

Response to predator scent by house finches across an urban-rural gradient

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Abstract

The world's wildlife currently faces an unprecedented challenge. 2007 marked the first time in history that more humans resided in cities than rural areas (United Nations Population Fund, 2007). Urban areas pose novel environmental challenges to organisms, such as exposure to non-native predators, destruction of native flora, and unfamiliar noise and light pollution (Pardeck et al, 2006). Though urban environments are often considered safer for native animal populations due to fewer natural predators, urban animals face new types of predators, such as cats, that may change behavioral responses. To determine if populations of urban and rural house finches (*Carpodacus mexicanus*) respond differently to urban predator scent, we captured house finches from one of four sites labeled either urban or rural based on distance from the Phoenix center and observed behavioral responses to the scents of cat (predator), hamster (nonpredatory mammal), and water (control). However, we found no significant difference in how urban and rural populations responded to scent, indicating that cats may be a serious threat to urban house finch populations or that they predate equally on urban and rural populations.



Introduction

Why do some animal populations avoid urban areas while others appear to thrive?

Phoenix 's rich diversity of city and desert/mountain areas allow us to study behavioral differences in these populations.

Do Urban Birds Face Different Predators?

A bird's ability to detect predators improves its chances of survival. Tomialojc (1982) proposed that urban bird populations enjoyed decreased risk of native predators; however, domesticated predators, such as cats, were not taken into consideration.

Can Birds Detect Scent?



Birds are largely visual, using sight to detect predators. However, visual detection may not be effective in urban areas where there are more ground predators and more places to hide.

Roth et al (2008) showed that house finches responded to cat scent by reducing time spent feeding and time spent overall on feeders associated with cat scent versus a water control or nonpredatory mammal (rabbit).

We predicted urban birds would show more caution toward cat-scented feeders.

Study Sites



A = Campus; B = Estrella; C = Phoenix; D = SMtn

Methods



Undergraduate assistant Melanie Mousel places 20mL of the water control inside the feeder box, which was soon to be covered by the mesh covering and sunflower seeds in a pet dish.



A male house finch was scored on time of first land, time spent on feeder, time spent eating and time spent displaying vigilance behavior. Lands on the edge of the pet dish to eat sunflower seeds.

Study System: House Finches

❖ Male house finches were captured at four sites, deemed urban or rural based on distance from city center for a sample size of:

- ❖ 10 campus (urban)
- ❖ 9 Estrella Mountain (rural)
- ❖ 11 Phoenix (urban)
- ❖ 10 South Mountain (rural)

❖ House finches are a seed-eating passerine that feeds on both ground and in foliage, making them vulnerable to both air and ground predators.

Predator System: Scent

❖ There were three trials per bird:

- ❖ **Cat:** Cat feces from domestic cats blended with distilled water
- ❖ **Hamster:** Hamster feces from captive PetCo hamsters blended with distilled water
- ❖ **Control:** Distilled water

