Gambel's Quail, *Callipepla gambelii*, in urbanized environments have elevated body mass and plasma lipids

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Introduction

- Birds naturally have higher blood sugar concentrations than mammals.[1]
- Many households provide bread and seeds for wild birds.[2]
- Human wastes are often unintentional food sources for wild animals living in urban environments.
- Differences in resource availability between urban and rural environments may have physiological and morphological effects on wild birds.

Hypothesis

Urban Gambel's Quail would be larger and would have higher triglyceride and glucose concentrations compared to rural birds.

Methods

Animals
- Adult male Gambel's quail (*C. gambelii*) were captured using Potter traps.
- Blood samples were collected from the jugular vein immediately after capture.
- Birds were released at each capture site after measurement of morphometrics.

Environment
- Temperature data was recorded.
- Land use and land cover (LULC) types within a 1-km radius around the 7 sampling locations were characterized using satellite imagery.
- Principal component analysis (PCA) was used to create an urbanization index

Blood analyses
- Plasma triglycerides and free glycerol were measured using a commercially available kit (TR0100; Sigma Aldrich, St. Louis, MO).
- Plasma total protein concentrations were measured according to the Bradford method (BioRad, Hercules, CA).
- Plasma glucose concentrations were measured using a kit (10009582; Cayman Chemical, Ann Arbor, MI).

Statistical Analyses
- Spearman correlations GraphPad Prism 5.0.

Results

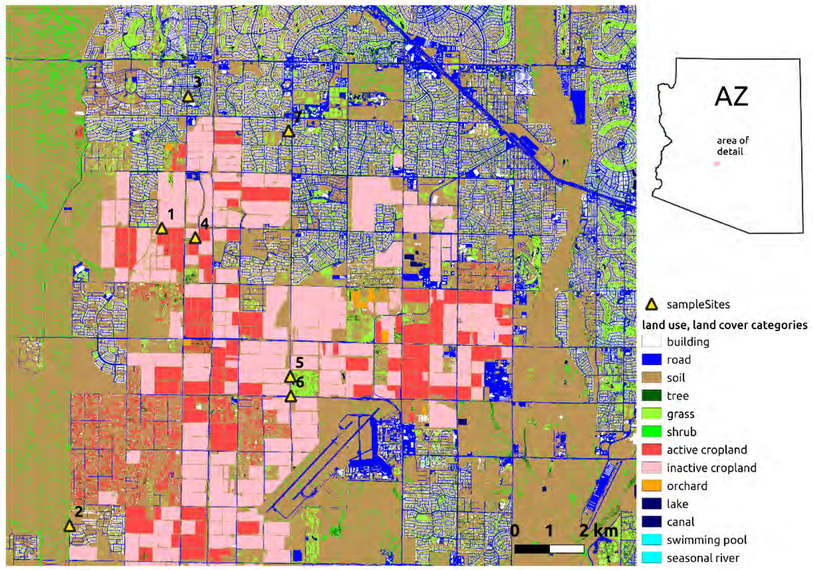

Figure 1: Map of the study area with land use and land cover categories denoted.

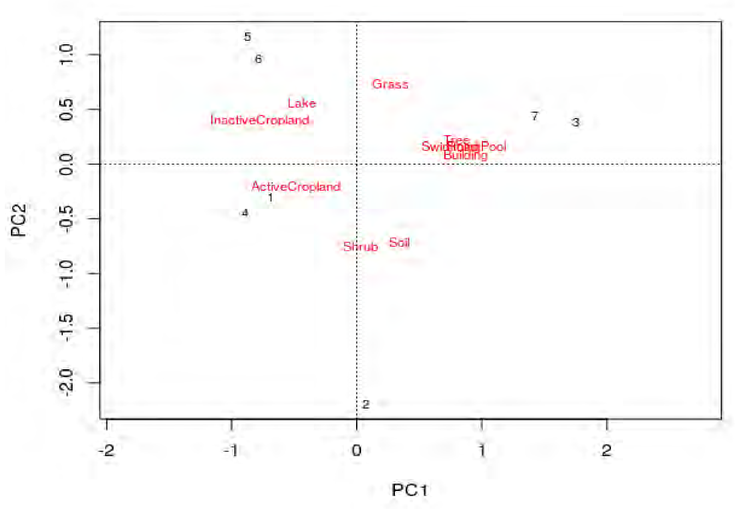

Figure 2: Principle Component Analysis (PCA) showing PC1 is positively associated with buildings, roads, and swimming pools whereas PC2 is positively associated with grass and lakes (urban features).

Results

Table. Results from Spearman's Correlations

Variable	PC1		PC2	
	r	p-value	r	p-value
Air Temperature	0.441	**0.0396**	-0.682	**0.0004**
Body Length	0.654	**0.0010**	-0.676	**0.0005**
Body Mass	-0.306	0.1620	0.337	0.1240
Chest Circumference	0.510	**0.0155**	-0.193	0.3830
Plasma Free Glycerol	0.129	0.5610	-0.460	**0.0310**
Plasma Triglycerides	0.456	**0.0329**	0.124	0.5750
Plasma Protein	-0.241	0.2750	0.388	0.0733
Plasma Glucose	0.086	0.7020	0.110	0.6210

Bold numbers indicate significant relationship.

Discussion

- Quail captured from areas with higher indices of urbanization were larger and had higher circulating triglycerides than birds captured less developed locations (Table).
- Similarly, birds captured from areas with more grass had higher plasma protein and lower free glycerol concentrations (Table).
- Quail living in more urbanized areas appear to be in better condition than quail inhabiting less urbanized areas, suggesting that differences in food availability between these areas may be beneficial.

Acknowledgements

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References

1. EJ Braun, KL Sweazea. Glucose regulation in birds. Comp Biochem Physiol B Biochemo Mol Biol. 151(1): 1-9, 2008.
2. JA Galbraith, JR Beggs, DN Jones, MC Stanley. Supplementary feeding restructures urban bird communities. Proc Natl Acad Sci. 112: E2648-E2657, 2015.