Altered Flight Initiation Distance in Urban Colonizer, Western Side-Blotched Lizards *(Uta stansburiana elegans)*

Student: Brooklyn Stone, Mentor: Zia Nisani

Contact: bstone10@avc.edu and znisani@avc.edu

Department of Biological & Environmental Sciences, Antelope Valley College, 3041 West Ave K, Lancaster Ca, 93536, USA

Introduction

Western side blotched lizard (*Uta stansburiana elegans*)

Escape strategies are an economic trade-off for prey animals, balancing the escape from predation with essential activities to maximize fitness such as foraging, mating, and basking. One of the most important decisions when confronted by a predator is when to begin their antipredator response, which for many prey is flight[1]. Thus, balancing the cost of flight with the chance of being captured.

In lizards, flight initiation distance (FID), the distance between a prey individual and a predator when escape begins, can be affected by many intrinsic or extrinsic factors such as sex, temperature, and habitat. Thus, anthropogenic activities that change the habitat could influence FID. Furthermore, altering behavior due to urbanization, influences the species ability to persist in a city[2].

We compared the FID of the western side-blotched lizards (*Uta stansburiana elegans*) in a high-trafficked urban city to a protected rural park area. Our study evaluated how urbanization and substrate variation could influence the lizards' FID.

We hypothesized that flight initiation distance would vary between the two populations due to artificial structures in urban environments.

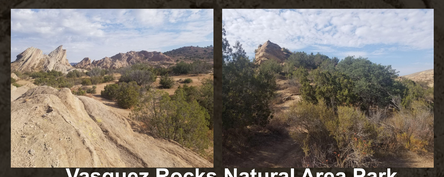
Methodology

Species:

The western side-blotched lizard, *Uta stansburiana elegans*, was chosen due to their accessibility in southern California and their distribution in both rural and urban environments.

Study sites:

Rancho Vista Blvd.



Vasquez Rocks Natural Area Park

Data Collection:

We conducted our study from July to September in 2022 in the mornings between 7:30 and 10:30, during the lizards' morning basking time. At each site, we would walk on a dedicated trail until we spotted a subject. We tracked our routes using Gaia GPS to ensure a new track was chosen each time to avoid pseudoreplication. We recorded the time and coordinates, wind speed, humidity, air temperature, and substrate temperature that the subject was found on. Once those variables were recorded, we used the technique used by Grolle et al. (2014)[3] where we would approach the lizard at a constant slow rate until the lizard fled. Once it fled, we measured the distance between the researcher and the lizard's position before fleeing. The researcher wore the same muted colors each time to minimize the potential effect that color has on FID[4].

Results

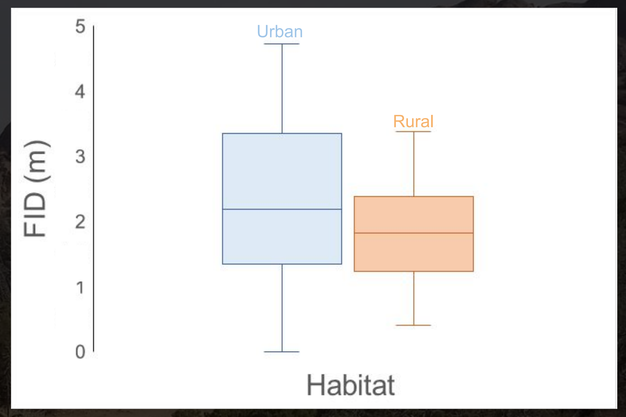


Fig. 1: western side-blotched lizard (*Uta stansburiana elegans*) at urban site exhibited (Mean +/- SD) a significantly higher flight-initiation (2.26 +/- 1.16 m) compared to rural site (1.85 +/- 0.77 m), t(83) = 2.07, p = 0.041. The line indicated the median.

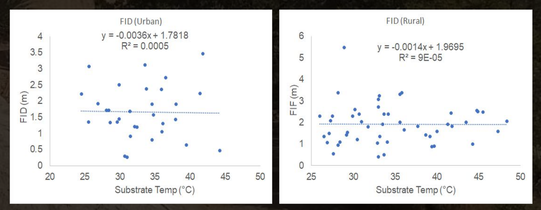


Fig. 2: The relationship between flight-initiation distance of lizards in Urban and Rural areas, in relation to substrate temperature.

Table 1: The FID of lizards on various substrates

Habitat	Substrate	Mean FID (m) ± SD (n)
Urban	Brick Wall	3.24 ± 1.16 (17)
Urban	Concrete	1.7 ± 0.59 (19)
Urban	Dirt	1.51 ± 0.69 (8)
Urban	Misc.	2.23 ± 0.53 (5)
Rural	Rock	1.9 ± 1.01 (26)
Rural	Dirt	1.9 ± 0.82 (21)
Rural	Sticks	2.19 ± 0.97 (3)

Table 2: A 2X2 ANOVA* (Habitat vs. Substrate) revealed that both habitat and substrate significantly influenced flight-initiation distance of lizards, however, there was a strong interaction effect.

Source	SS	df	MS	F	P
Substrate	8.06	1	8.06	8.95	0.0037
Habitat	5.62	1	5.62	6.24	0.0146
Interaction	13.27	1	13.27	14.74	0.0002
Error	71.14	79	0.9		
Total	98.09	82			

*(Habitat: urban vs. rural; Substrate: Brick wall & Concrete vs. Rock & Dirt). The other substrates were not included due to small sample size.

Conclusions

The urban lizards had a longer FID compared to rural lizards (Fig. 1). Urbanization changes the habitat by replacing natural vegetation with artificial structures that can stress the lizards by altering abiotic factors such as temperature, refuge availability, and so on[5]. Our urban location had little ground coverage/foliage as refuge compared to the rural location which could correlate with a longer FID[6].

Habitat influenced FID was mostly due to substrate variation with a strong interaction effect (Table 2). The lizards on concrete walls had the longest FID (Table 1) possibly due to hindered locomotive abilities due to the substrate[2]. A longer FID could be to compensate for not being able to move swiftly on the smooth wall, but more research is needed to see if lizards adjust escape mode to maximize locomotor efficiency on different substrates.

Habituation could also be playing a role in affecting the FIDs of urban and rural lizards. The lizards found on the ground in both areas had similar FIDs (Table 1). Studies have shown that visitation of the natural park does influence lizard's behaviors, including FID. Some lizards show habituation in areas with minimal human disturbance, only showing significant differences in FID in areas with virtually no human contact[7].

To be a successful urban colonizer, the lizards seem to modify their behaviors in response to humans and altered environments. This ability to alter escape behavior is an important trait that allows lizards to survive and persist in urban habitats, and likely have fitness consequences[2].

References

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