

The effects of urbanization on scorpion populations, reproduction, and predation in the Phoenix Valley, Arizona

Introduction

- Urbanization can substantially influence patterns of landscapes, species, and communities. In particular, communities are predicted to change across the gradient of urbanization, where some species increase, and other species decrease.
- Scorpions are an important group of species across the desert southwest, both ecologically and socially. However, relatively little is known how scorpion populations vary across the gradient of urbanization in the Phoenix Valley, Arizona.
- Although research has evaluated reported sting data (McIntyre 1999), no studies have evaluated how urbanization affects individual scorpion species in the field.
- **The objective of this project** was to evaluate the scorpion community across the Phoenix Valley. Specifically, we evaluated changes in (1) the occurrence of scorpion species, (2) scorpion reproduction, and (3) prey items of scorpions across the gradient of urbanization.

Methods

- To sample scorpion species (Fig 1), we conducted walking transects (560 m long) with UV lights at 50 CAP sites across the Phoenix area (Fig 2). Each site was sampled 3 times during the summer of 2019.

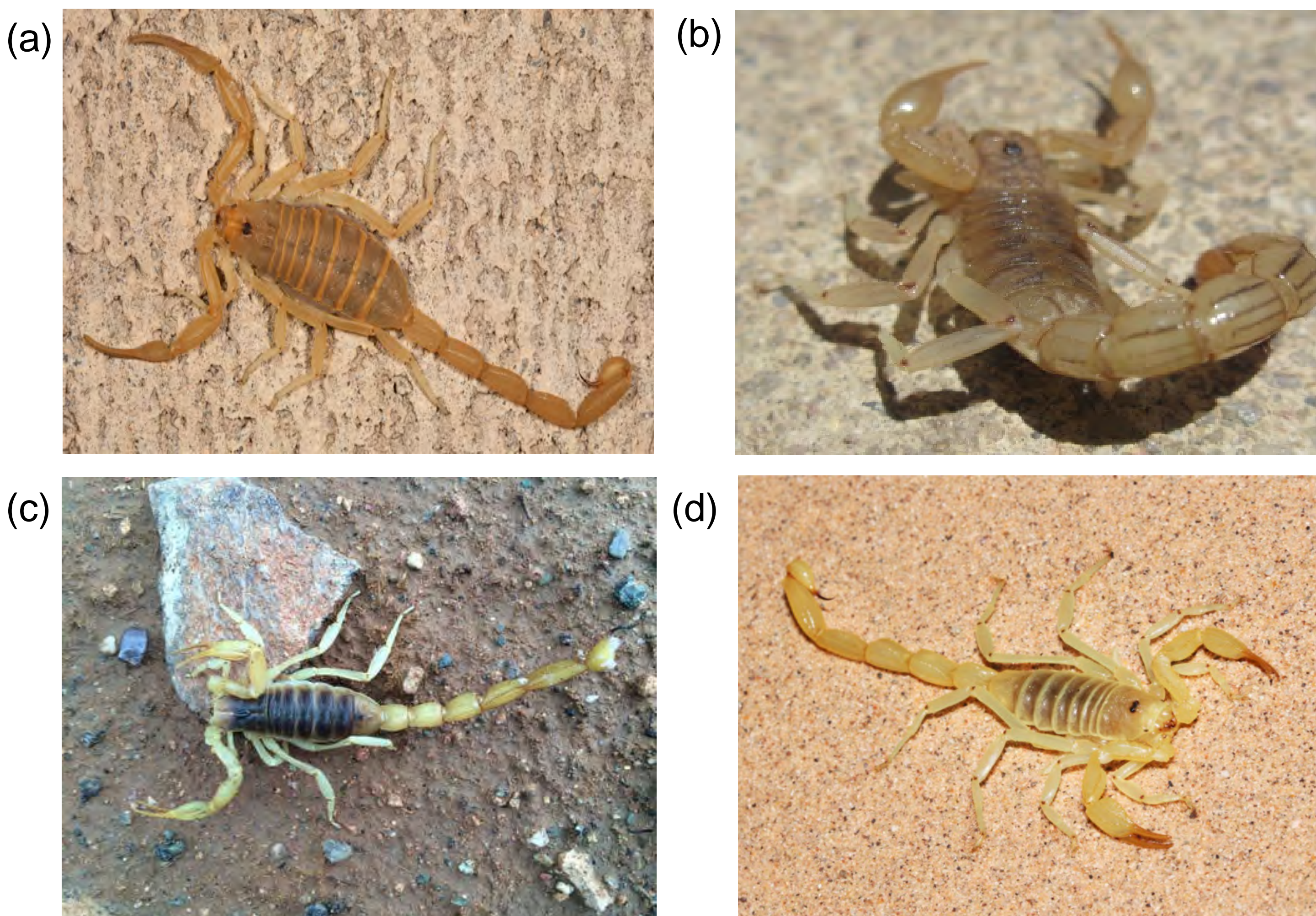
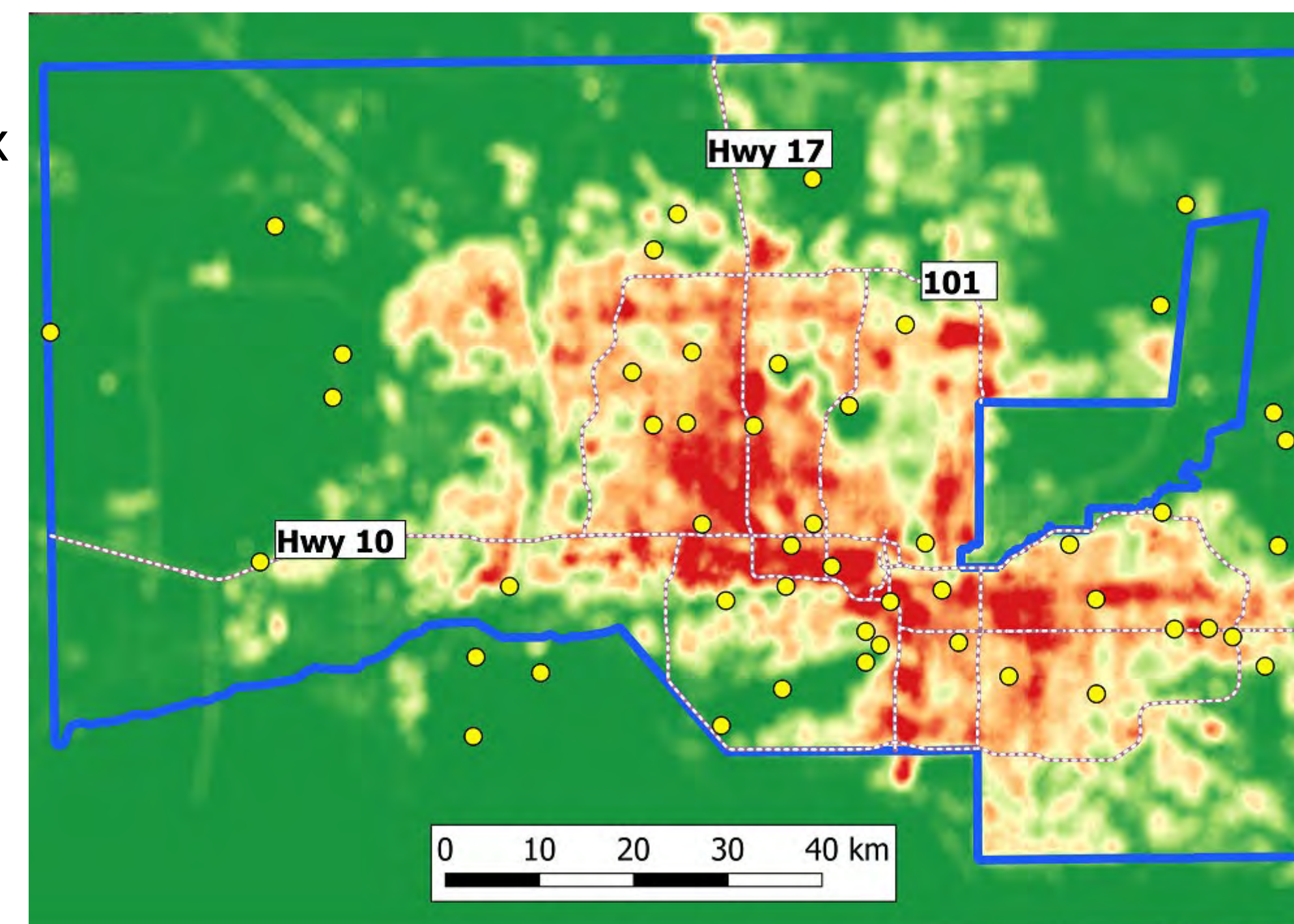


Fig. 1: Scorpion species sampled in the Phoenix Valley, AZ, including (a) bark, (b) stripe-tailed, (c) giant desert hairy, and (d) yellow.