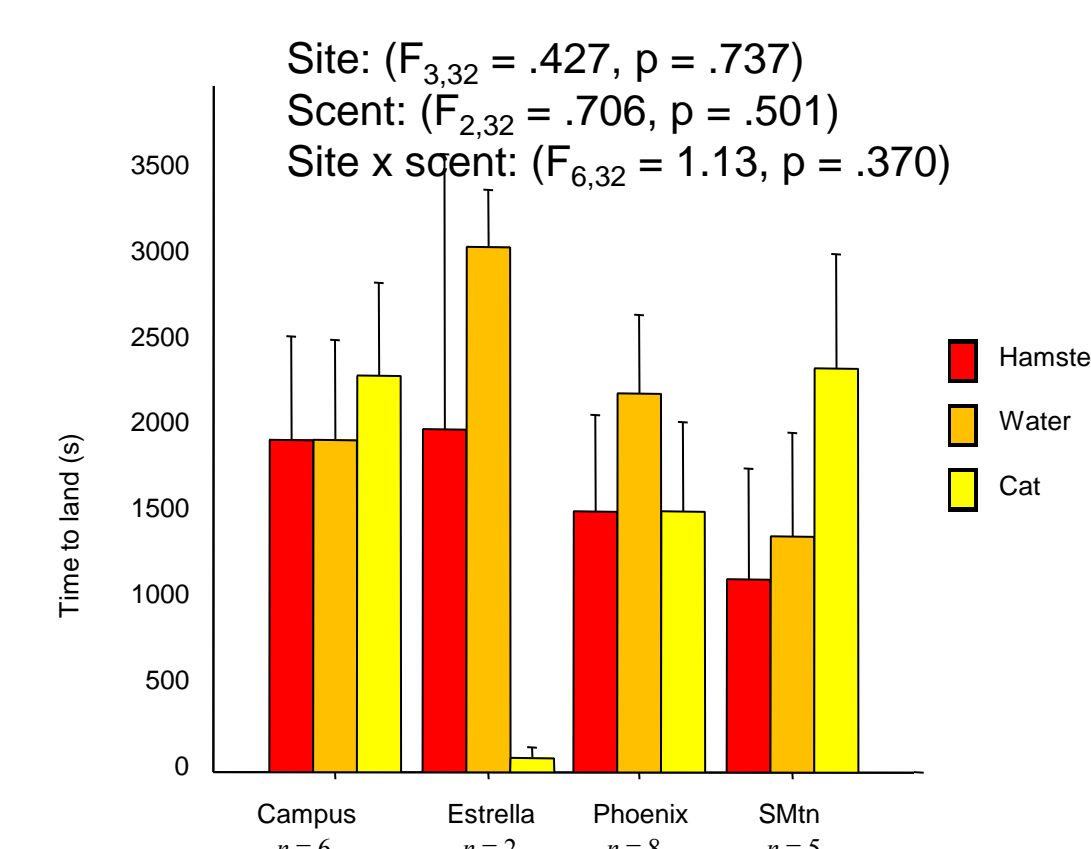
❖ A feeder was constructed from Tupperware and was placed on the ground and covered with hardware cloth and air filter, which blocked visual access but allowed scent to permeate.

Trials

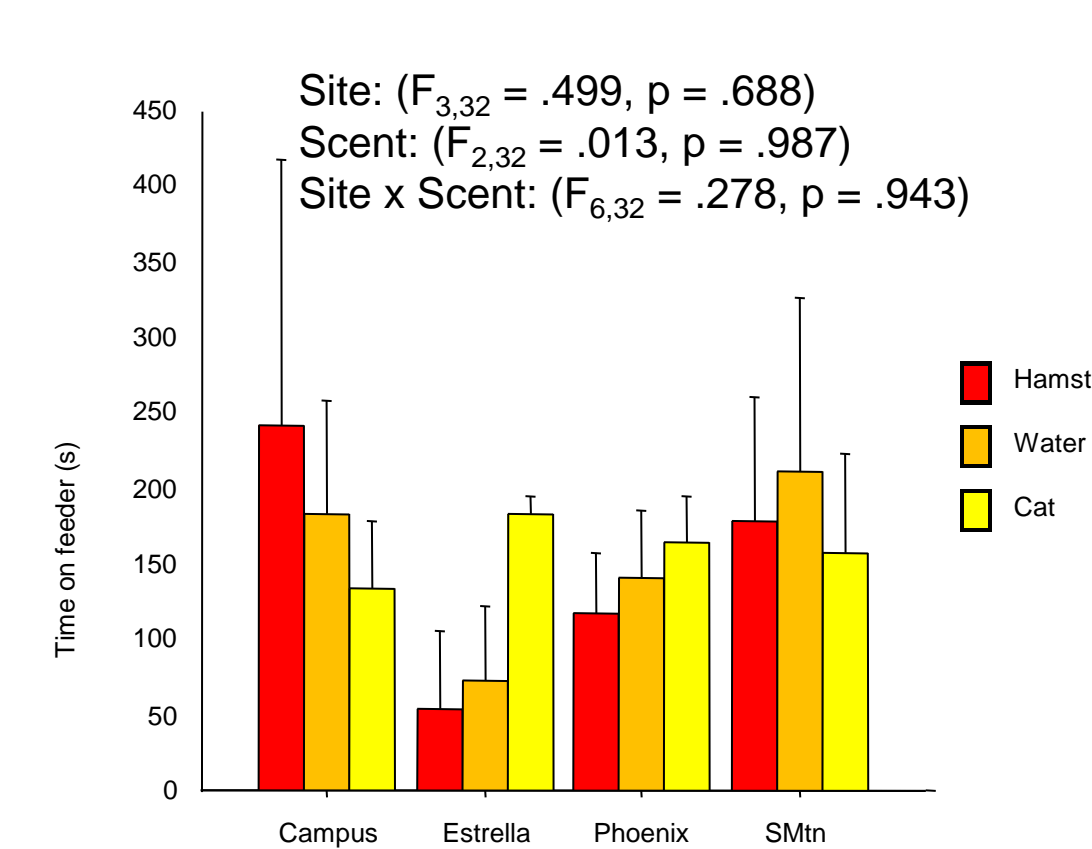
- ❖ Birds were randomly assigned both order of trials and time of day for each trial.
- ❖ Hour-long trials were run between 6 and 10 a.m.
- ❖ Birds were scored for four behaviors:
 - ❖ Time to first land on the feeder
 - ❖ Time spent on the feeder
 - ❖ Time spent eating while on the feeder
 - ❖ Time spent displaying vigilance behavior on feeder

