

Avian anthrophobia? Stress response of house finches (*Haemorrhous mexicanus*)

across an urban gradient in the presence of humans

Melinda Weaver, Kevin J. McGraw, and Melanie Mousel

School of Life Sciences, Arizona State University, Tempe AZ



Melinda Weaver
melinda.weaver@asu.edu



Introduction

Cities are typically thought to harbor fewer predatory threats to wildlife because many native predators are not found in human-impacted areas.

However, most studies on urban predation do not take human presence into account.



Number of predators may not be as accurate as a measure of perceived predation risk (Shocat 2004).

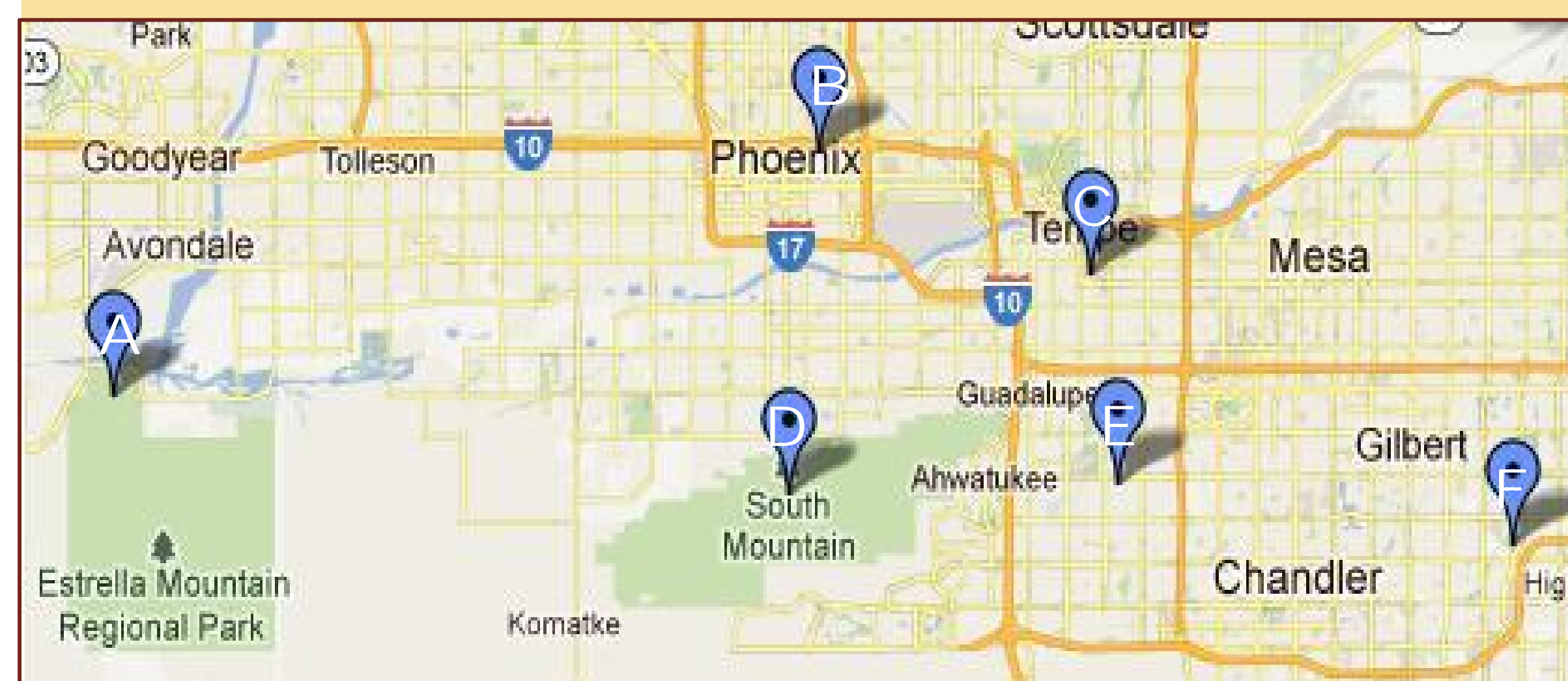
Field studies show that urban populations tend to flock in greater numbers and have shorter flight distance in the presence of humans than more rural populations, indicating a greater perceived predator threat (Valcarcel and Fernandez-Juricic 2009; Moller 2008).