Fig. 2: Study area across the Phoenix Valley, AZ where scorpions were sampled across the gradient of urbanization from low (green) to high (red) urban intensity. The blue line represents the CAP LTER boundary.



Results

- As urbanization increased, bark scorpions increased in prevalence, and other scorpion species decreased (Fig. 3).
- Bark scorpions with offspring increase with urbanization (Fig. 4).
- Bark scorpions with prey were observed across the gradient of urbanization (Fig. 5)

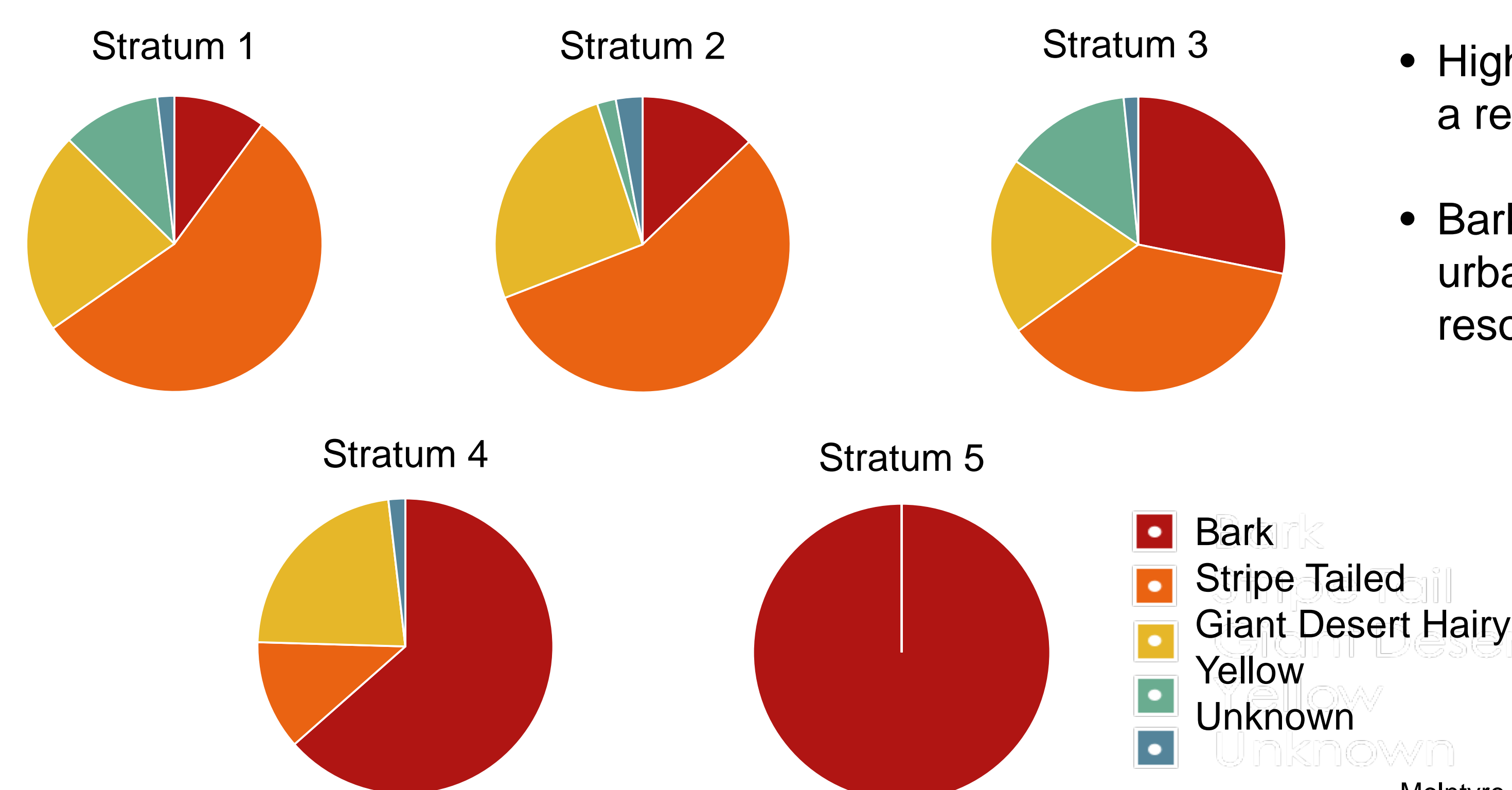


Fig. 3: Pie charts reporting the number of individuals for each scorpion species that were found across the gradient of urbanization in the Phoenix Valley. Stratum 1 was the least urbanized and stratum 5 was the most urbanized.