Results

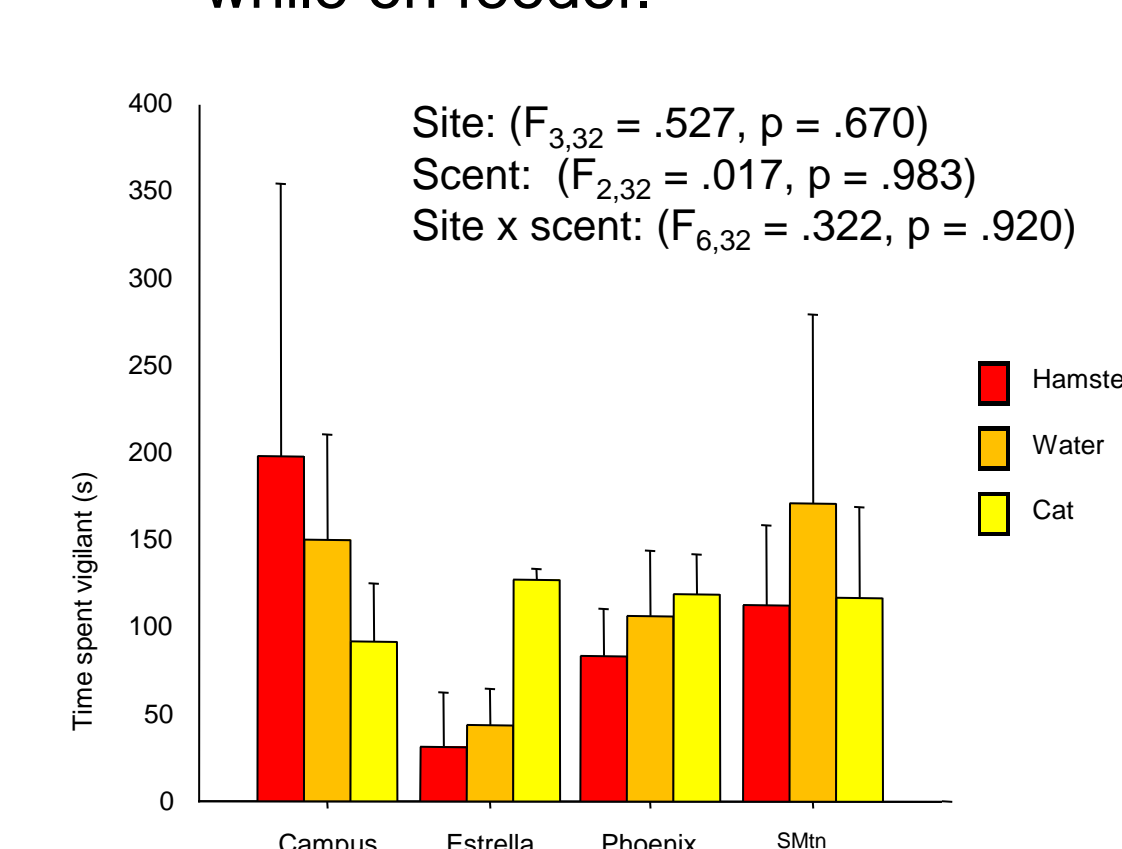
No significant effects of site and scent type on time to first land.



