No Fry Zones: Birds' Response to Restaurant Distribution in Phoenix Metropolitan Area

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Introduction

Urbanization acts as a selective filter that alters avian communities (Aronson et al. 2014) and mean species abundance and richness (Batáry et al., 2018; Xu et al., 2018). One of the factors that may influence avian distribution is the availability of novel / anthropogenic food sources (Smith and Carlile, 1993). Restaurants act as a predictable anthropogenic food subsidy within urban areas (Oro et al. 2013) and therefore may influence the presence and abundance of avian species.

Methods

This study uses the bird census and land use land cover (LULC) data from the Central Arizona-Phoenix Long Term Ecological Research Project (CAP LTER) as well as business and employment records from the Maricopa Association of Governments (MAG).

1. The number of restaurants within 1 km of bird census counts was measured for all years from 2000-2015.
2. A correlation between the abundance of 138 species observed at census points and the number of restaurants was calculated.
3. Generalized linear mixed models (GLMMs) were used to incorporate the impact of LULC , water availability, and breeding season on bird abundance along with restaurant abundance.
4. Model selection was used to select top models for predicting bird abundance.
5. Results are presented for species that show a significant relationship with restaurants in top models after model selection

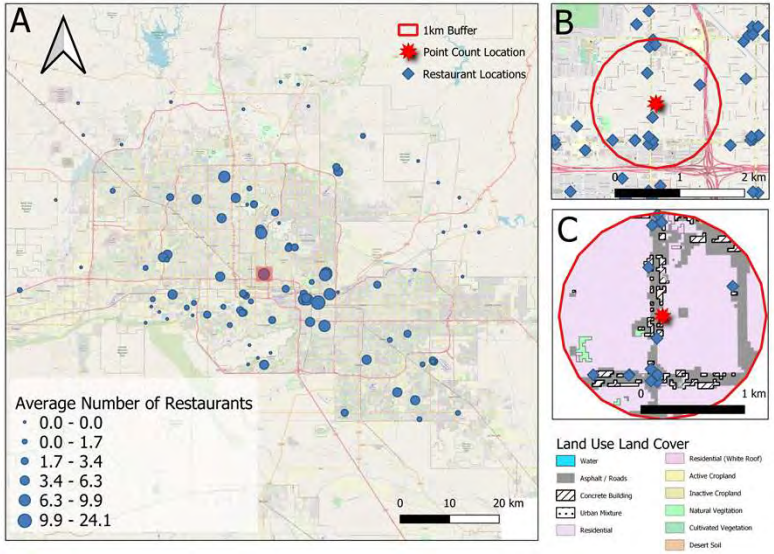

Figure 1: (A) The average number of restaurants within 1km of CAP LTER bird survey points from 2000-2015. (B) The bird survey point (red) is seen along with the 1km buffer and locations of restaurants (blue). (C) Land use land cover (LULC) data from CAP LTER for 2010 is shown along with restaurant locations.