Objectives

- ❑ To measure behavioral stress of house finches in the presence of humans.
- ❑ To measure physiological stress of house finches in response to human handling.
- ❑ To measure problem-solving ability of house finches in the face of human-created stress.

Study Sites

Six sites were labeled urban, suburban or rural based on population within 2km of site.



A = Estrella Mountain (rural); B = Phoenix neighborhood (urban); C = Arizona State University main campus (urban); D = South Mountain (rural); E = Chandler neighborhood (suburban); F = Gilbert Crossroads Park (suburban)

Acknowledgments and References

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Carere C, van Oers K. Sly and bold great tits: body temperature and breath rate in response to handling stress. *Physiology and Behavior* 2004, 82 (5): 905-912.
Moller AP. Flight distance of urban birds, predation and selection for urban life. *Behavioral Ecology and Sociobiology* 2008, 63: 63-75.
Shocat E. Credit or debit? Resource input changes population dynamics of city slicker birds. *Oikos* 2004, 106: 622-626.
Valcarcel A, Fernandez-Juricic F. Antipredator strategies of house finches: are urban habitats safe spots from predators even when humans are around? *Behavioral Ecology and Sociobiology* 2009, 63: 673-685.

Methods

Behavioral Stress Measurements

Bird were placed in a cage equipped with hide area, feeders and escape route. Activity levels were recorded for a 20 minute settling period. Human approached from 20m away at a speed of one step/second. Activity levels were recorded for final 10 minutes. Birds were scored for these behaviors:

- ❑ Activity: hop, fly, approach escape, beak poke out of cage
- ❑ Stress: feather ruffle, beak wipe
- ❑ Time spent on feeder
- ❑ Time spent in hide area



