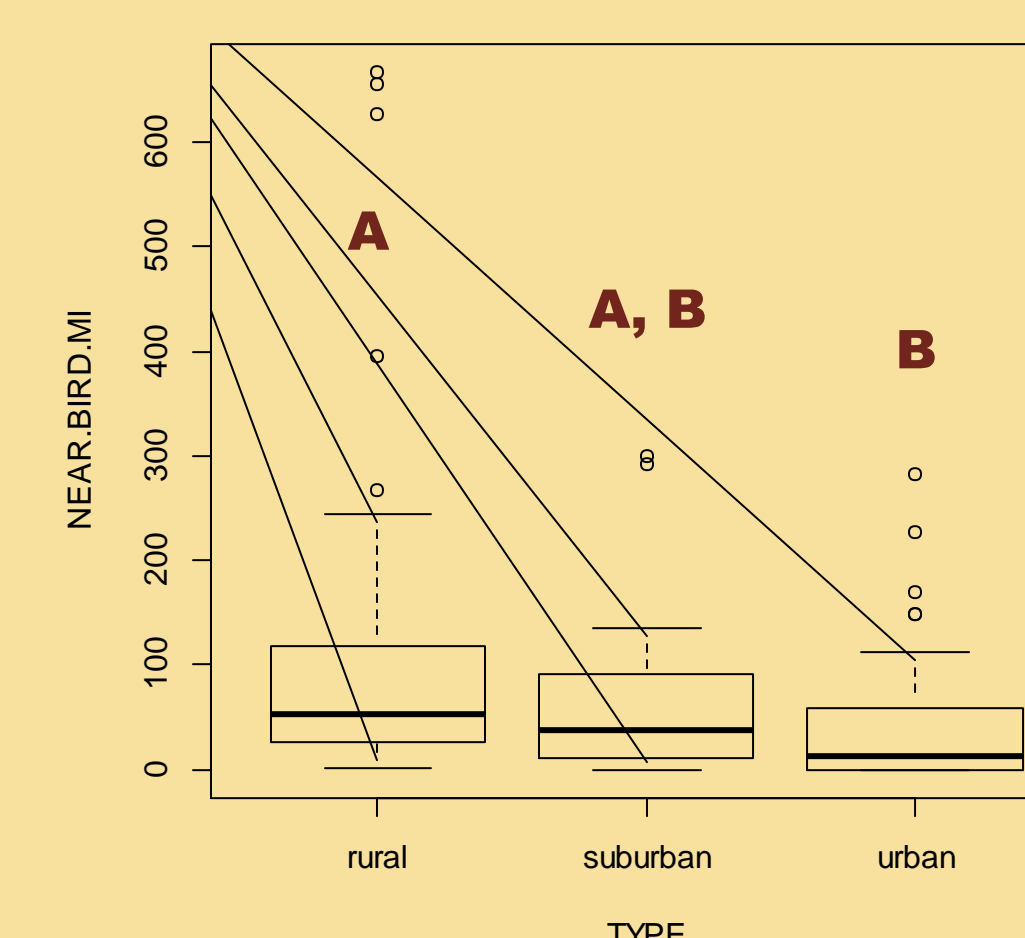
Sites differed significantly in ruffles in the novel environment ( $F=3.06$ ,  $df=2$ ,  $p=0.049$ ).

##### Time on Feeder



Sites differed significantly in time spent on feeder in the novel environment ( $F=11.48$ ,  $df=2$ ,  $p=2.37 \times 10^{-5}$ ).

