

Urban pest and invasive species behavioral differences: the web building and foraging aggression of two widow spiders

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Introduction

- Invasive and urban pests can both alter ecosystems, but we know little of the interaction between these disturbances.
- Black widows (BLW, *Latrodectus hesperus*) are a common, native urban pest of Western North America [1].
- Brown widows (BRW, *L. geometricus*) are native to Africa, but have invaded North America multiple times, sometimes outperforming native widow species [2].
- Here we compare the laboratory behavior of native BLWs that are pests of urban Phoenix habitat with a BRW population that invaded urban San Diego within the last 15 years.
 - We took repeated measures of web building and foraging voracity.
- We hypothesized that differences in mean behavior, or behavioral consistency, among species may provide insight into BRW invasive success, and their potential replacement of the native BLW.

Methodology

- BRWs were collected 10/22 from the San Diego St. Univ. campus; BLWs were collected 11/22 from Scottsdale, AZ.
- All spiders were returned to the laboratory, weighed (mg), placed in clear acrylic boxes (5 x 4") and housed under reverse photo period.
- Web building trials were conducted in clean acrylic boxes, documenting activity every minute for the first 5 minutes, and then every 5 minutes until 60 minutes.
- Prey trials were conducted by placing two 2-week old crickets (*Acheta domesticus*) into a spider's home box and recording latency to subdue.



Results

- Both species showed a high level of individual consistency in web-building activity across repeated measures.
 - Figure 1:** Intraclass correlation coefficient= 0.67; $p < 0.0001$.
- Neither species showed individual consistency in foraging voracity across repeated measures.
 - Intraclass correlation coefficient= 0.107; $P = 0.32$
- On average, BLWs were 4x more active web building than BRWs.
 - Figure 2:** $p < 0.0001$.
- Foraging voracity (measured as time to subdue) was similar for both species ($p = 0.445$).
- We found no evidence that a spider's web building activity was correlated with either its foraging voracity.
- Neither behavioral measures were predicted by the spider's body mass on the day of the trial.

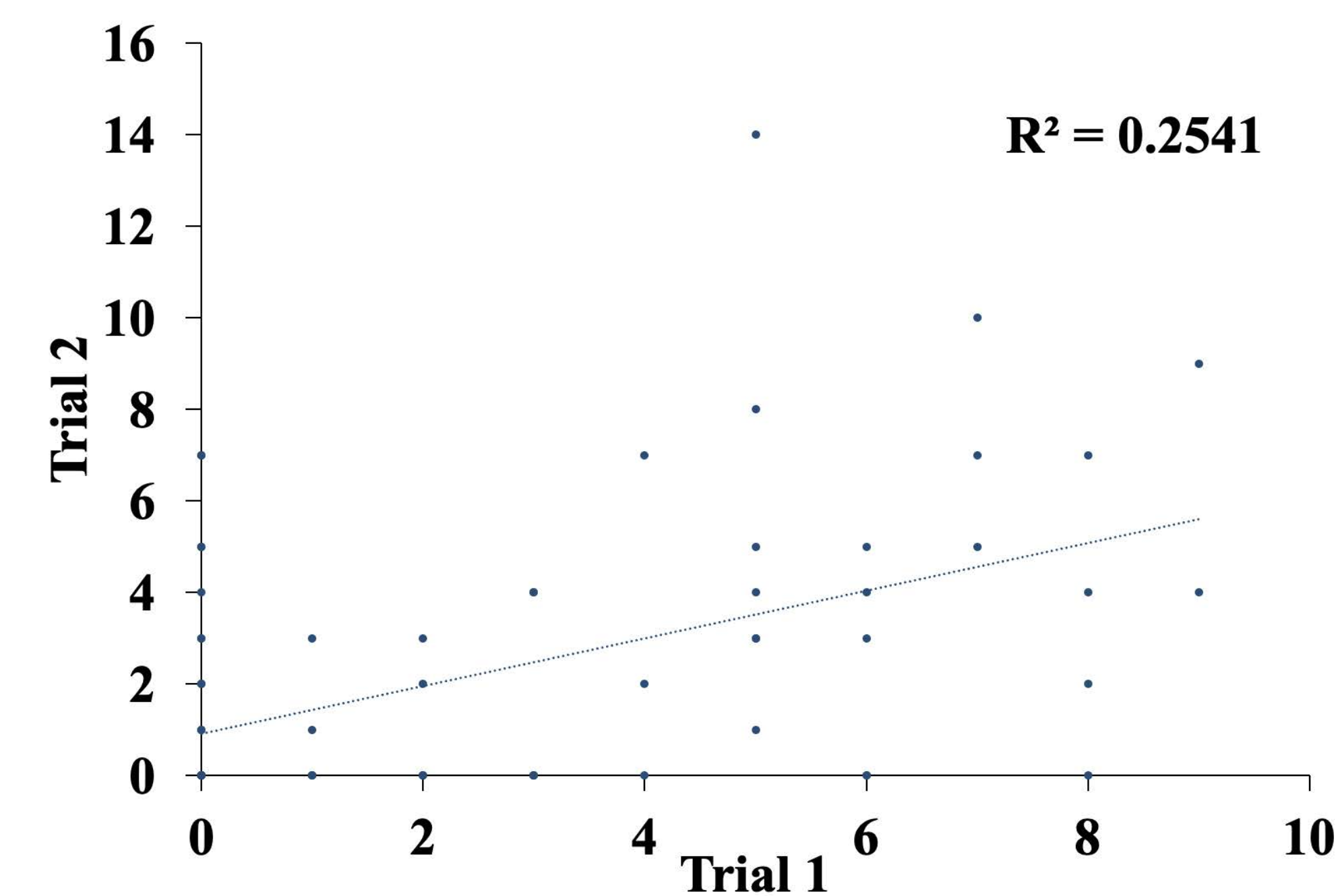


Figure 1: Spiders (both species) show strong intra-individual consistency between web building repeated measures.

