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Does urbanization drive variance in bee traits? An examination of desert bee body weight in urban and rural habitats



Fig 2: The UHI measures the difference in temperature between cities and their surrounding wildlands

Avoider	Wonga Pigeon
Avoider	- Ann
Adapter	Eastern Spinebill
Adapter	
Exploiter	Rainbow Lorikeet
Exploiter	· ····
Lithanization level	Lithanization (night-time lights)

Fig 3: Urban species tend to fall along a continuum of urban tolerance (Avoider → Exploiter; Callaghan et al. 2019)



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Albuquerque," n.d.) vs surrounding

wildlands (bottom)



Fig 5: a generalist bee feeds on a dandelion (Katy, 2019).



Fig 6: a specialist bee feeds on an orchid (Sedore, 2018). Note smaller size.

The Importance of Urban Ecology

- The world is becoming increasingly urban as shown at left (Sanderson 2009).
- Yet most ecological studies have focused on "wildlands", which are disappearing
- We still don't know if urban areas "break ecological rules" based on studies of these wild areas
- We do know that cities are warmer & drier than surrounding wildlands, as measured by Urban Heat Index (UHI) (Imhoff et al., 2010)

Traits associated with urbanization

- Generalists are more common than specialists
- Smaller types of animals, but larger individuals
- Thermal tolerance biased towards hot conditions created by cities

Cities vs. wildlands in deserts

- During the day, desert cities are cooler than wildlands
- At night, cities do not cool down, so they are hotter than desert wildlands
- Desert cities more humid than wildlands

Responses of desert bees to urbanization

- Diet homogenization of plant life causes species which feed on multiple generalist plants like dandelions to fare better than species which feed only on one or two specialist plants like orchids
- Size larger due to higher presence of invasive and/or generalist bumblebees and honeybees
- Nesting cavity-nesting species outnumber ground-nesting species due to impenetrable surfaces like concrete obscuring the soil (Hernandez et al., 2009)
- Degree of sociality social bees are more common than solitary bees because sociality increases species' adaptability in a rapidly changing environment like a city (Banaszak-Cibicka and Żmihorski, 2012)

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Results









Future Directions

• Identify species-level traits for nesting behavior, feeding preferences, & sociality in order to map

Broader goal: use this and other current and future data to understand how urbanization influences