

Effects of Landscaping Type and Predators on Avian Ground Foraging Behavior in Phoenix Parks

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ABSTRACT

Landscaping and land-use practices of humans have a profound impact on local ecological systems. Urban parks are one of the areas where these impacts are easily monitored. This study focused on two factors affecting bird behavior in urban parks in Phoenix: predator density and landscaping schemes. Ground foraging in open areas places individuals at high risk of predation. Accordingly, longer ground foraging sessions and longer distance from cover are expected with lower predator densities. Four xeric parks and four mesic parks were selected from the Phoenix metro area, controlling for differences in mean park size, neighborhood income level, and human population density. We observed foraging behavior for eight weeks in the summer of 2004. We conducted transects for domestic cats around each park. We compared time spent in the open and distance from cover to numbers of domestic cats as well as to presence of raptors and coyotes. Birds foraged on the ground for longer bouts in xeric parks. Cat presence and presence of two or more raptor species was correlated with a decrease in ground foraging times, while coyote presence was correlated with increased ground foraging periods. These preliminary data suggest that mesic and xeric landscapes may differ in predation rates on birds. All of these factors could be very helpful in understanding how choices in human land use can effect local avian populations.

Methods

SITE SELECTION: We selected 4 mesic and 4 xeric parks in Phoenix, defining mesic as entirely lacking xeric vegetation or gravelscapes (Fig. 1a). Xeric parks usually contained an area of irrigated turf surrounded by xeriscapes (Fig. 1b). We controlled for differences in park age, area, distance from urban center and neighborhood income level.

BIRD FORAGING BEHAVIOR: We used two measures of predator anxiety in birds foraging on the ground in open turf areas: **duration of time spent in the open** (by stopwatch) and **maximum distance from cover** (by visual estimate to nearest 5m). We collected the data over six 10-minute observation periods on weekly visits to each park (#visits/park = 7).

CATS & COYOTES: Walking transects were conducted in July 2004, counting cats in the surrounding neighborhoods between 7-9am and 5-7pm (total = 3 visits per park). In 2003, predator censuses were in each parks over 3 successive nights, using baited, motion-triggered cameras.

ANALYSES: We conducted nested ANOVAs with park effects nested within the main effect variable. Park effects were always significant. We present here only statistical results for each of the 3 grouping variables (Figs. 3-5). Letters indicate significant post-hoc paired t-tests

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Hypotheses

1. Parks with xeric landscaping should provide better refugia from predators than predominantly mesic parks due to differences in shrub density.

Prediction: Ground foraging birds should spend more time in open areas and forage farther from cover (lower 'predator anxiety') in xeric-landscaped parks than in mesic parks.

2. Foraging behavior should be depressed by the presence of predators.

Prediction: Birds should show lower anxiety levels in parks with fewer predators and where top predators (e.g. coyotes) suppress mesopredators (e.g. cats).

Fig. 1a – Mesic Parks



Fig. 1b – Xeric Parks



Fig. 3 – Greater predator anxiety in mesic parks.

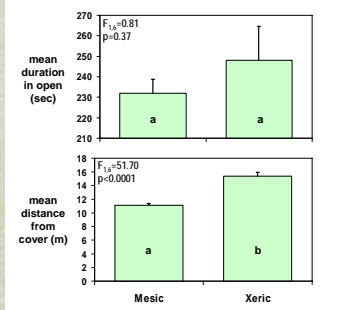


Fig. 4 – Greater predator anxiety with lower shrub density.

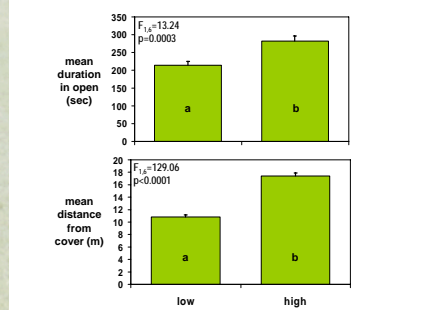


Fig. 5 – Cats depress bird foraging; coyotes facilitate it.

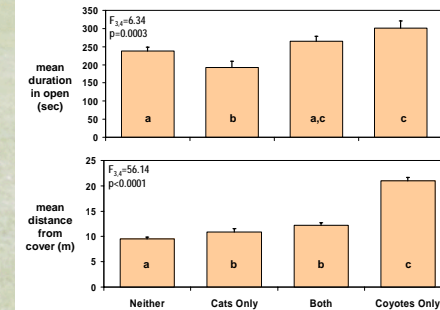


Fig. 2



Results

Birds tended to display greater predator anxiety in mesic parks (Fig. 3), but birds in Palomino Park, a xeric park with low shrub density, cats, and no coyotes exhibited the greatest predator anxiety, i.e. shortest open foraging durations and shortest distances from cover (not shown).

As predicted, both availability of cover (shrubs – Fig. 4) and predator presence (cats/coyotes – Fig. 5) significantly correlated with foraging anxiety. Sample sizes were too small to distinguish between effects of predators versus cover. Cats and coyotes appear to have interacting effects. Raptor presence, however, was a relatively poor predictor of bird foraging behavior (not shown).

Presence of coyotes, to the degree we were able to measure it, appears to have a positive effect on bird foraging behavior, increasing time spent in the open and distance from cover (Fig. 5). We note, however, that 3 of the 4 parks where we detected coyotes were xeric.

Implications: Mesic and xeric urban landscapes appear to differ in both trophic structure and bird foraging behavior. The causes of these differences need to be further investigated, but they could include direct effects on protective cover from predation, indirect effects on habitat for native predators such as coyotes, and incidental effects such as correlations between newer, xeriscaped residential areas and availability of habitat for predators at the landscape level.