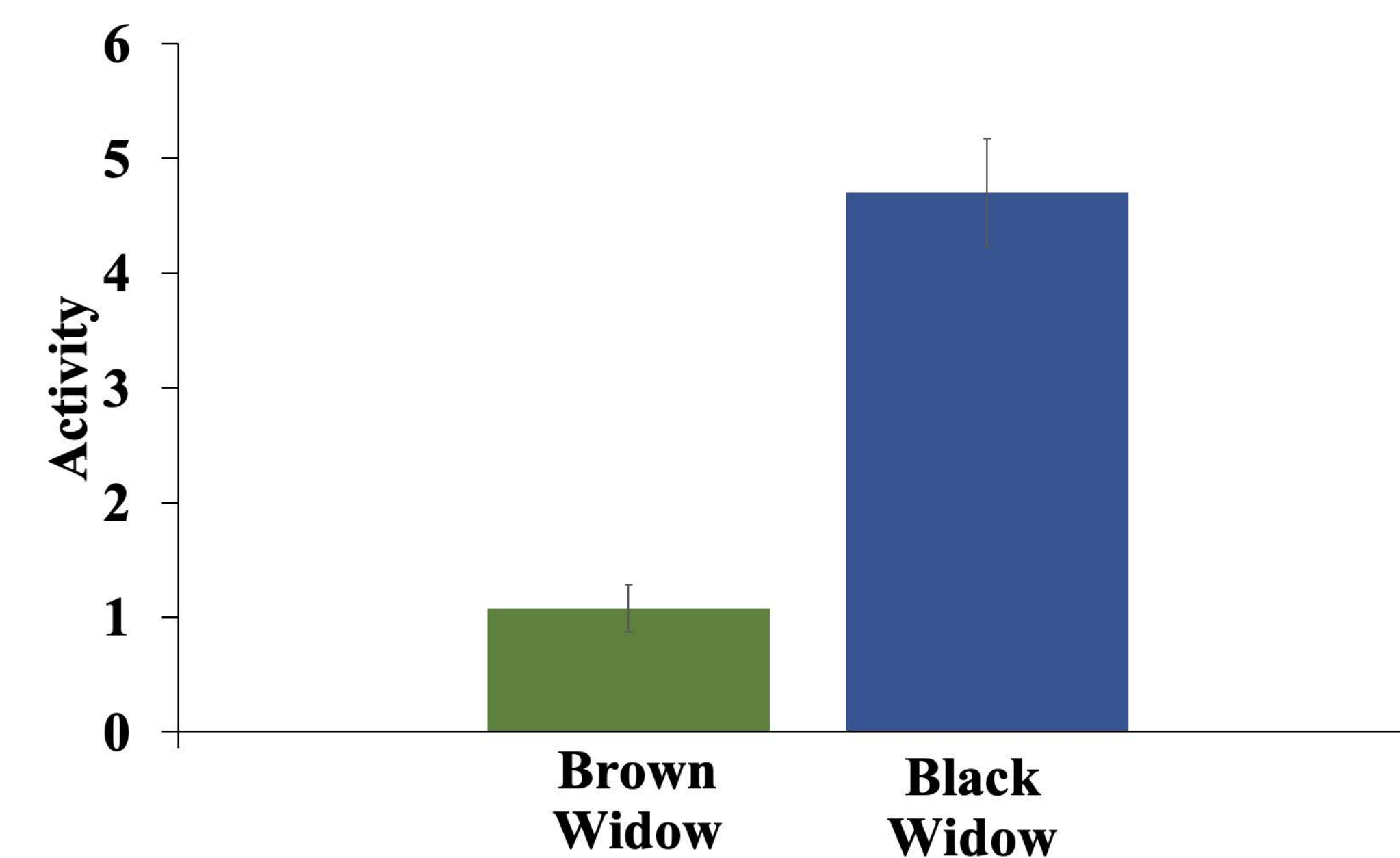


Figure 2: BRWs show almost 4x less web building activity compared to BLWs.



Discussion

- Behavioral analysis of invasive and urban pests can provide us with clues as to how and why pests are so successful.
- BRWs are successfully invading non-native urban areas and appear to be replacing the native BLW urban pest.
- Yet, we find that BRWs are significantly **LESS** active in their web building.
 - This is a surprising finding given other invasive pests thrive by being more active and aggressive than their native counterparts [3].
 - Urban and invasive success may sometimes derive from a reduced response to stimulus (e.g. urban BLW spiderlings show reduced siblicide and increased social tolerance [4]).
- Thus, BRWs may enjoy invasive success because they are less reactive in the urban environment and more amenable to group-living.
 - Future studies will test the prediction that BRWs share web space, potentially capturing more prey than they would with a larger single web.
 - These adult trials (and ongoing siblicide trials) will further establish if BRWs show reduced cannibalism.
- Understanding the behavior and ecology of urban and invasive pests has the potential to support urban development practices that promote native biological diversity.



Literature Cited

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