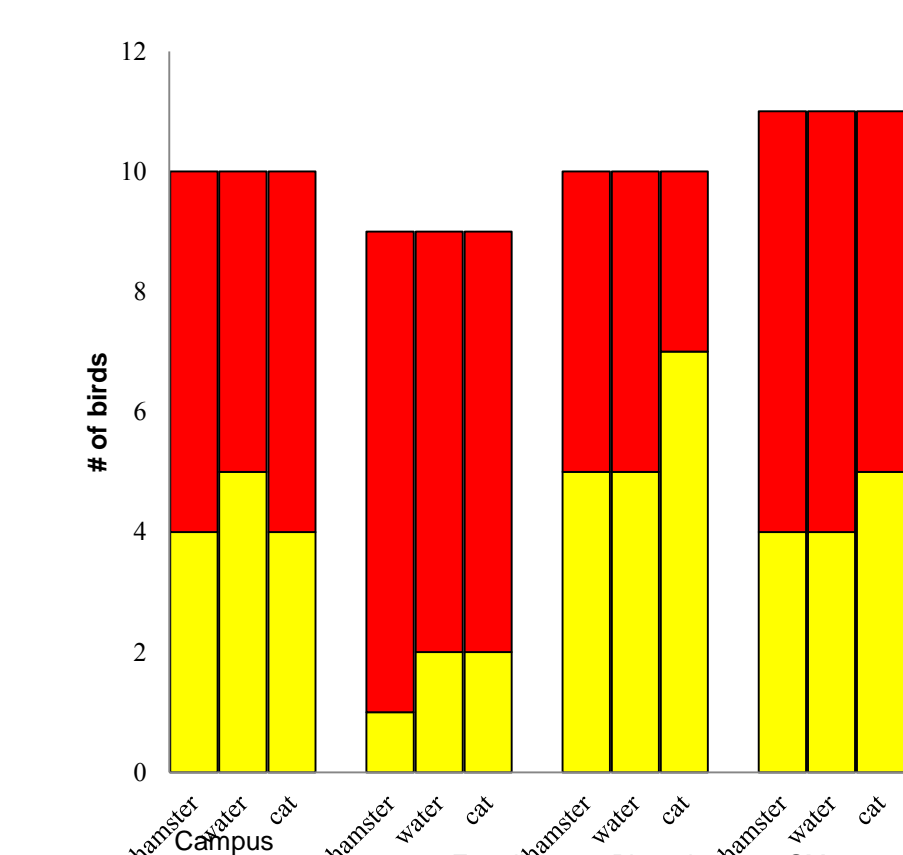
No significant effect of site or scent type on time spent on feeder.