Results

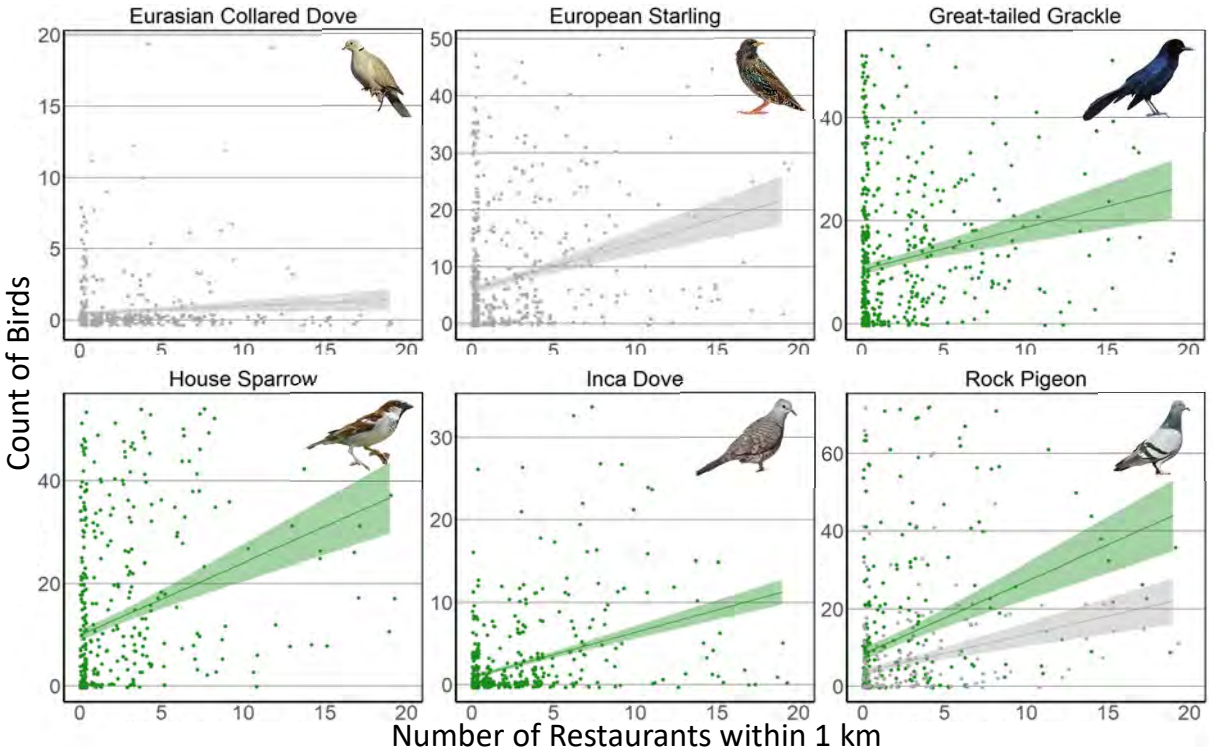

Figure 2: Six species show a significant relationship with restaurants in the top models. The relationship with restaurant abundance varied by breeding (green) and non-breeding (gray) season with only rock pigeons showing a significant relationship in both seasons.

Averaged equations from GLMM selection for each species abundance during the breeding season (green) and non-breeding season (gray). Subscript represents sum of variable weight. Only significant (* p < 0.05) or near significant (· p < 0.1) are shown.

*Great-tailed Grackle Abundance ~ Active Cropland$_{0.67*}$ + Natural Vegetation$_{0.63*}$ + Residential Land$_{1*}$ + **Restaurants$_{0.58*}$***

*House Sparrow Abundance ~ Residential Land$_{1*}$ + **Restaurants$_{1}$**. + Urban Mixture$_{0.82*}$*

*Inca Dove Abundance ~ **Restaurants$_{0.77}$**.*

*Rock Pigeon Abundance ~ Cultivated Vegetation$_{0.73}$. + Residential Land$_{0.91*}$ + **Restaurants$_{1*}$** + Urban Mixture$_{0.56}$.*

*European Starling Abundance ~ Residential Land$_{1*}$ + **Restaurants$_{.53*}$** + Urban Mixture$_{1*}$*

*Eurasian Collared Dove Abundance ~ Concrete / Building$_{0.83*}$ + Residential Land$_{0.52}$. + **Restaurants$_{0.77}$*** + Urban Mixture$_{1*}$*

*Rock Pigeon Abundance ~ **Restaurants$_{1*}$** + Urban Mixture$_{0.78}$.*

Conclusion

Restaurants may shape urban avian communities by providing supplemental food sources. Restaurants may be especially important to the success of non-native species as five of the species related to restaurant abundance are non-native. Whether higher restaurant abundance also results in greater community stability is still to be tested.

Award #1832016