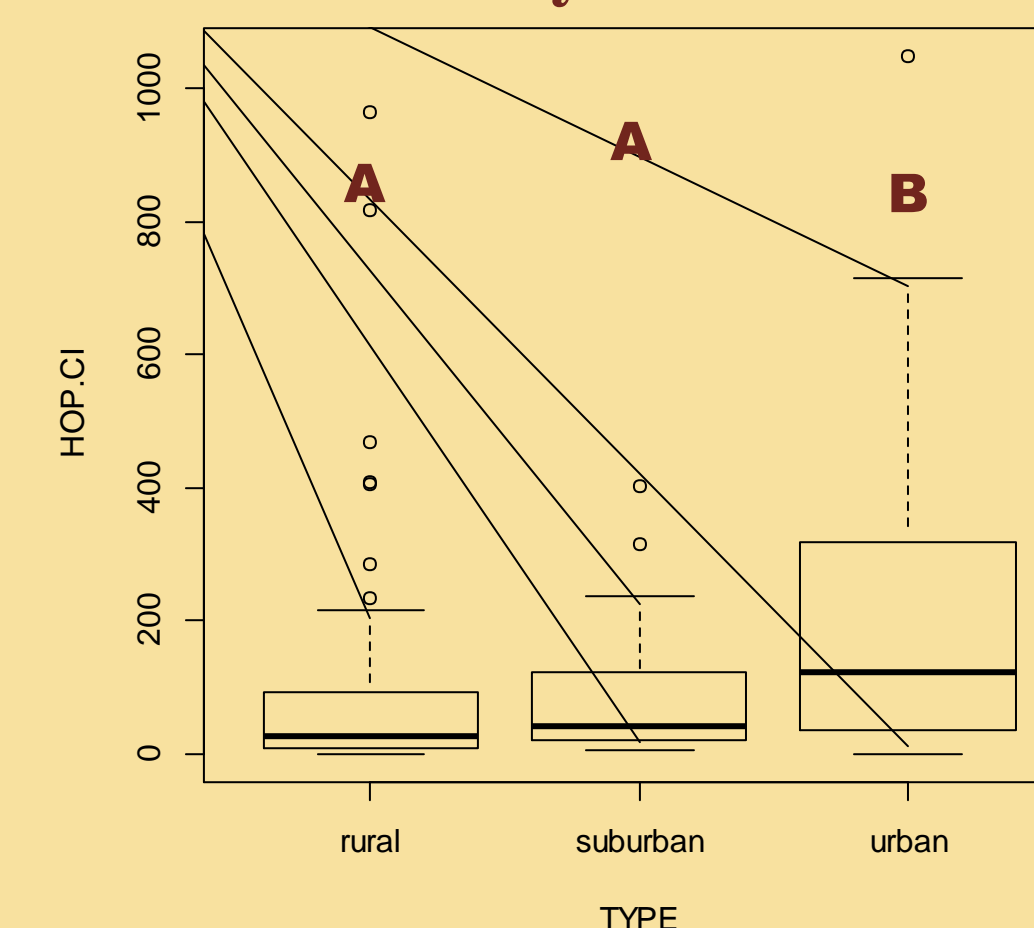
##### Time Near Novel Bird



Sites differed significantly in time spent near novel birds in the novel environment ( $F=16.27$ ,  $df=2$ ,  $p=2.93 \times 10^{-4}$ ).