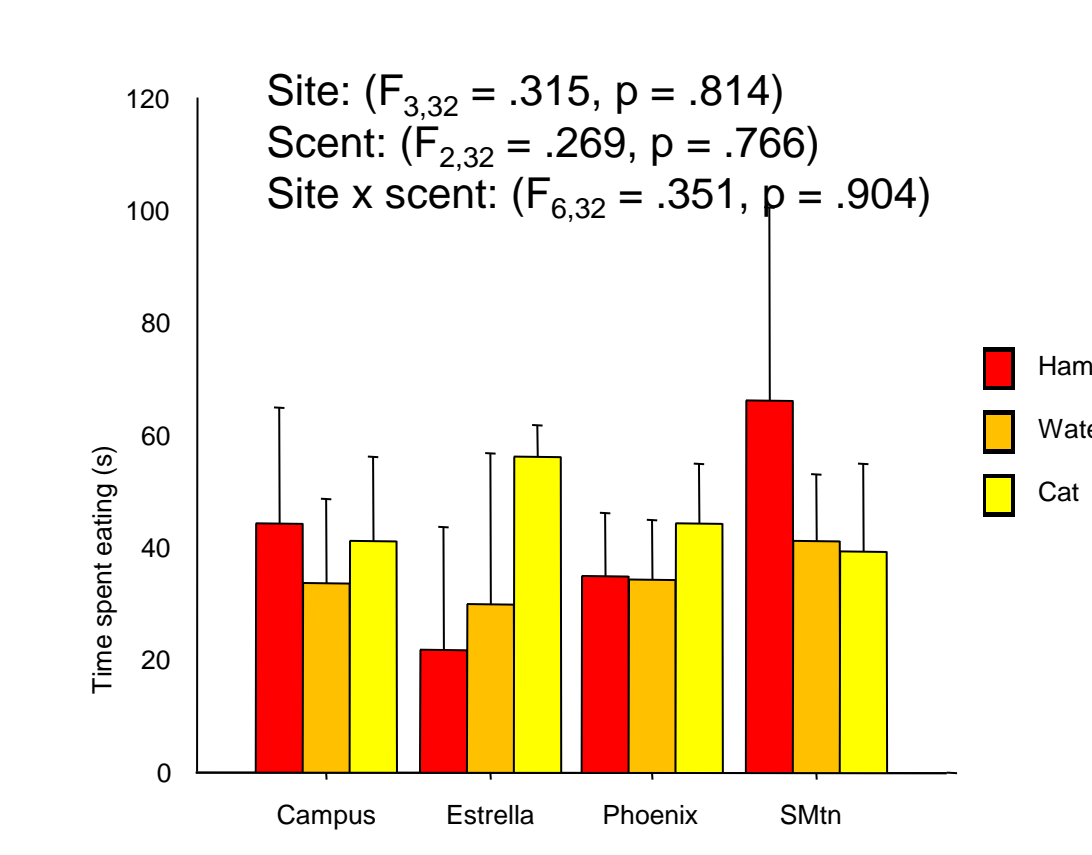
No significant effect of site or scent type on time spent vigilant while on feeder.



