INTRODUCTION

- We are interested in the effect of urbanization on the behavior, ecology and evolution of organisms.
- Urban, built structures (e.g. concrete) retain heat and result in the Urban Heat Island (UHI) effect [1].
- Nevertheless, urban pests thrive in the face of this environmental change despite temperature increases involving metabolic costs [2].
- Black widow spiders (Latrodectus hesperus) from urban Phoenix experience a 6°C UHI (33 v 27°C) relative to desert counterparts, drastically slowing spiderling development (In prep.).
- Sibling cohorts routinely exhibit a great deal of variation in their cannibalistic behavior, a behavior that likely has population growth implications [3].
- Here we ask whether UHI temperatures influence cannibalism, and whether urban and desert lineages respond to the UHI differently.

METHODS

- Urban areas were classified as within city limits and in proximity to urban development (e.g roads, industry, ...).
- Desert areas were classified as relatively undisturbed desert habitats at least 15 km outside of city limits.
- Egg sacs were collected from 6 urban and 7 desert females and isolated for 31 days at 23°C.
- Juvenile spiders were divided into groups of 5 siblings and placed into a clear acrylic box (4.1 x 4.1 x 5.7 cm)
- Boxed groups were split into 27° and 33°C incubators for an average of 12 replicates per treatment group.
- These treatments mimic the average daily temperature in July of desert (27°C) and urban (33°C) black widow habitats (In prep.).
- Survivorship was scored daily and cannibalism was confirmed by the presence of silk wrapping.

RESULTS

- Family of origin had a significant effect on time to 40% cannibalism (F1,298=50.63, p<0.001) (Fig 1) and time to 80% cannibalism (F1,298=15.92, p<0.001). Family wide averages were used for subsequent statistical analysis.
- Desert lineages were quicker to reach 40% cannibalism than urban lineages (F1,298=6.40, p=0.019), while temperature showed no significant effect on this measure (F1,298=1.61, p=0.217) (Fig 3).
- 33°C treatments were quicker to reach 80% cannibalism than 27°C treatments (F1,298=8.133, p=0.009), while habitat of origin showed a marginally non significant quickening of cannibalism in the desert group (F1,298=3.826, p=0.063) (Fig 4).

DISCUSSION

- Desert spiders cannibalized faster than urban spiders suggesting urban spiders are more tolerant of siblings.
- The increased social tolerance of urban spiders may explain the severity of urban widow infestations (e.g. web sharing).
- Perhaps the prey abundance typical of urban widow habitats [4] has selected for less cannibalistic spiderlings.
- Increased cannibalism after exposure to UHI temperatures suggests urbanization may actually limit black widow population growth.
- Mechanistically, increased metabolic demands associated with higher temperatures may explain increased cannibalism at UHI temperatures [4].
- Again, higher prey density in urban environments [5] may compensate for the UHI metabolic demands and allow urban infestations to occur.
- Future studies should compare UHI survivorship between desert and urban lineages across a realistic continuum of food limitation.

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LITERATURE CITED