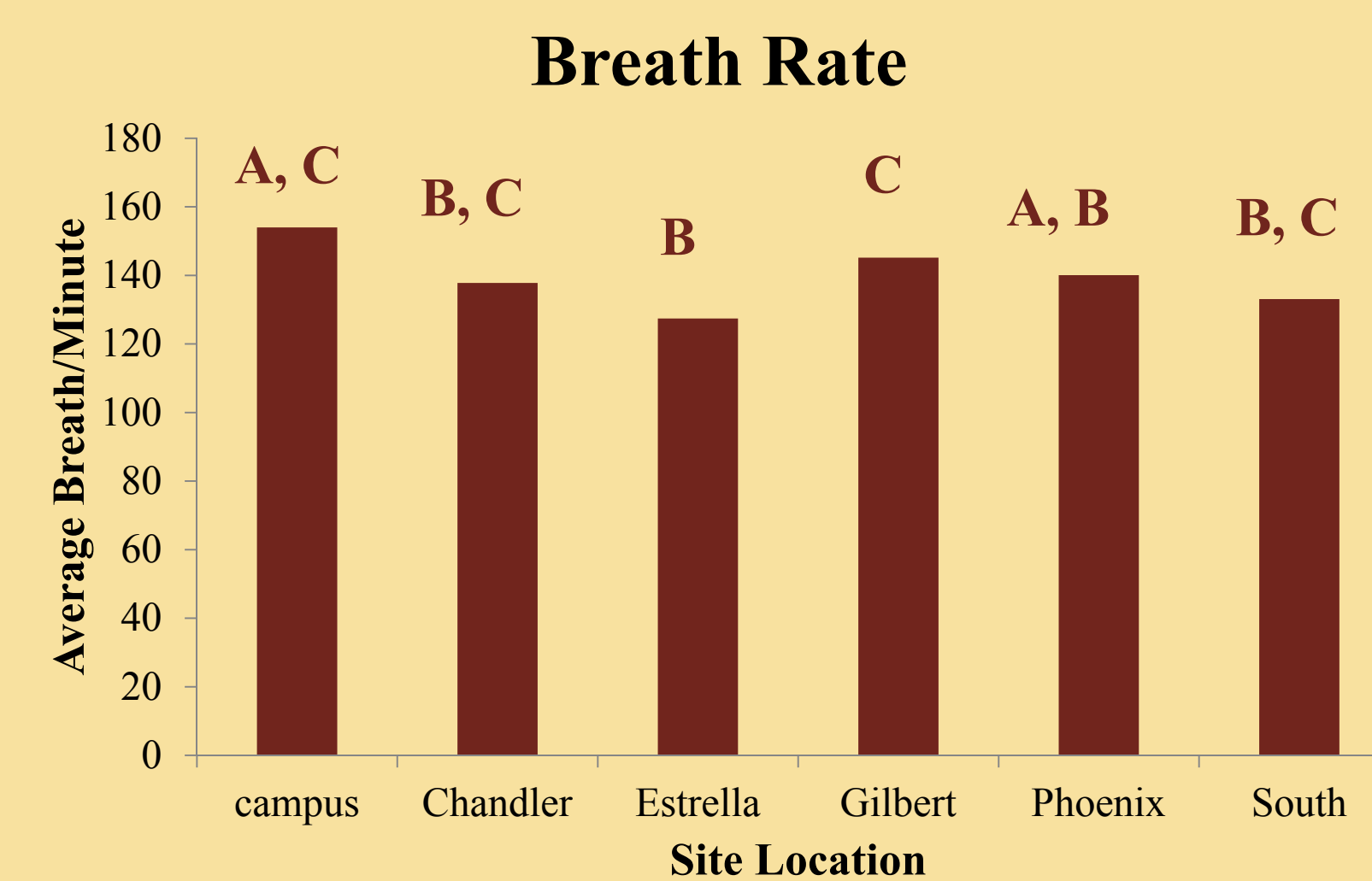
Physiological Stress Measurements

Held each bird for 60 seconds after capture and counted all breaths in that time.