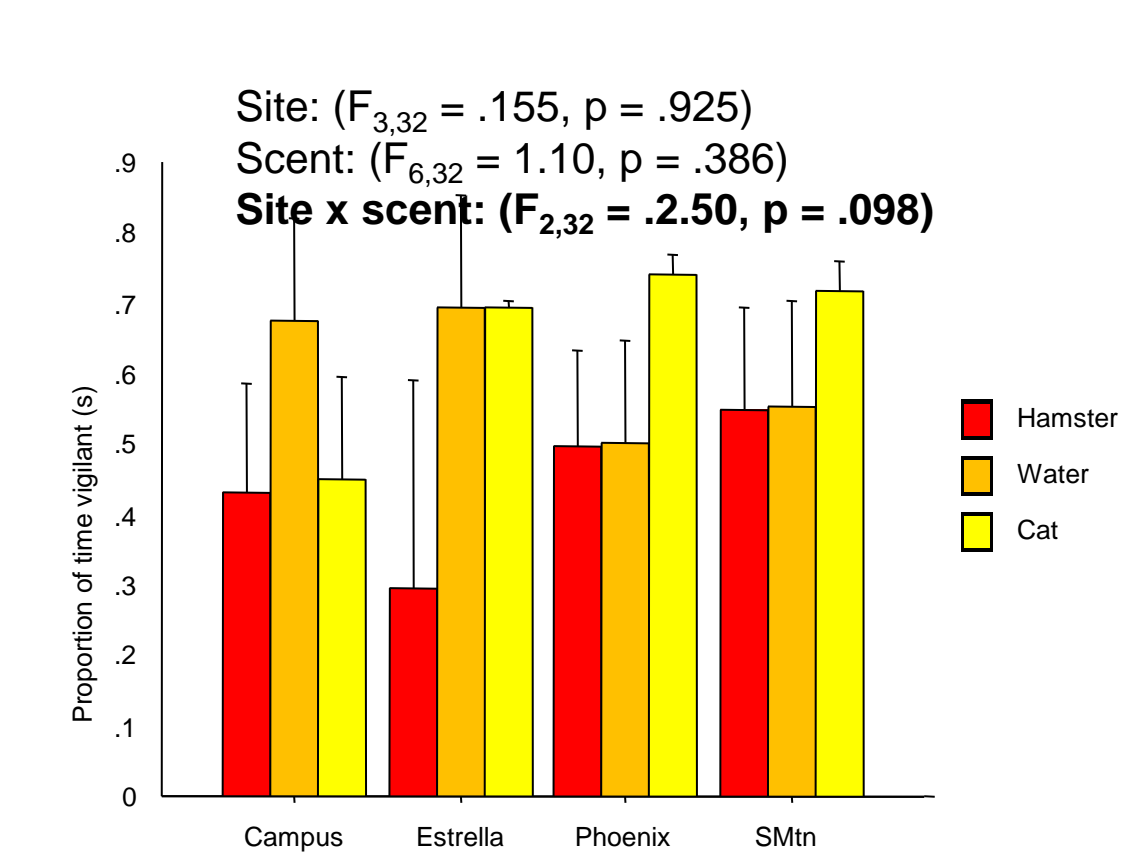
No statistical effect of site for birds landing on feeders, except pairwise comparison ($p = .037$) between Phoenix (closest to urban center) and Estrella (furthest).



No significant effect of site or scent type on time spent eating while on the feeder.



No significant effect of site or interaction between site and scent on proportion of time spent vigilant while on feeder, but there was a significant tendency for scent.



Conclusions

Why Conflicting Results?

Roth et al (2008) found that house finches responded to predator scent, spending less time eating and less time overall on cat-scented feeders. Our results differed. Why?

Why No Effect of Site?

- ❖ Cats may be predators in both urban and rural areas. Only significant difference was seen between most rural population (Estrella) and most urban (Phoenix).
- ❖ Study was run during molt rather than winter as Roth et al (2008).
- ❖ Fokidis et al (2009) found a substantial increase in corticosteroids in both rural and urban Phoenix songbirds during molt, the only time of year the two populations had similar cort levels.
- ❖ Both Swaddle and Witter (1997) and Haukioja (1971) recorded decreased behavior and increased anti-predatory response for passerine species during molt as we saw fewer behaviors than expected among our birds.
- ❖ Birds who actually landed on the feeder spent only 1/60th of their time eating from feeders, perhaps indicative of high stress levels.

Why No Effect of Site?

- ❖ Study used a repeated-measures design rather than a cross-sectional study. Possibly, birds became conditioned to the feeder.
- ❖ Roth et al (2008) conducted its study in winter in Indiana. Our study took place in the hottest month on record in Phoenix history.
- ❖ Heat may have caused the birds to be less active overall. Increased stress may have caused increased level of vigilance.
- ❖ Potentially, cats may be a greater threat to house finch populations in Indiana than Phoenix, especially in the summer months when cats may also be less active.

Future Research

An emerging field of research involves how behavior traits affect animal populations. We will investigate which traits differ between house finch populations across an urban-rural gradient. Specifically, we will look at:

- ❖ Boldness/shyness (response to a risky situation)
- ❖ Exploration/avoidance (response to unknown stimulus)
- ❖ Activity
- ❖ Sociality

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