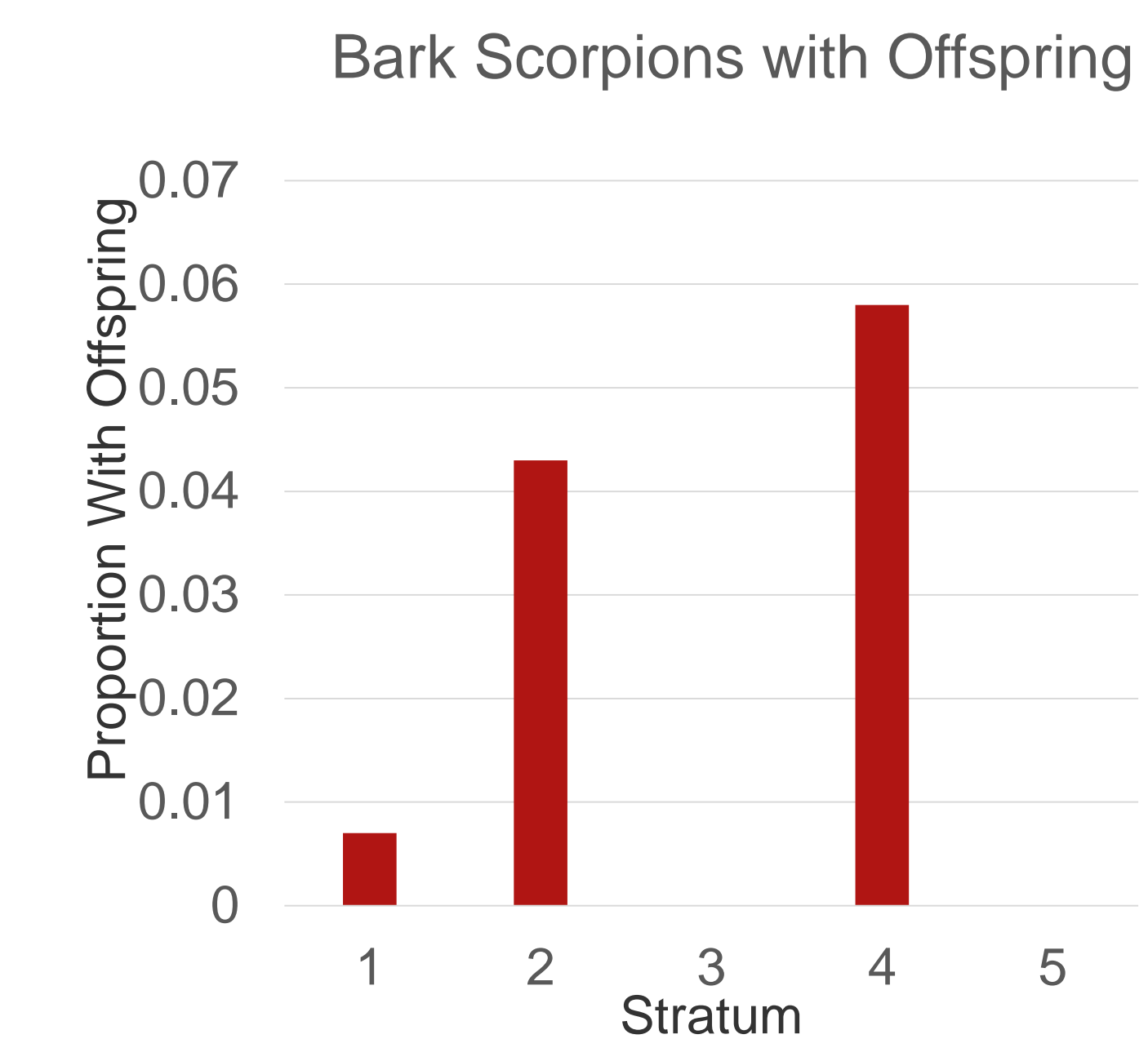


Fig. 4: Proportion of bark scorpions with offspring from low urbanization (stratum 1) to high urbanization (stratum 5).