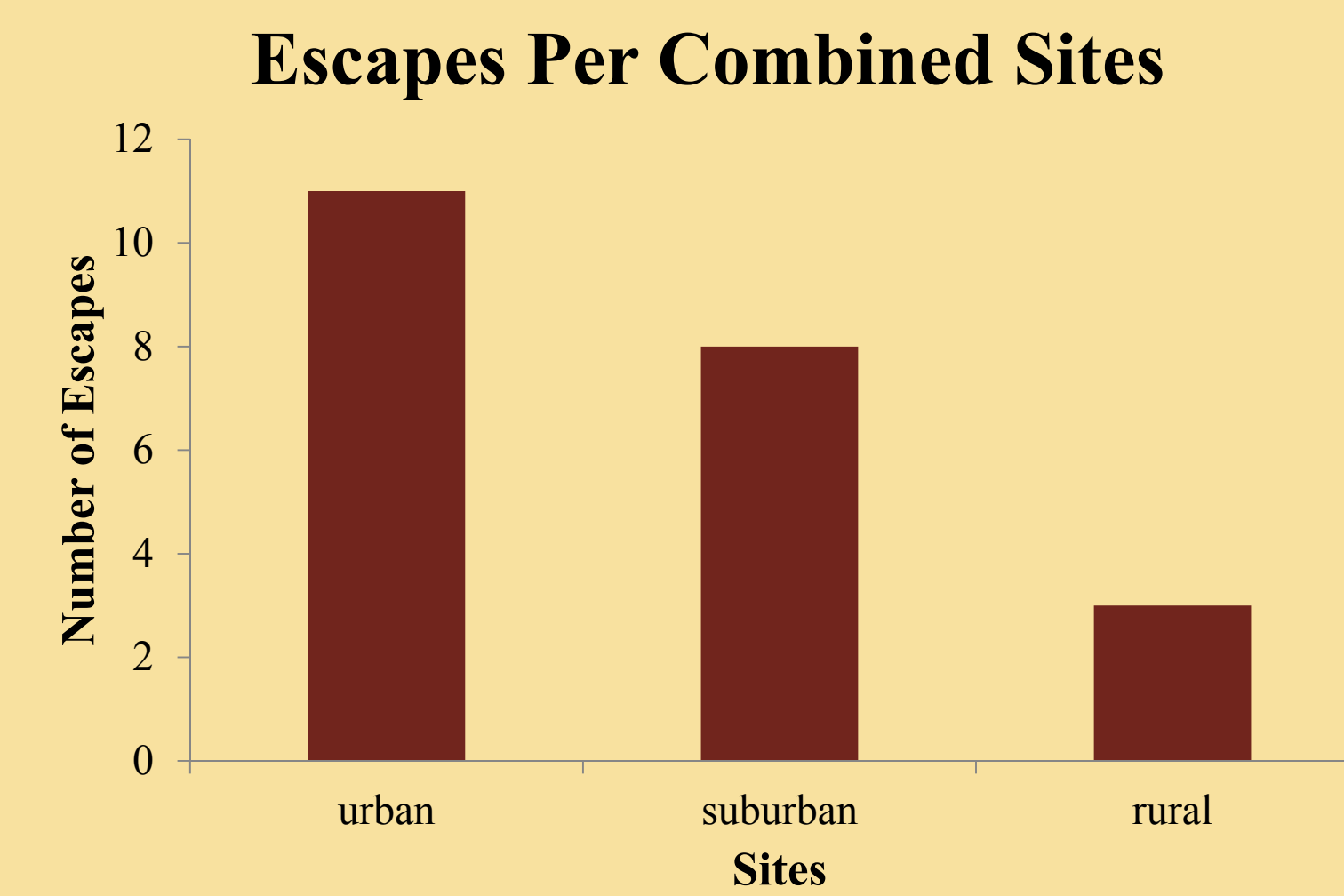
Problem-Solving Ability

Recorded if bird escaped through escape route.

Results



An ANOVA showed significant results ($F = 5.97, df = 5, p = 4.65 \times 10^{-5}$). Tukey's HSD post hoc significant results:
 Chandler v campus $p = 0.043$
 Estrella v campus $p = 2.15 \times 10^{-5}$
 South v campus $p = 0.0025$
 Gilbert v Estrella $p = 0.021$



A chi-squared test revealed significant results between the urban (campus, Phoenix) sites and rural (Estrella, South) sites ($\chi^2 = 4.36, df = 1, p = 0.037$).

Conclusions

Urban birds had lower activity scores and higher problem-solving abilities than rural birds. There were no significant differences in number of stress-related behaviors (feather ruffling, bill wiping). Thus, we cannot definitively say that urban birds experience less stress, but they are better problem solvers and have lower activity levels in the face of that stress, indicating that they may be better at functioning under human-induced stress.

The campus site had significantly higher breath rates than both of the rural sites, which is a physiological measure of stress (Carere and van Oers 2004). There were also significant differences between Gilbert and Estrella populations as well as Chandler and campus. This indicates that the rural populations were experiencing decreased stress in human presence.

Though Gilbert and Chandler have similar populations, Chandler has higher xeric vs mesic landscaping, which may create a more natural environment for the birds. This might explain why Chandler birds had similar behavioral and physiological responses to the rural sites while Gilbert had similar responses to the more urban sites.