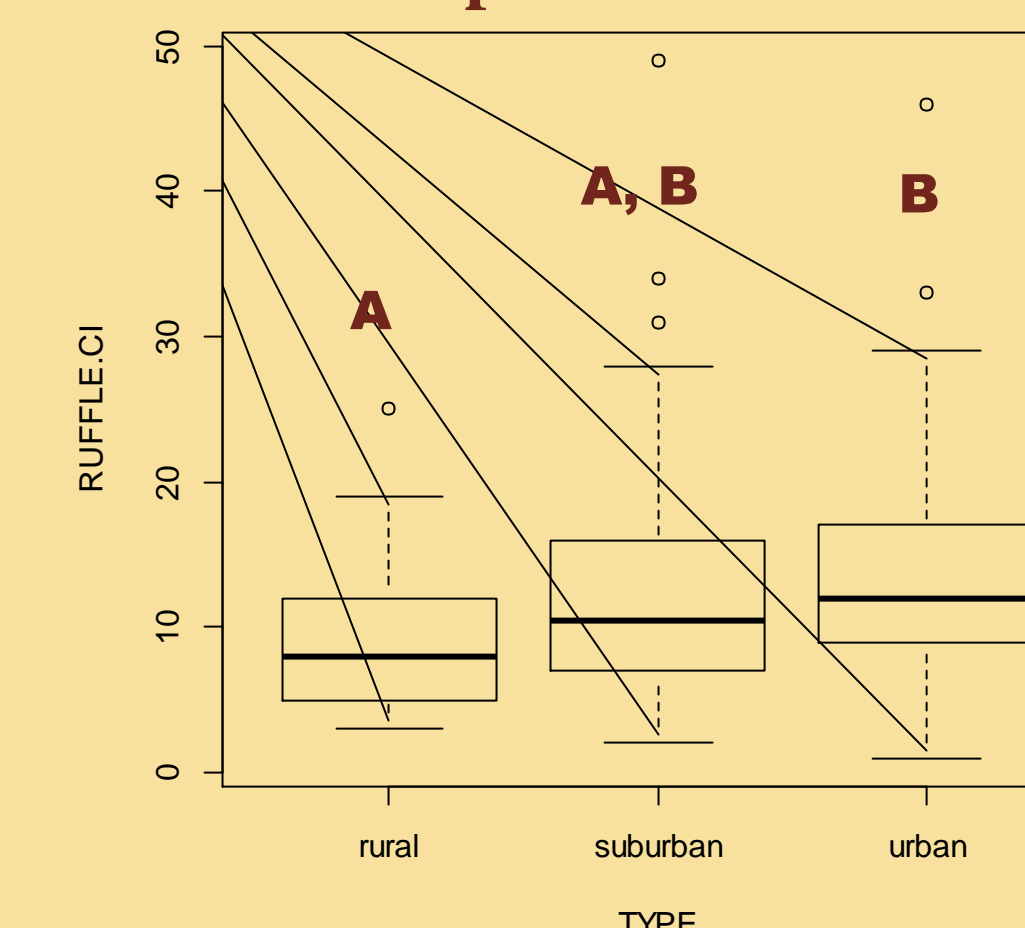
#### Behavior in Captivity Just Post-Capture

##### Activity Behavior



Sites differed significantly in hops in home cages prior to capture ( $F=16.55$ ,  $df=2$ ,  $p=2.55 \times 10^{-4}$ ).

##### Displacement Behavior



Sites differed significantly in ruffles in home cages prior to capture ( $F=12.45$ ,  $df=2$ ,  $p=0.002$ ).

### Discussion

#### Are Urban Birds More Likely to Explore a Novel Environment?

Studies have shown mixed results:

- Mynas (*Acridotheres tristis*) in urban areas are more likely to explore (Sol et al. 2011).
- Urban house sparrows (*Passer domesticus*) and brown-headed cowbirds (*Molothrus ater*) are less (Echeverria and Vassallo 2008).

Urban birds might be wary of novelty because human-related structures/feeding sources can be harmful.

Supplemented food might limit foraging ranges in urban areas and reduce necessity of exploration.

#### Why Does Activity Differ Between Home Cage and Novel Cage?

Despite showing lower levels of activity and displacement behaviors in human presence (Weaver et al., unpublished), urban birds showed higher levels of activity and displacement behavior in their home cages than rural birds shortly after capture.

However, they showed fewer activity and displacement behaviors in the novel environment.

This could indicate a greater comfort with novel environments than rural birds but a greater discomfort with confinement or greater desire to escape.

### Acknowledgments and References

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Echeverria AI, Vassallo AI. Novelty responses in bird assemblage inhabiting an urban area. *Ethology* 2008, 114: 616-624.

Sol D, Griffin AS, Bartomeus I, Boyce H. Exploring or avoiding novel food resources? The novelty conflict in an invasive bird. *PLoS One* 2011, 6 (5): 1-7.