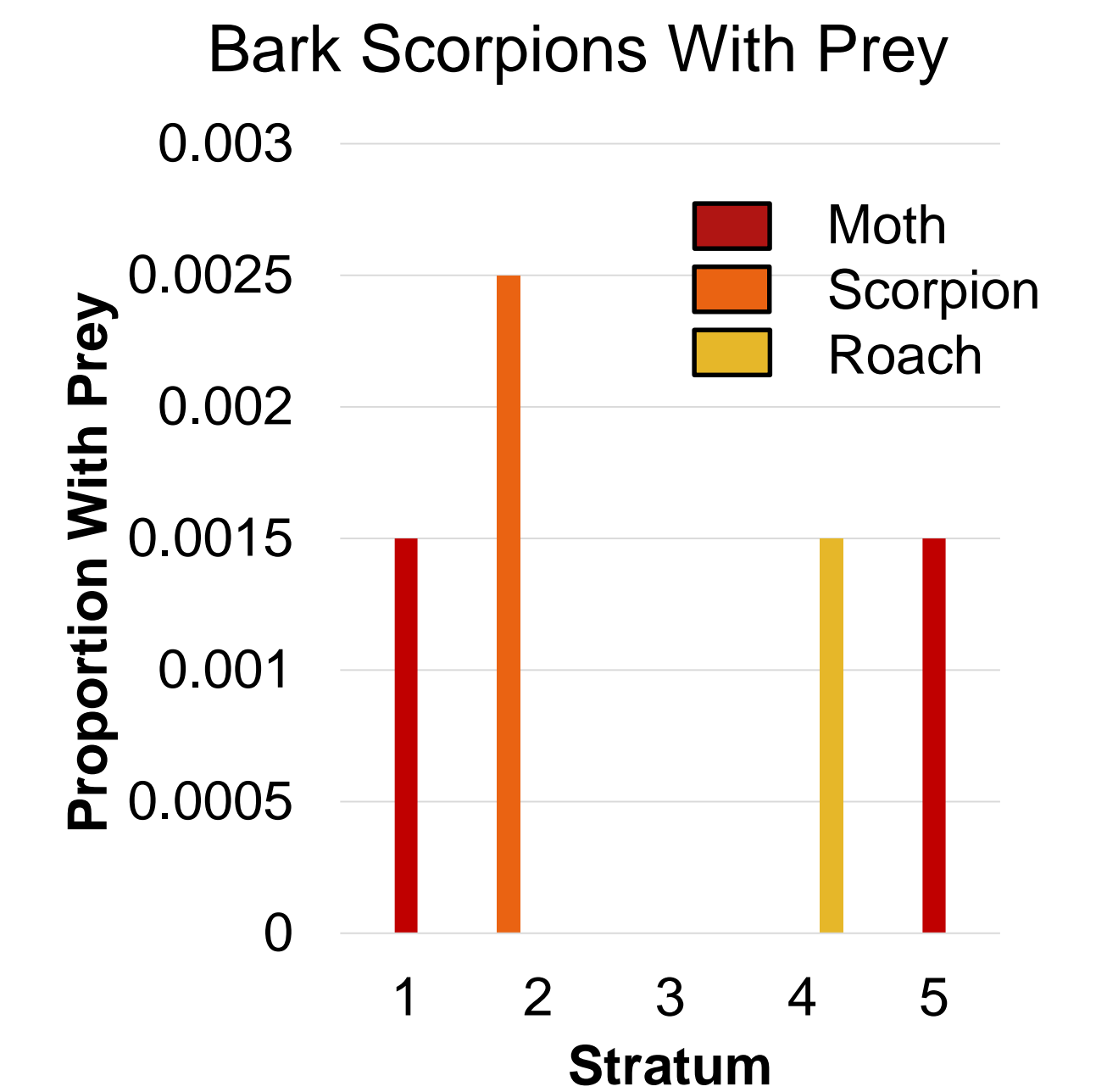


Fig. 5: Proportion of bark scorpions with prey from low urbanization (stratum 1) to high urbanization (stratum 5).

Conclusions

- Urbanization dramatically changed the scorpion community across the Phoenix Valley.
- Bark scorpions were the only species found in highly urbanized areas, and are largely responsible for stings of people, which can be very painful.
- High populations of bark scorpions in urbanized areas could potentially be a result of reduced competition with other scorpion species.
- Bark scorpions might have exhibited higher reproduction in highly urbanized areas, which could be a result of abundant food and cover resources.

Literature cited and acknowledgements

McIntyre, N. E. (1999). Influences of urban land use on the frequency of scorpion stings in the Phoenix, Arizona, metropolitan area. *Landscape and Urban Planning*, 45(1), 47–55. doi: 10.1016/s0169-2046(99)00021-3

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