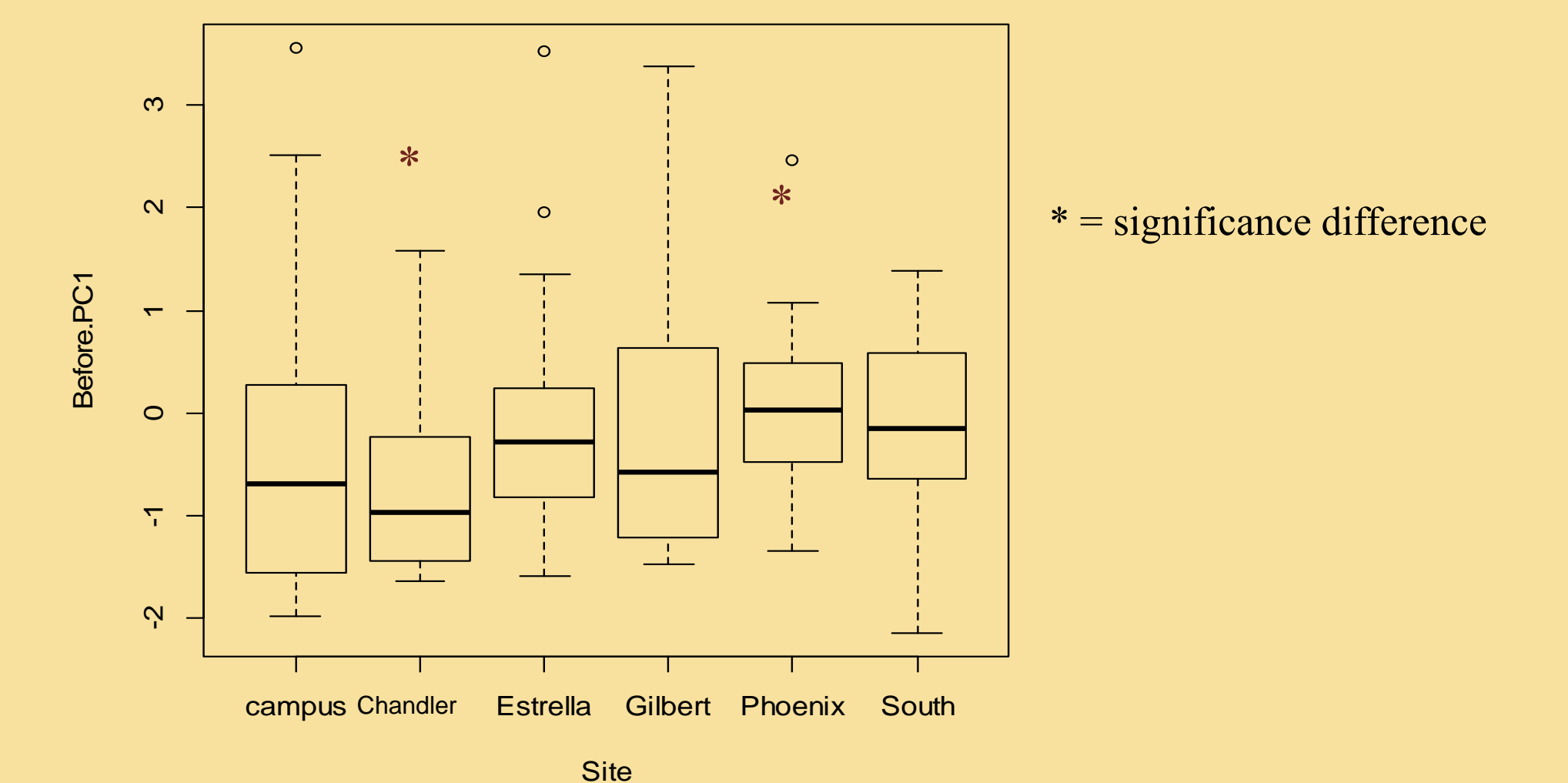
Behavioral Results

Principle Component Analysis; Three Factors Explain 54%

- PC1 (Activity Score):** High hops, flies, approaches, feather ruffles, bill wipes, beak pokes, time on feeder and low time on hide.
- PC2 (Stress Score):** Low hops, flies, approaches, beak pokes, time on hide and high feather ruffles, bill wipes, bill pokes and time on feeder.
- PC3 (Nervous Eater Score):** High hops, feather ruffles, bill wipes, time on feeder and low flies, approaches, beak pokes and time on hide.

Behaviors were calculated as first 20 minutes (prior to human approach), last 10 minutes (after human approach) and relative difference. Values were then analyzed with ANOVA or Kruskal Wallis (activity score), depending on if ANOVA assumptions were met. Significant results were:

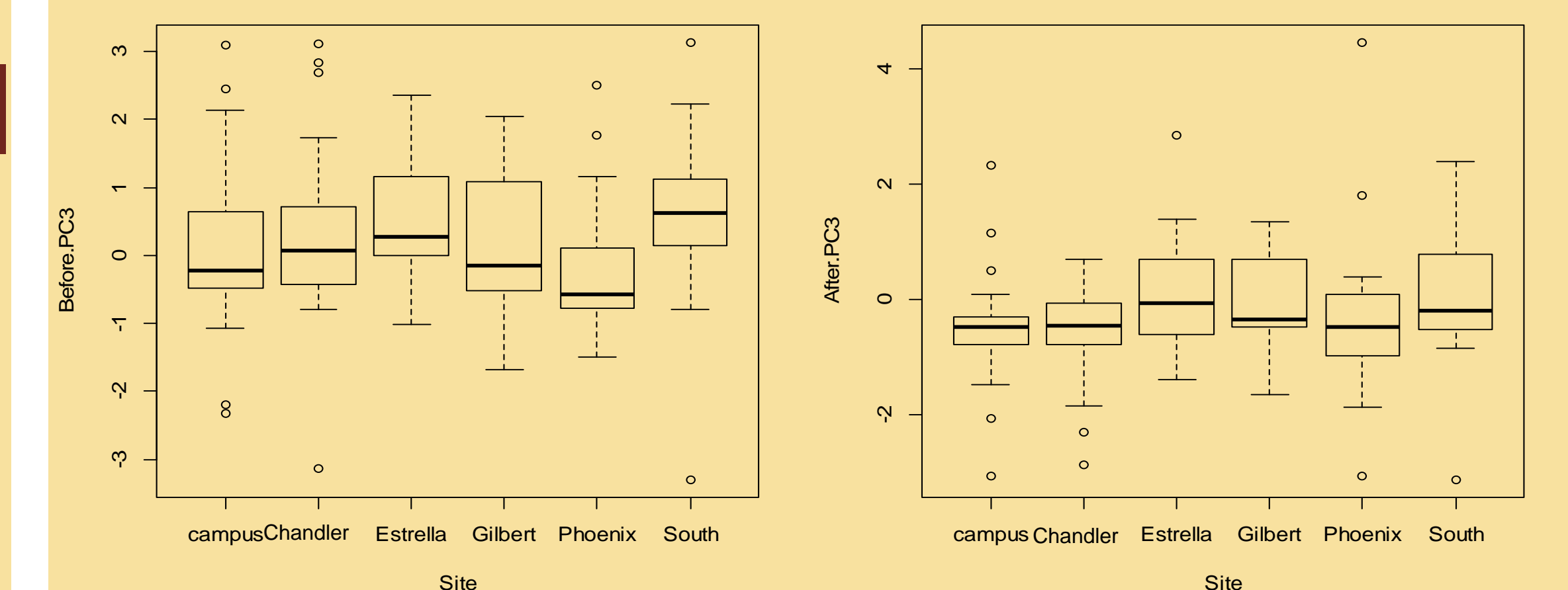
Activity score first 20 minutes ($\chi^2 = 14.31, df = 5, p = 0.014$)



Significance difference between Chandler and Phoenix sites' activity scores in the first 20 minutes, time spent adjusting to the cage environment.

Nervous Eater first 20 minutes ($F = 3.77, df = 2, p = 0.027$)

Nervous Eater last 10 minutes ($F = 3.07, df = 2, p = 0.049$)



Significance difference between urban and rural sites' nervous eater score for both first 20 and last 10 minutes.